INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	222
Annual Incidence[a]	
LA County	2.35
California[b]	N/A
United States[bc]	4.4
Age at Diagnosis	
Mean	47
Median	49
Range	0–95 years

[a]Cases per 100,000 population.

[b]Not notifiable.

[c] National projection of IGAS incidence from Active Bacterial Core Surveillance Areas data, 2014.

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for hand washing can be found at www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm . All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2014 TRENDS AND HIGHLIGHTS

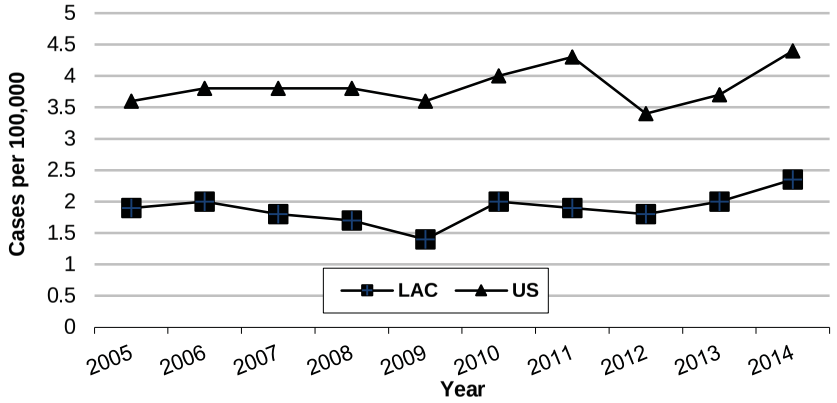
- The incidence rate of reported IGAS was 2.35 cases per 100,000 during 2014, which is the highest it has been in the last ten seasons (Figure 1). This increase may be attributable to an increase in reporting due to the development of electronic laboratory reporting systems.
- Cases <1 year old had the highest rate of any age group with 5.9 cases per 100,000; however, this group only contributed 3.2% of all cases reported. The next highest incidence was among persons aged 65 years and older with 4.9 cases per 100,000 and 25.2% of all reported cases.
- In 2014, whites had the highest IGAS incidence among racial/ethnic groups (1.9 per 100,000); from 2010-13, blacks consistently had the highest rate (Figure 3). Fifty one percent of cases had an unknown race/ethnicity.
- SPA 3 and 4 had the highest incidence rate at 3.0 and 3.8 cases per 100,000, respectively (Figure 4). SPA 3 had the largest incidence rate increase, from 1.4 to 3.0 per 100,000 in 2013 and 2014, respectively.
- The greatest number of cases occurred in winter through spring. July, August and September had the lowest number of reported cases (Figure 5). The number of reported cases throughout the year was higher overall than the previous five-year average and higher than any other individual year since 2005 (Figure 1).
- IGAS cases presented most often with bacteremia (without focus) and cellulitis (Table 1).
- Diabetes was reported more than any other risk factor (29%) followed by chronic heart disease (15%). Twenty nine percent of cases reported having none of the traditional risk factors (Table 2).

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

	2010 (N=191)			2011 (N=175)			2012 (N=168)			2013 (N=195)			2014 (N=222)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	4	2.1	3.3	1	0.6	0.7	3	1.8	2.5	5	2.6	4.1	7	3.2	5.9
1-4	6	3.1	1.2	6	3.4	1	5	3	1.1	4	2.1	0.8	7	3.2	1.4
5-14	6	3.1	0.5	10	5.7	0.8	7	4.2	0.6	10	5.1	0.8	16	7.2	1.3
15-34	33	17.3	1.2	16	9.1	0.5	27	16.1	1	29	14.9	1.0	34	15.3	1.2
35-44	21	11.0	1.6	28	16	1.9	20	11.9	1.5	20	10.3	1.5	24	10.8	1.8
45-54	34	17.8	2.6	32	18.3	2.4	31	18.5	2.4	41	21.0	3.2	43	19.4	3.3
55-64	29	15.2	3.0	36	20.6	3.7	35	20.8	3.4	31	15.9	3.0	35	15.8	3.3
65+	58	30.4	5.8	46	26.3	4.3	39	23.2	3.5	54	27.7	4.9	56	25.2	4.9
Unknown	0	-	-	0	-	-	0	-	-	1	0.5	-	0	-	-
Race/Ethnicity															
Asian	16	8.4	1.2	13	7.4	1	8	4.8	0.6	8	4.1	0.6	6	2.7	0.4
Black	25	13.1	3.2	22	12.6	2.6	24	14.3	3.1	29	14.9	3.7	10	4.5	1.3
Hispanic	52	27.2	1.2	49	28	1	58	34.5	1.3	29	14.9	0.6	29	13.1	0.6
White	53	27.7	2.0	45	25.7	1.6	44	26.2	1.7	50	25.6	1.9	51	23.0	1.9
Other	3	1.6	11.6	0	-	-	2	1.2	-	5	2.6	-	11	50.5	-
Unknown	42	22.0	-	46	26.3	-	32	19	-	74	37.9	-	115	51.8	-
SPA															
1	2	1.0	0.5	3	1.7	0.8	0	-	-	4	2.1	1.0	5	2.3	1.3
2	34	17.8	1.6	34	19.4	1.5	32	19	1.5	38	19.5	1.7	38	17.1	1.7
3	30	15.7	1.9	22	12.6	1.3	17	10.1	1.1	23	11.8	1.4	49	22.1	3.0
4	38	19.9	3.4	31	17.7	2.5	38	22.6	3.4	33	16.9	2.9	44	19.8	3.8
5	12	6.3	1.9	14	8	2.1	10	6	1.6	18	9.2	2.8	11	5.0	1.7
6	29	15.2	2.9	22	12.6	2.1	24	14.3	2.4	23	11.8	2.2	25	11.3	2.4
7	12	6.3	0.9	20	11.4	1.5	17	10.1	1.3	16	8.2	1.2	21	9.5	1.6
8	13	6.8	1.2	28	16	2.5	21	12.5	2	24	12.3	2.2	24	10.8	2.2
Unknown	0	-	-	1	0.5	-	9	5.4	-	16	8.2	-	5	2.3	-

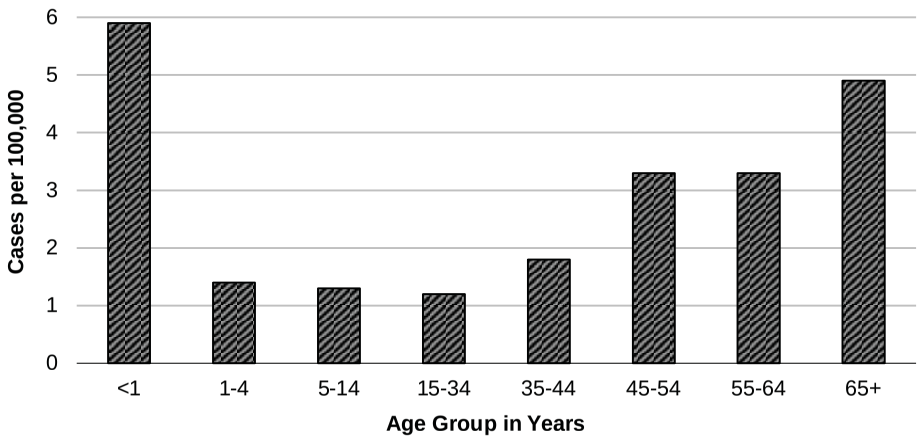
*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 2005-2014*



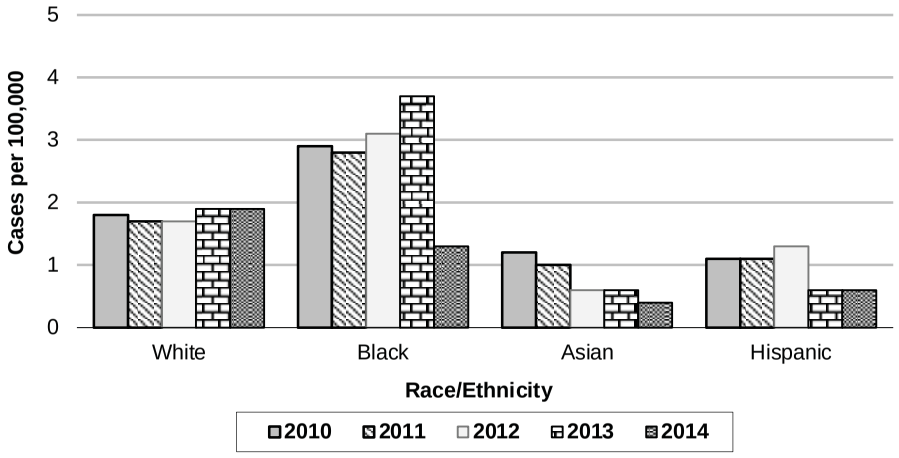
*US incidence for 2014 not available.
**National projection of IGAS incidence from Active Bacterial Core Surveillance areas data, 2014 [1].

Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2014 (N=222)



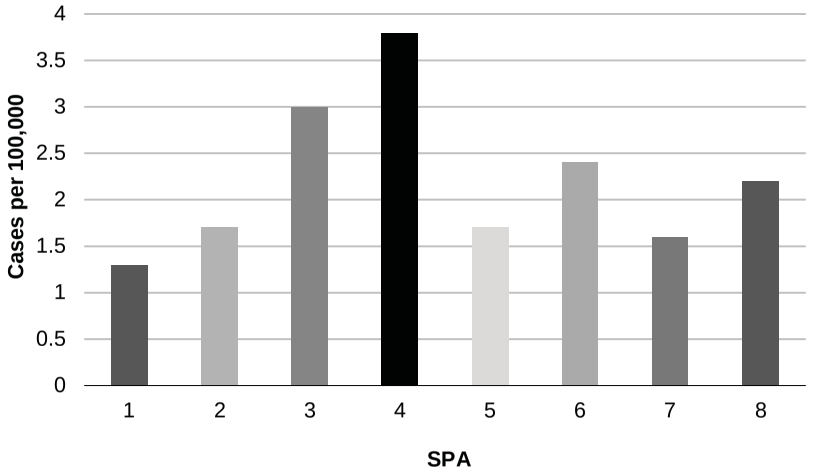
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2010-2014



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2014 (N=222)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2014 (N=222)

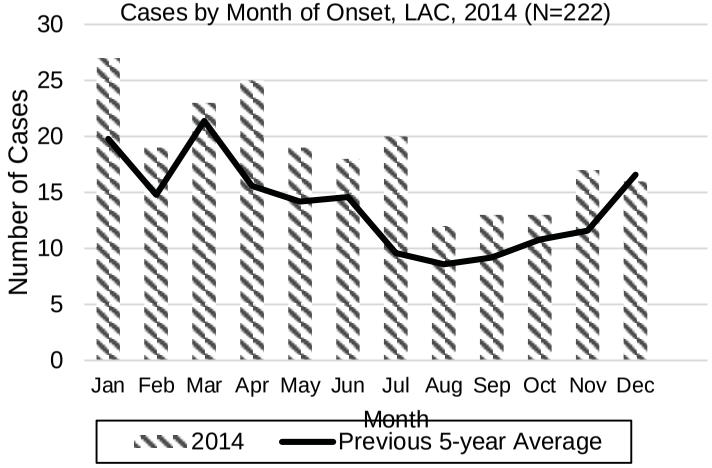


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2014 (N=181)

Syndrome	Number	Percent*
Bacteremia (without focus)	56	31
Cellulitis	49	27
Other	30	17
Pneumonia	29	16
STSS	29	16
Necrotizing Fasciitis	15	8
Non-surgical wound infection	12	7
Osteomyelitis	5	3

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

Table 2. Percentage of IGAS Risk Factors Based on Date of Onset Between 1/1/12–12/31/14

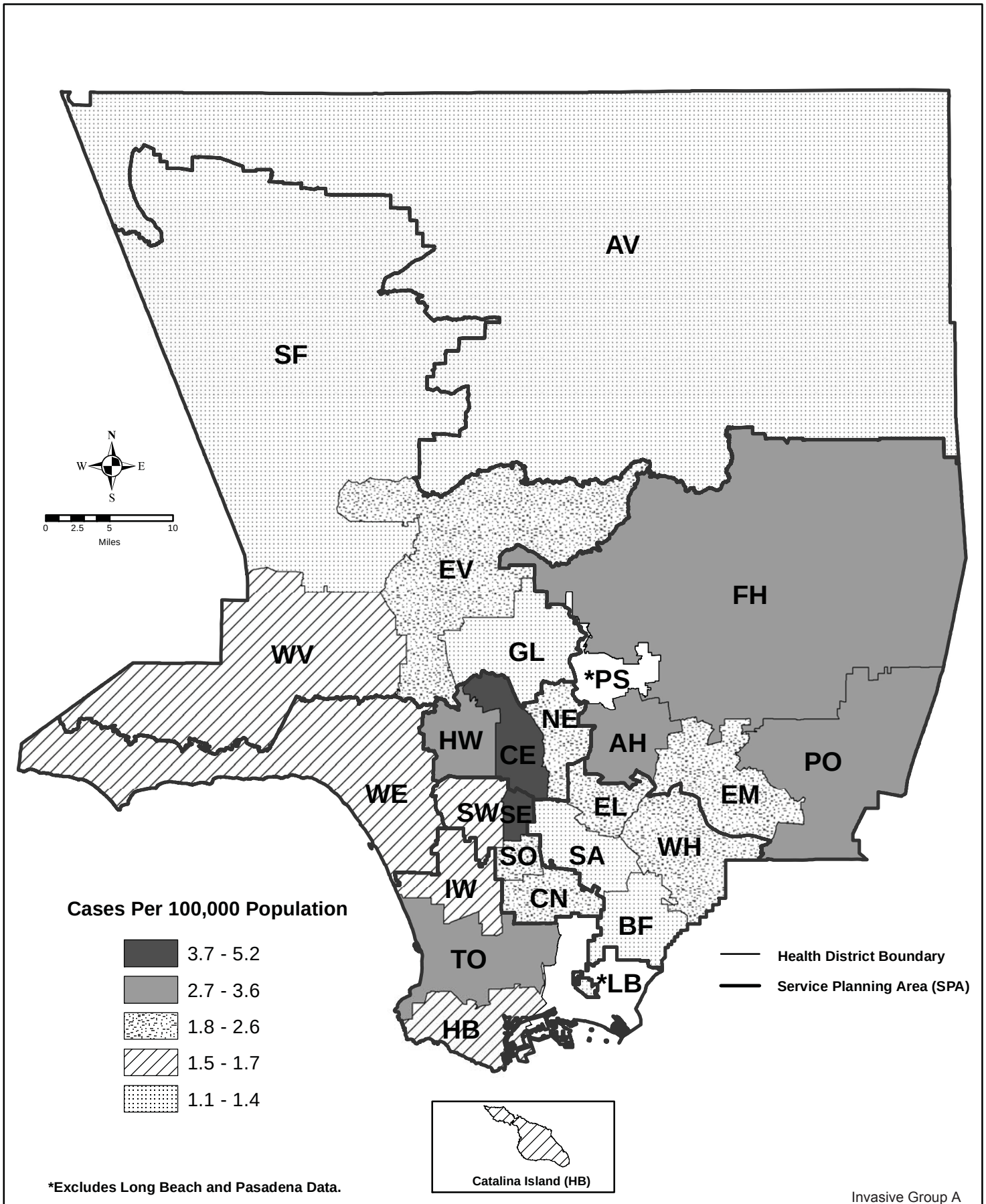
Risk Factors*	2012 (N=168) %**	2013 (N=195) %**	2014 (N=182) %**
Alcohol Abuse	13	13	8
Chronic Heart Disease	11	14	15
Chronic Lung Disease	3	6	6
Cirrhosis	9	5	7
Diabetes	26	28	30
History of Blunt Trauma	10	17	4
HIV/AIDS	1	2	2
IV Drug Use	6	7	2
Malignancy	4	13	9
Other	1	15	7
None	26	30	29

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

References

1. Active Bacterial Core Surveillance Reports from 2000 to 2013 from the Centers for Disease Control and Prevention's Division of Bacterial Diseases. Report available at: www.cdc.gov/abcs/reports-findings/surv-reports.html. Accessed 6/05/2015.

Map 14. Streptococcus, Group A Invasive Rates by Health District, Los Angeles County, 2014*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	195
Annual Incidence[a]	
LA County	2.07
California[b]	N/A
United States[c]	3.4
Age at Diagnosis	
Mean	50
Median	51
Range	0–99 years

[a]Cases per 100,000 population.

[b]Not notifiable.

[c]Estimate from Centers for Disease Control and Prevention's Division of Bacterial Diseases--Active Bacterial Core Surveillance Report, 2012. http://www.cdc.gov/abcs/reports-findings/surv-reports.html. Accessed 6/27/2014.

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups, such as diabetics, are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2013 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 2.07 cases per 100,000 during 2013, which is the highest it has been since 2010, when it was also 2.07.
- Cases aged ≥65 years had the highest rate of IGAS (4.9 per 100,000) followed by cases aged less than one (4.1 per 100,000) (Figure 2). The age groups <1 year, 45-54 and ≥65 years had increased rates compared with 2012. Remaining age groups had the same or decreased rates from the year prior.
- Blacks continued to have the highest rate of IGAS. In 2013, blacks had the highest rate relative to the four most recent years (2009-2012). In 2013, rates of disease in whites increased from 1.7 to 1.9 and decreased for Hispanics from 1.3 to 0.6. Asians remained consistent with the previous year at a rate of 0.6 (Figure 3). Thirty-seven percent of cases had an unknown race/ethnicity.
- SPA 4 and 5 had the highest incidence rate at 2.9 and 2.8 cases per 100,000, respectively (Figure 4). SPA 5 had the largest incidence rate increase, 1.6 to 2.8 per 100,000 from 2012 to 2013, respectively.
- In 2013, the number of reported cases peaked in January with 28 cases, followed by 25 cases in December. The number of reported cases throughout the year was higher overall than the previous five-year average and higher than any other individual year since 2008 (Figure 5).

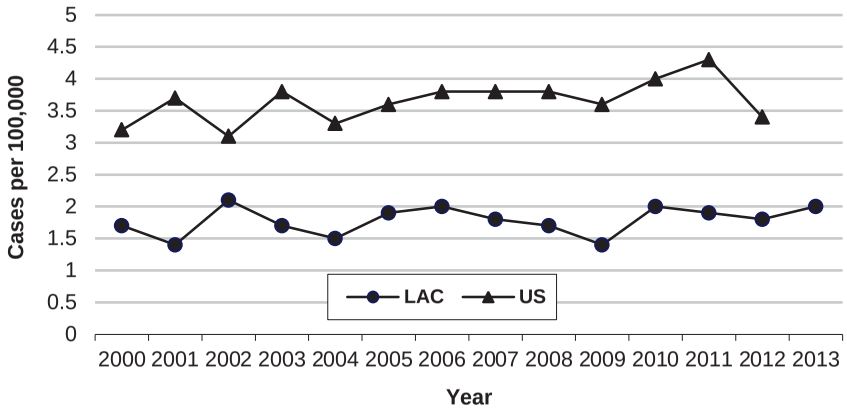
- IGAS cases presented most often with bacteremia (without focus) and cellulitis (Table 1).
- Consistent with the past several years, diabetes was reported more than any other risk factor (28%) and history of blunt trauma (17%). Thirty percent of cases reported having none of the traditional risk factors (Table 2).
- Risk factors in the category of other included renal failure (3%), stroke (5%) and organ transplant (3%).
- Although the number of cases in 2013 is highest over the last five year period (2008-2012), this increase may be attributable to an increase reporting due to the development of more efficient electronic reporting systems.

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

	2009 (N=129)			2010 (N=191)			2011 (N=175)			2012 (N=168)			2013 (N=195)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	1	0.8	0.8	4	2.1	3.3	1	0.6	0.7	3	1.8	2.5	5	2.6	4.1
1-4	3	0.6	0.6	6	3.1	1.2	6	3.4	1	5	3	1.1	4	2.1	0.8
5-14	9	0.7	0.7	6	3.1	0.5	10	5.7	0.8	7	4.2	0.6	10	5.1	0.8
15-34	15	11.6	0.5	33	17.3	1.2	16	9.1	0.5	27	16.1	1	29	14.9	1.0
35-44	14	11	1.0	21	11.0	1.6	28	16	1.9	20	11.9	1.5	20	10.3	1.5
45-54	29	22.5	2.3	34	17.8	2.6	32	18.3	2.4	31	18.5	2.4	41	21.0	3.2
55-64	23	17.8	2.5	29	15.2	3.0	36	20.6	3.7	35	20.8	3.4	31	15.9	3.0
65+	35	27.1	3.5	58	30.4	5.8	46	26.3	4.3	39	23.2	3.5	54	27.7	4.9
Unknown	0			0			0			0			1	0.5	
Race/Ethnicity															
Asian	10	7.8	0.8	16	8.4	1.2	13	7.4	1	8	4.8	0.6	8	4.1	0.6
Black	16	12.4	2.1	25	13.1	3.2	22	12.6	2.6	24	14.3	3.1	29	14.9	3.7
Hispanic	43	33.3	1.0	52	27.2	1.2	49	28	1	58	34.5	1.3	29	14.9	0.6
White	40	31	1.5	53	27.7	2.0	45	25.7	1.6	44	26.2	1.7	50	25.6	1.9
Other	1	0.8	3.9	3	1.6	11.6	0	0	0	2	1.2		5	2.6	
Unknown	19	14.7		42	22.0		46	26.3		32	19		74	37.9	
SPA															
1	5	3.8	1.3	2	1.0	0.5	3	1.7	0.8	0	0	0	4	2.1	1.0
2	24	18.6	1.1	34	17.8	1.6	34	19.4	1.5	32	19	1.5	38	19.5	1.7
3	17	13.1	1.1	30	15.7	1.9	22	12.6	1.3	17	10.1	1.1	23	11.8	1.4
4	11	8.5	1.0	38	19.9	3.4	31	17.7	2.5	38	22.6	3.4	33	16.9	2.9
5	7	5.4	1.1	12	6.3	1.9	14	8	2.1	10	6	1.6	18	9.2	2.8
6	14	10.8	1.4	29	15.2	2.9	22	12.6	2.1	24	14.3	2.4	23	11.8	2.2
7	17	13.1	1.3	12	6.3	0.9	20	11.4	1.5	17	10.1	1.3	16	8.2	1.2
8	13	10.0	1.2	13	6.8	1.2	28	16	2.5	21	12.5	2	24	12.3	2.2
Unknown	21	16.2					1	0.5		9	5.4		16	8.2	

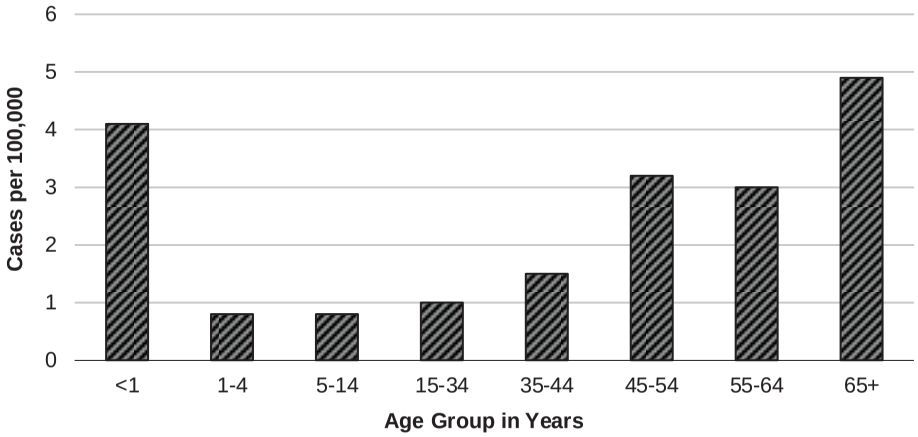
*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates* of Invasive Group A Streptococcus LAC and US, 2000-2013



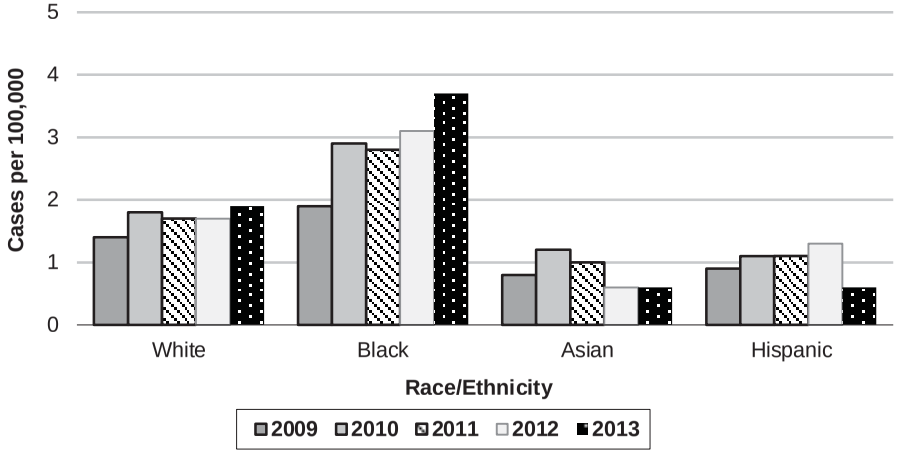
*United States incidence rate estimates from Active Bacterial Core Surveillance Reports [1].

Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2013 (N=195)



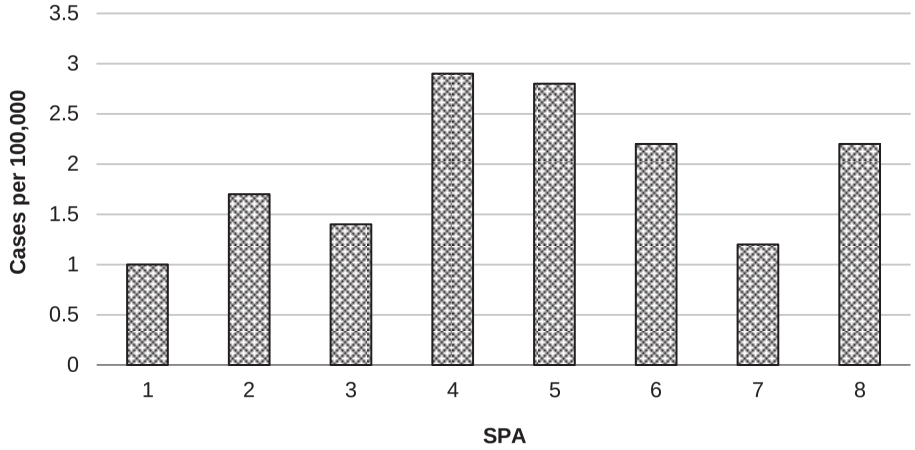
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2009-2013



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2013 (N=195)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2013 (N=195)

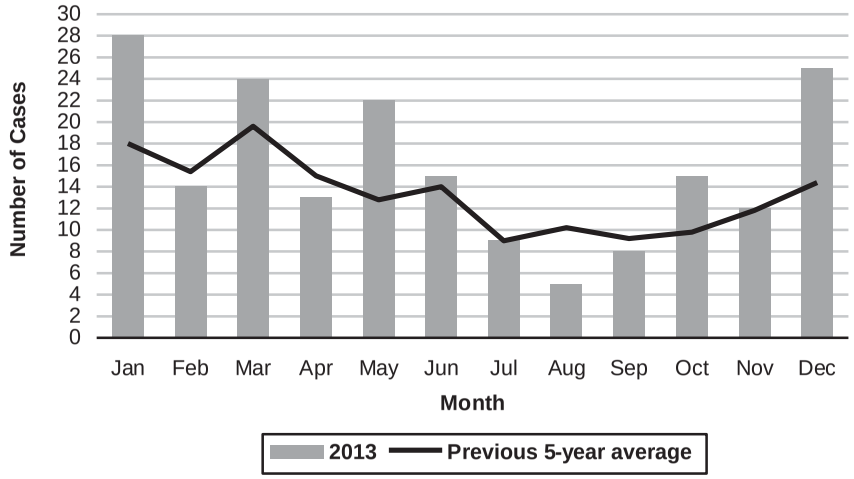


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2013 (N=195)

Syndrome	Number	Percent*
Bacteremia (without focus)	77	39
Cellulitis	51	26
Other	42	22
Non-Surgical Wound Infection	22	11
Pneumonia	21	11
STSS	18	9
Necrotizing Fasciitis	14	7
Postpartum Sepsis	5	3

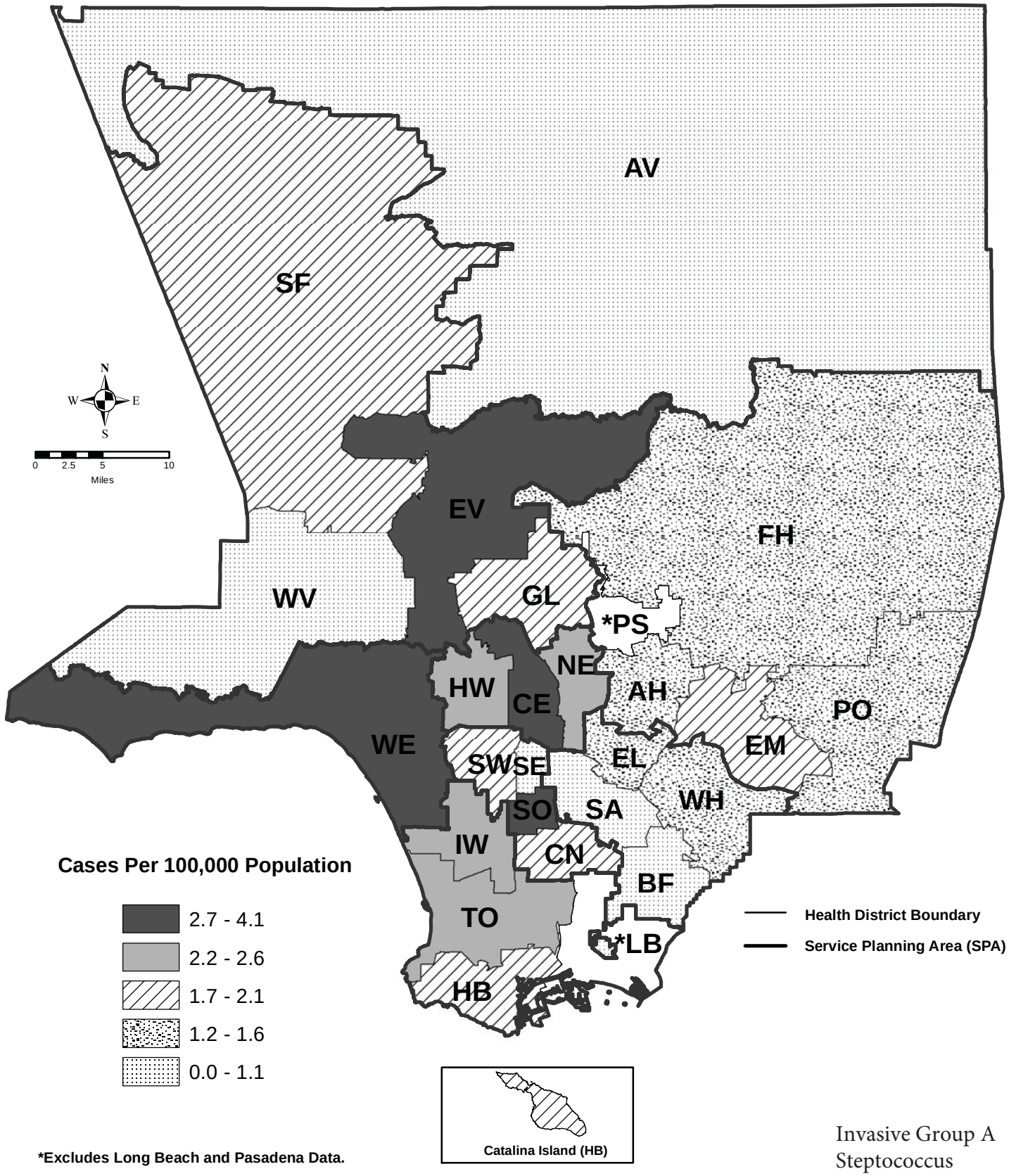
*Overlapping syndromes will total over 100%.
**Cases with unknown symptoms excluded.

Table 2. Percentage of IGAS Risk Factors – Based on Date of Onset Between 1/1/2011-12/31/2013

Risk Factors*	2011 (N = 175)	2012 (N =168)	2013 (N =195)
	%**	%**	%**
Alcohol Abuse	16	13	13
Chronic Heart Disease	23	11	14
Chronic Lung Disease	12	3	6
Cirrhosis	8	9	5
Diabetes	45	26	28
History of Blunt Trauma	33	10	17
HIV/AIDS	6	1	2
IV Drug Use	5	6	7
Malignancy	14	4	13
Other	41	1	15
None	55	26	30

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

Map 15. Streptococcus, Group A Invasive
Rates by Health District, Los Angeles County, 2013*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	168
Annual Incidence[a]	
LA County	1.8
California[b]	N/A
United States[b]	N/A
Age at Diagnosis	
Mean	49
Median	52
Range	0–94 years

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

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2012 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 1.8 cases per 100,000 during 2012, slightly lower than the previous year (2011) but higher than the previous five-year average (Figure 1).
- Cases aged 65 years and older had the highest rate of IGAS (3.5 per 100,000) followed by cases aged 55 to 64 years (3.4 per 100,000) (Figure 2). All age groups showed declines in incidence from 2011 to 2012 with exception of the <1 year age group with an incidence rate increasing from 0.6 to 2.5 cases per 100,000 in 2011 and 2012, respectively.
- Blacks continued to have the highest rate of IGAS. In 2012, blacks had the highest rate relative to the three most recent years (2009-2011). In 2012, rates of all race/ethnicities increased or remained the same except for Asians. Asians had a lower rate of disease compared to the previous four years (2008-2011) (Figure 3).
- SPA 4 and 6 had the highest incidence rate at 3.4 and 2.4 cases per 100,000, respectively (Figure 4). SPA 4 had the largest incidence rate increase, 2.8 to 3.4 per 100,000 from 2011 to 2012, respectively.
- In 2012, the number of reported cases peaked in January with 24 cases, followed by 20 cases in March. May, July and September had the lowest number of reported cases, with nine cases. The number of reported cases throughout the year was higher overall than the previous five-year average (Figure 5).
- IGAS cases presented most often with bacteremia (without focus) and other, non-traditional symptoms (Table 1).
- Although reported with much lower frequency than 2011, diabetes was reported more than any other risk factor (26%) followed by and alcohol abuse (13%). Twenty-six percent of cases

reported having none of the traditional risk factors (Table 2).

- One invasive group A Streptococcus (IGAS) outbreak was documented in a skilled nursing facility. Three IGAS cases were identified including two confirmed and one probable case. The investigation and site visit conducted by an Acute Communicable Disease Control Program investigation team revealed several breaches in infection control including improper hand washing practices, poor access to sanitizing hand gels and sinks in addition to infection control policies that were not consistent with CDC guidelines.

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

	2008 (N=156)			2009 (N=129)			2010 (N=191)			2011 (N=175)			2012 (N=168)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	2	1.3	1.4	1	0.8	0.7	4	2.1	2.9	1	0.6	0.7	3	1.8	2.5
1-4	6	3.8	1.1	3	2.3	0.5	6	3.1	1	6	3.4	1	5	3	1.1
5-14	14	9	1	9	7	0.7	6	3.1	0.5	10	5.7	0.8	7	4.2	0.6
15-34	24	15.4	0.8	15	11.6	0.5	33	17.3	1.1	16	9.1	0.5	27	16.1	1
35-44	22	14.1	1.5	14	10.9	0.9	21	11	1.5	28	16	1.9	20	11.9	1.5
45-54	13	8.3	1	29	22.5	2.1	34	17.8	2.5	32	18.3	2.4	31	18.5	2.4
55-64	27	17.3	3	23	17.8	2.4	29	15.2	3	36	20.6	3.7	35	20.8	3.4
65+	48	30.8	4.7	35	27.1	3.3	58	30.4	5.5	46	26.3	4.3	39	23.2	3.5
Unknown	0	0		0	0		0	0		0	0		1	0.6	
Race/Ethnicity															
Asian	14	8.3	1.1	10	7.8	0.8	16	8.4	1.2	13	7.4	1	8	4.8	0.6
Black	30	17.8	3.5	16	12.4	1.9	25	13.1	2.9	22	12.6	2.6	24	14.3	3.1
Hispanic	50	29.6	1.1	43	33.3	0.9	52	27.2	1.1	49	28	1	58	34.5	1.3
White	49	29	1.7	40	31	1.4	53	27.7	1.8	45	25.7	1.6	44	26.2	1.7
Other	0	0	0	1	0.8	3.9	3	1.6	11.6	0	0	0	2	1.2	
Unknown	26	15.4		19	14.7		42	22		46	26.3		32	19	
SPA															
1	4	2.6	1.1	3	2.3	0.8	2	1	0.5	3	1.7	0.8	0	0	0
2	35	22.4	1.6	22	17.1	1	34	17.8	1.5	34	19.4	1.5	32	19	1.5
3	19	12.2	1.1	17	13.2	1	30	15.7	1.7	22	12.6	1.3	17	10.1	1.1
4	24	15.4	1.9	9	7	0.7	38	19.9	3	31	17.7	2.5	38	22.6	3.4
5	17	10.9	2.6	6	4.7	0.9	12	6.3	1.8	14	8	2.1	10	6	1.6
6	14	9	1.3	14	10.9	1.3	29	15.2	2.7	22	12.6	2.1	24	14.3	2.4
7	15	9.6	1.1	16	12.4	1.2	12	6.3	0.9	20	11.4	1.5	17	10.1	1.3
8	22	14.1	2	12	9.3	1.1	13	6.8	1.2	28	16	2.5	21	12.5	2
Unknown	6	3.8		30	23.3					1	0.57		9	5.4	

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

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 2000-2012

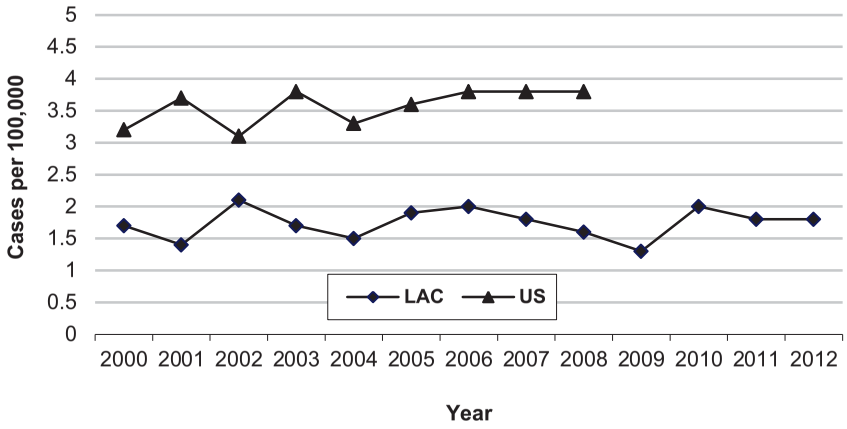
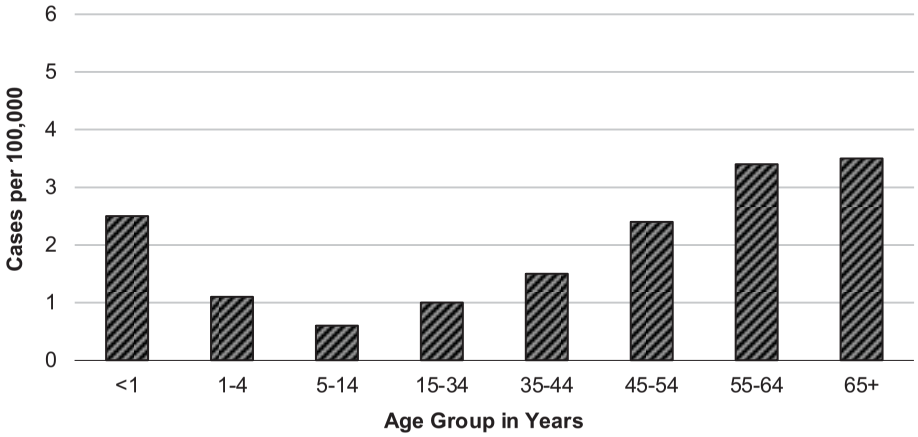
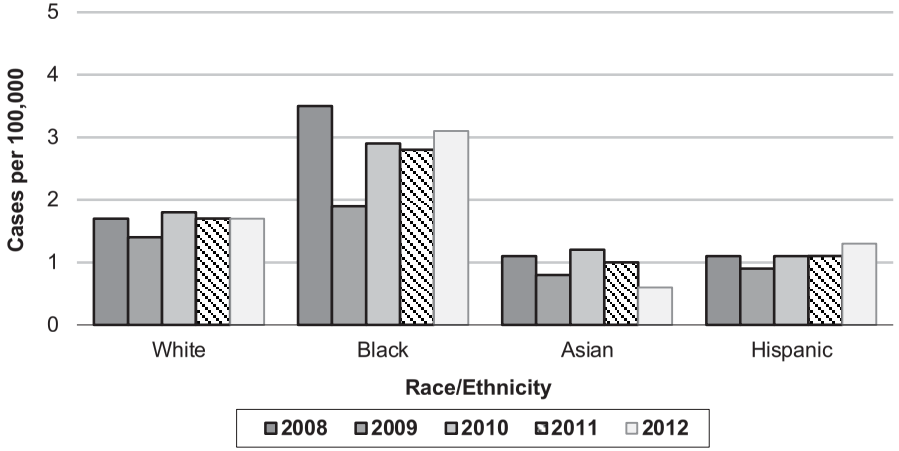


Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2012 (N=168)



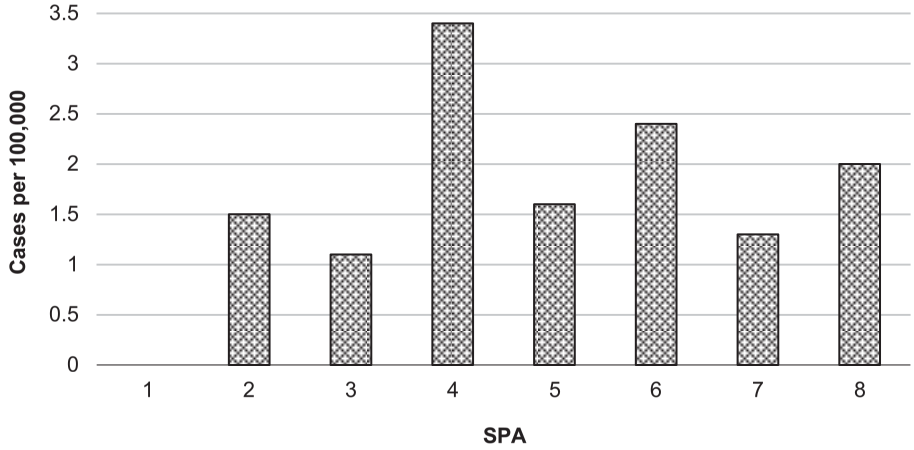
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2008-2012



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2012 (N=168)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2012 (N=168)

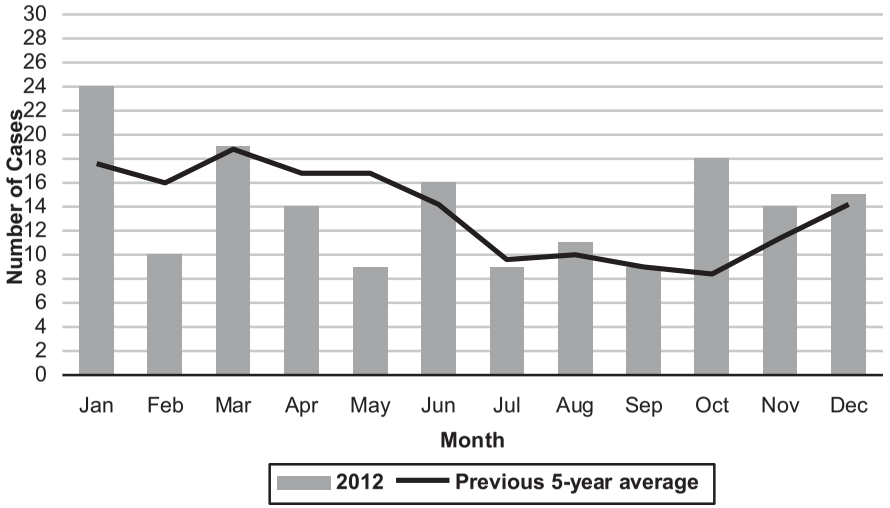


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2012 (N=168)

Syndrome	Number	Percent*
Other	58	34
Bacteremia (without focus)	53	31
Cellulitis	33	20
Sepsis	32	19
Pneumonia	31	18
Non-Surgical Wound Infection	21	13
Necrotizing Fasciitis	11	7
STSS	9	5

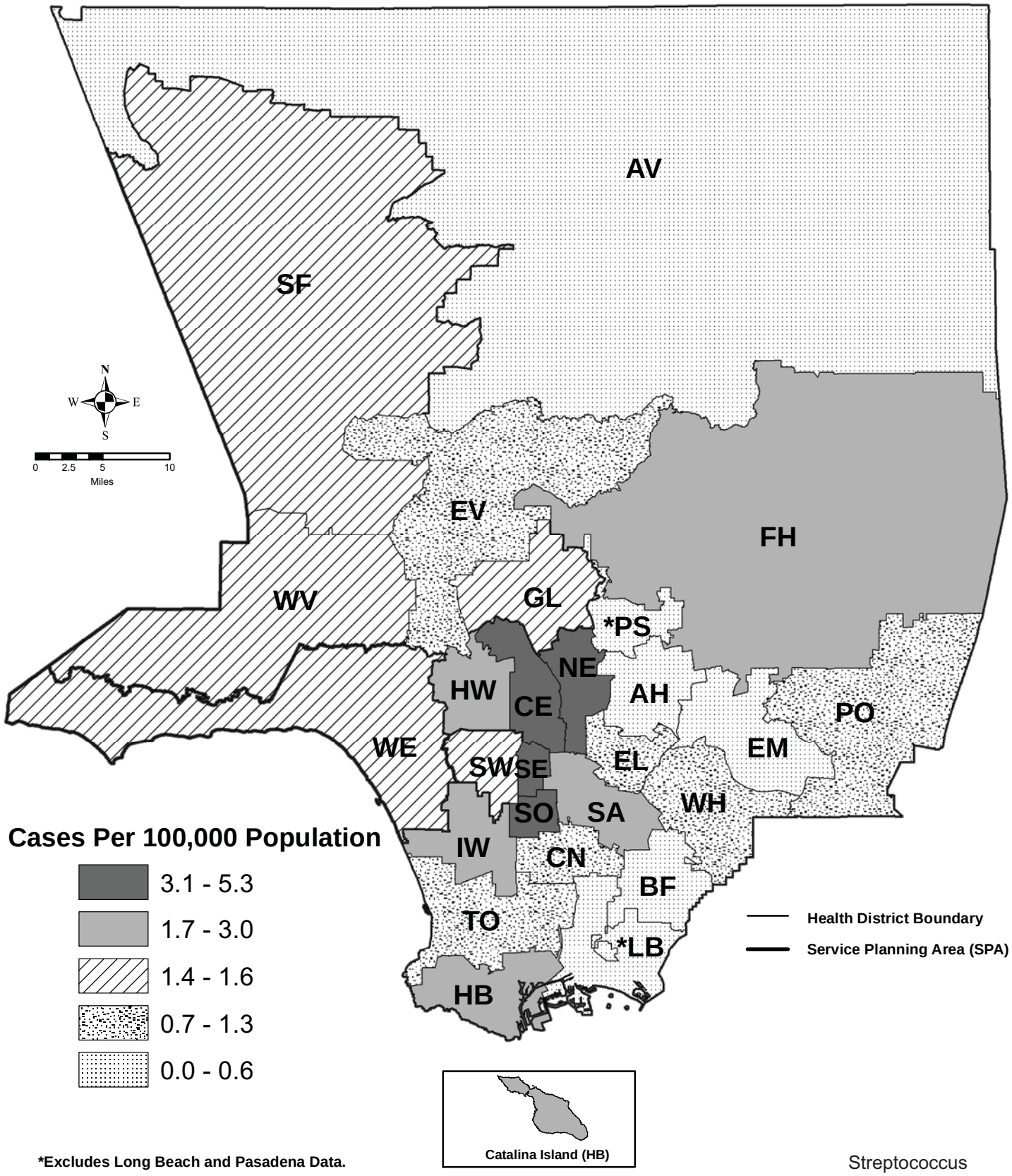
*Overlapping syndromes will total over 100%.
**Cases with unknown symptoms excluded.

Table 2. Percentage of IGAS Risk Factors — Based on Date of Onset Between 1/1/10-12/31/2012

Risk Factors*	2010 (N = 191) %**	2011 (N =175) %**	2012 (N =168) %**
Alcohol Abuse	6	16	13
Chronic Heart Disease	12	23	11
Chronic Lung Disease	6	12	3
Cirrhosis	4	8	9
Diabetes	23	45	26
History of Blunt Trauma	10	33	10
HIV/AIDS	1	6	1
IV Drug Use	3	5	6
Malignancy	5	14	4
Other	26	41	1
None	30	55	26

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

Map 13. Streptococcus, Group A Invasive Disease Rates by Health District, Los Angeles County, 2012*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	175
Annual Incidence[a]	
LA County	1.78
California[b]	N/A
United States[c]	--
Age at Diagnosis	
Mean	51
Median	53
Range	0–96 years

[a]Cases per 100,000 population.
[b]Not notifiable.
[c]See Final Summary of Nationally Notifiable Infectious Diseases, United States on MMWR website http://www.cdc.gov/mmwr/mmwr_nd/index.html.

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2011 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 1.78 per 100,000 during 2011, slightly lower than the previous year (2010) but slightly higher than the previous five-year average (Figure 1).
- Cases aged 65 years and older had the highest rate of IGAS (4.3 per 100,000) followed by cases aged 55 to 64 years (3.7 per 100,000) (Figure 2). The age group <1 years had the largest decrease in incidence rate relative to 2010: 2.9 per 100,000 in 2010 to 0.7 per 100,000 in 2011.
- Blacks continued to have the highest rate of IGAS although the rate in 2011 is lower relative to three recent years (2007, 2008, and 2010). Rates of all race/ethnicities in 2011 are lower compared to 2010 except Hispanics. In 2011 Hispanics had a higher rate of disease compared to the previous 4 years (2006-2010) (Figure 3).
- SPA 4 and 8 both had the highest incidence rate at 2.5 cases per 100,000 (Figure 4). SPA 8 had the largest increased incidence rate compared to 2010, 1.2 per 100,000 in 2010 and 2.5 per 100,000 in 2011.
- In 2011, the number of reported cases peaked in February with 29 cases, closely followed by 26 cases in March. August, September and November had the lowest number of reported cases, with eight cases. The number of reported cases throughout the year was lower overall than the previous five-year average (Figure 5).
- IGAS cases presented most often with bacteremia and cellulitis, the same as 2010 (Table 1).
- Diabetes was reported more than any other risk factor followed by chronic heart disease and history of blunt trauma. A large percentage of cases (55%) reported having none of the traditional risk factors (Table 2).

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

	2007 (N=173)			2008 (N=156)			2009 (N=129)			2010 (N=191)			2011 (N=175)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	3	1.7	2.0	2	1.3	1.4	1	0.8	0.7	4	2.1	2.9	1	0.6	0.7
1-4	6	3.5	1.0	6	3.8	1.1	3	2.3	0.5	6	3.1	1.0	6	3.4	1.0
5-14	8	4.6	0.6	14	9.0	1.0	9	7.0	0.7	6	3.1	0.5	10	5.7	0.8
15-34	20	11.6	0.7	24	15.4	0.8	15	11.6	0.5	33	17.3	1.1	16	9.1	0.5
35-44	18	10.4	1.2	22	14.1	1.5	14	10.9	0.9	21	11.0	1.5	28	16.0	1.9
45-54	33	19.1	2.5	13	8.3	1.0	29	22.5	2.1	34	17.8	2.5	32	18.3	2.4
55-64	29	16.8	3.3	27	17.3	3.0	23	17.8	2.4	29	15.2	3.0	36	20.6	3.7
65+	56	32.4	5.5	48	30.8	4.7	35	27.1	3.3	58	30.4	5.5	46	26.3	4.3
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Race/Ethnicity															
Asian	11	6.4	0.9	14	8.3	1.1	10	7.8	0.8	16	8.4	1.2	13	7.4	1.0
Black	34	19.7	4.0	30	17.8	3.5	16	12.4	1.9	25	13.1	2.9	22	12.6	2.6
Hispanic	49	28.3	1.1	50	29.6	1.1	43	33.3	0.9	52	27.2	1.1	49	28.0	1.0
White	52	30.1	1.8	49	29.0	1.7	40	31.0	1.4	53	27.7	1.8	45	25.7	1.6
Other	4	2.3	19.2	0	0.0	0.0	1	0.8	3.9	3	1.6	11.6	0	0.0	0.0
Unknown	23	13.3		26	15.4		19	14.7		42	22.0		46	26.3	
SPA															
1	5	2.9	1.4	4	2.6	1.1	3	2.3	0.8	2	1.0	0.5	3	1.7	0.8
2	43	24.9	2.0	35	22.4	1.6	22	17.1	1.0	34	17.8	1.5	34	19.4	1.5
3	20	11.6	1.2	19	12.2	1.1	17	13.2	1.0	30	15.7	1.7	22	12.6	1.3
4	15	8.7	1.2	24	15.4	1.9	9	7.0	0.7	38	19.9	3.0	31	17.7	2.5
5	15	8.7	2.3	17	10.9	2.6	6	4.7	0.9	12	6.3	1.8	14	8.0	2.1
6	35	20.2	3.3	14	9.0	1.3	14	10.9	1.3	29	15.2	2.7	22	12.6	2.1
7	18	10.4	1.3	15	9.6	1.1	16	12.4	1.2	12	6.3	0.9	20	11.4	1.5
8	17	9.8	1.5	22	14.1	2.0	12	9.3	1.1	13	6.8	1.2	28	16.0	2.5
Unknown	5	2.9		6	3.8		30	23.3					1	0.57	

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

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 2000-2011

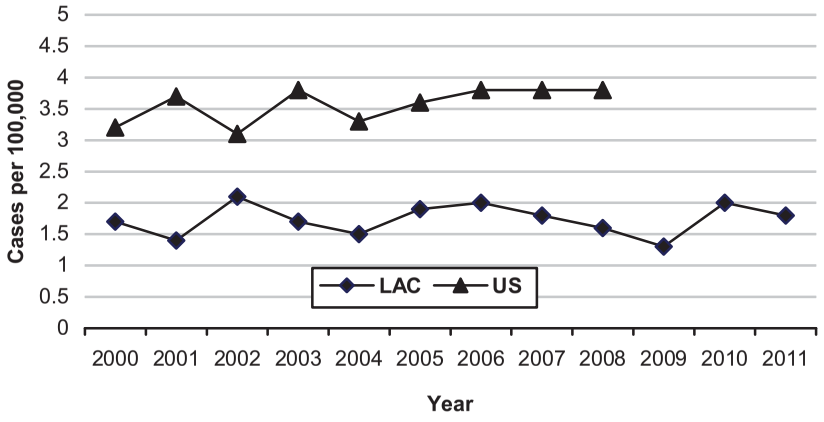
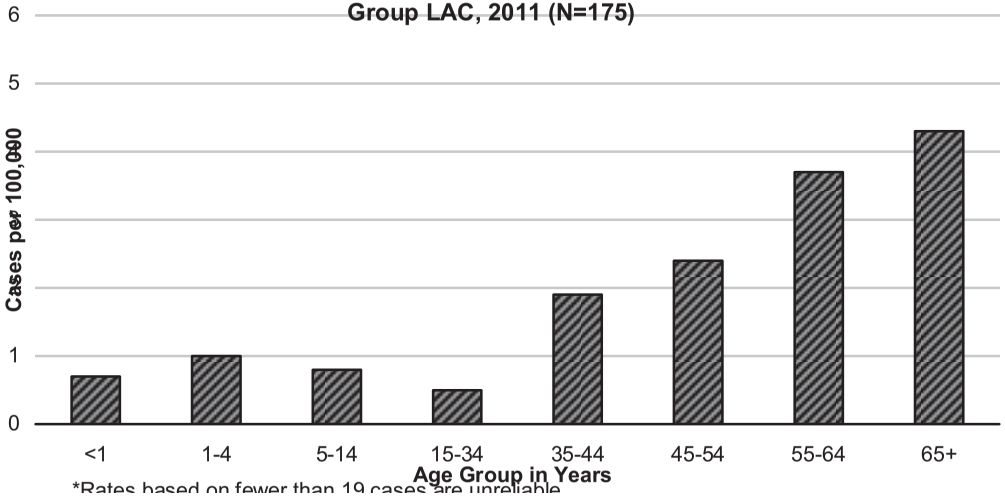
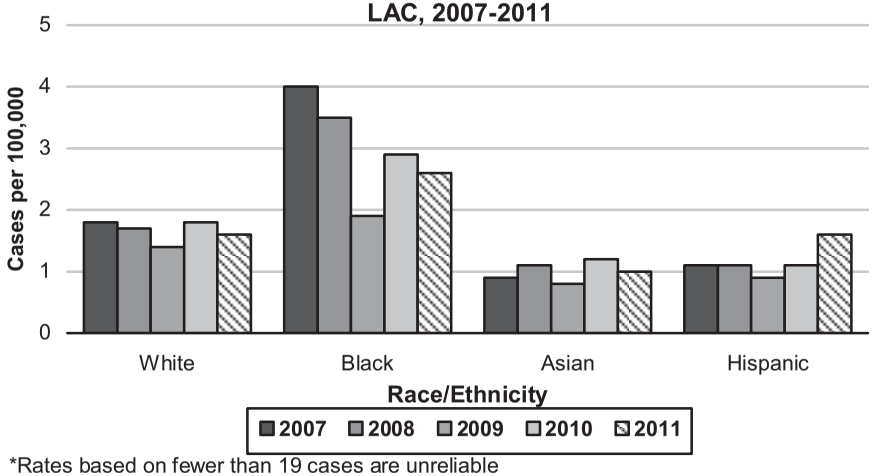


Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2011 (N=175)



*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2007-2011



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2011 (N=175)

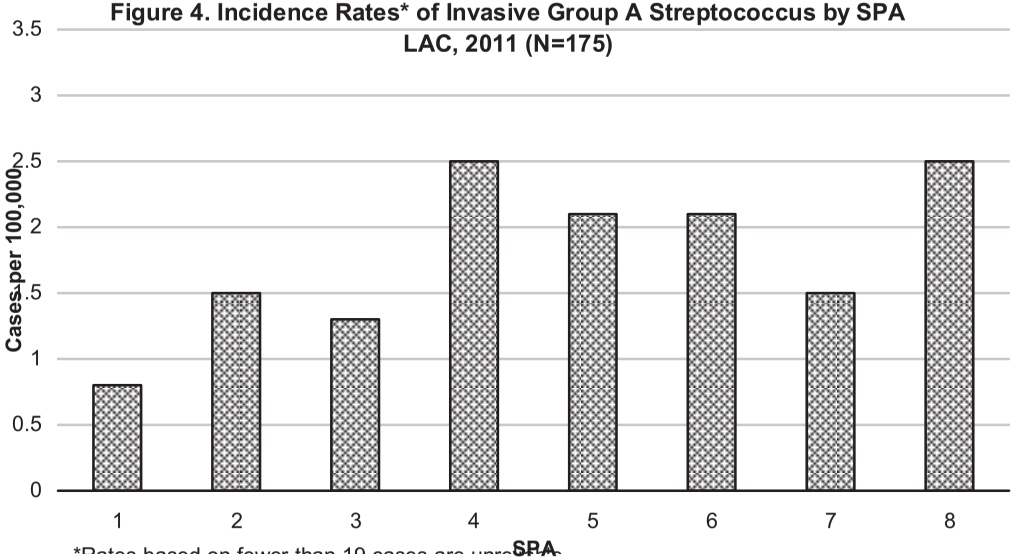


Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2011 (N=175)

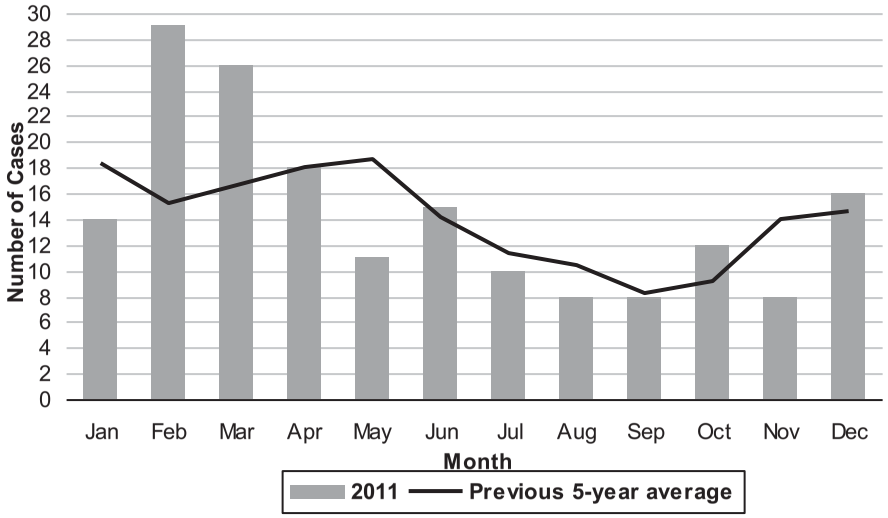


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2011 (N=175)

Syndrome	Number	Percent*
Cellulitis	118	67
Bacteremia (without focus)	99	57
Pneumonia	55	31
STSS	5	3
Non-Surgical Wound Infection	31	18
Necrotizing Fasciitis	33	19
Other	78	45

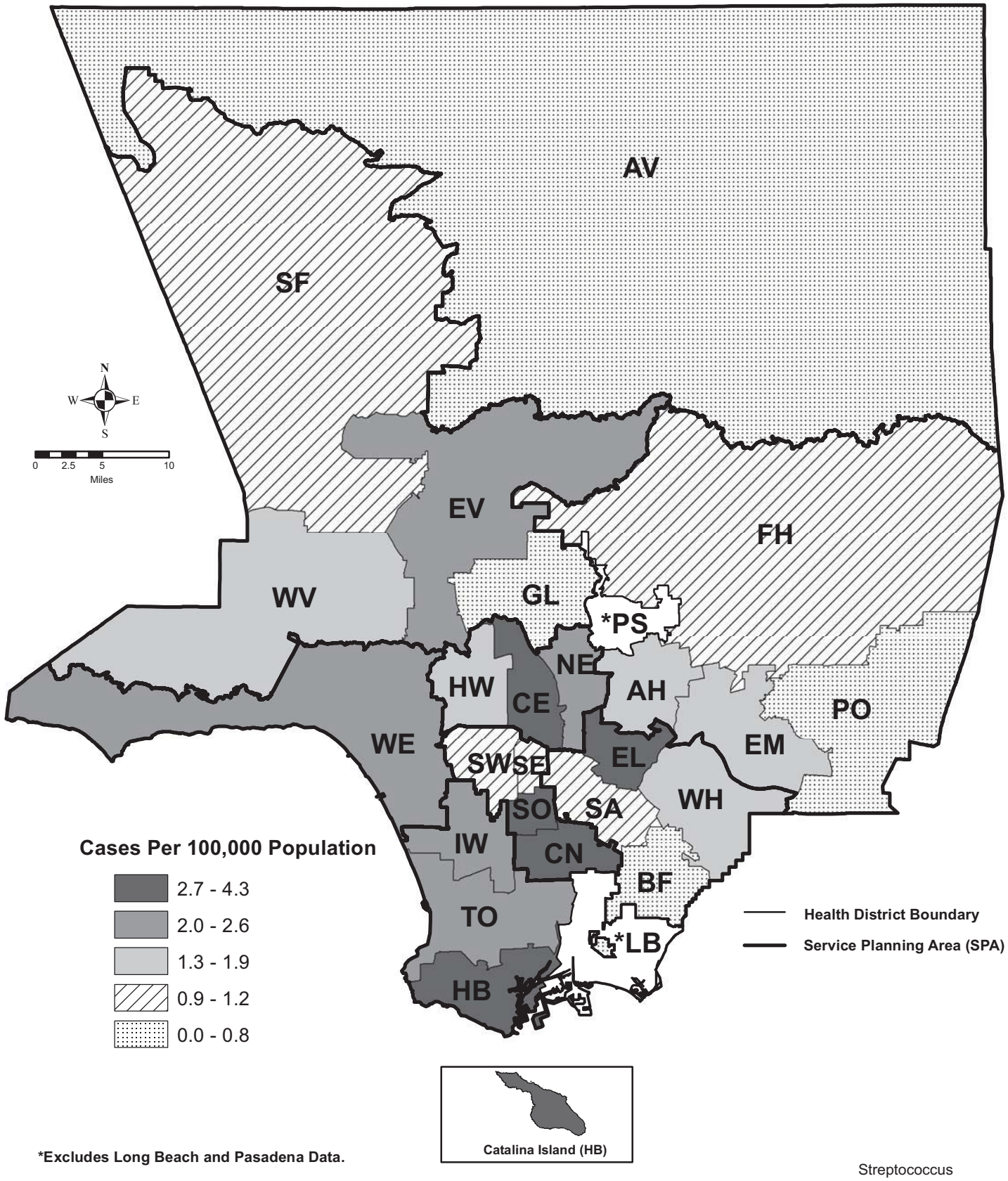
*Overlapping syndromes will total over 100%.
**Cases with unknown symptoms excluded.

Table 2. Percentage of IGAS Risk Factors — Based on Date of Onset Between 1/1/09-12/31/2011

Risk Factors*	2009 (N=113) %**	2010 (N = 191) %**	2011 (N =175) %**
Alcohol Abuse	16	6	16
Chronic Heart Disease	12	12	23
Chronic Lung Disease	4	6	12
Cirrhosis	3	4	8
Diabetes	33	23	45
History of Blunt Trauma	8	10	33
HIV/AIDS	2	1	6
IV Drug Use	3	3	5
Malignancy	10	5	14
Other	17	26	41
None	30	30	55

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

Map 15. Streptococcus, Group A Invasive Rates by Health District, Los Angeles County, 2011*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	191
Annual Incidence[a]	
LA County	1.95
California[b]	N/A
United States[c]	--
Age at Diagnosis	
Mean	50
Median	52
Range	0–99 years

[a]Cases per 100,000 population.
[b]Not notifiable.
[c]See Final Summary of Nationally Notifiable Infectious Diseases, United States on MMWR website http://www.cdc.gov/mmwr/mmwr_nd/index.html.

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2010 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 1.95 per 100,000 (n=191) during 2010, slightly higher than that of the previous five-year average (Figure 1).
- Cases aged 65 years and older had the highest rate of IGAS (5.5 per 100,000) followed by cases aged 55 to 64 years (3.0 per 100,000) (Figure 2). The age groups of <1 and 65 years and older showed the most significant increases in rates relative to the previous four years. The incidence rates for all age groups overall were higher compared to previous years.
- Blacks continued to have the highest rate of IGAS and while the rate increased within this group compared to last year, the rate is lower relative to two recent years (2007 to 2008). Although rates among whites and Latinos were higher compared to last year, rates remain the same compared to the average of the previous four years. Asians rates increased compared to the previous four years (Figure 3).
- SPA 4 had the highest incidence rate at 3.0 cases per 100,000. This is not consistent with the prior four years as SPA 5 or 6 normally had the highest rate of cases by SPA (Figure 4).
- In 2010, the number of cases peaked in March and June. October continued to have the lowest number of reported cases. Number of reported cases throughout the year was overall higher than the previous five-year average (Figure 5).
- IGAS cases presented most often with bacteremia and cellulitis (Table 1).
- Diabetes was reported more than any other risk factor followed by chronic heart disease and history of blunt trauma. A large percentage of cases (30%) reported having none of the traditional risk factors (Table 2).

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

	2006 (N=197)			2007 (N=173)			2008 (N=156)			2009 (N=129)			2010 (N=191)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	1	0.5	0.7	3	1.7	2.0	2	1.3	1.4	1	0.8	0.7	4	2.1	2.9
1-4	9	4.6	1.6	6	3.5	1.0	6	3.8	1.1	3	2.3	0.5	6	3.1	1.0
5-14	15	7.7	1.0	8	4.6	0.6	14	9.0	1.0	9	7.0	0.7	6	3.1	0.5
15-34	20	10.2	0.7	20	11.6	0.7	24	15.4	0.8	15	11.6	0.5	33	17.3	1.1
35-44	34	17.3	2.3	18	10.4	1.2	22	14.1	1.5	14	10.9	0.9	21	11.0	1.5
45-54	36	18.4	2.8	33	19.1	2.5	13	8.3	1.0	29	22.5	2.1	34	17.8	2.5
55-64	29	14.8	3.3	29	16.8	3.3	27	17.3	3.0	23	17.8	2.4	29	15.2	3.0
65+	52	26.5	5.3	56	32.4	5.5	48	30.8	4.7	35	27.1	3.3	58	30.4	5.5
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Race / Ethnicity															
Asian	9	4.6	0.7	11	6.4	0.9	14	8.3	1.1	10	7.8	0.8	16	8.4	1.2
Black	23	11.7	2.7	34	19.7	4.0	30	17.8	3.5	16	12.4	1.9	25	13.1	2.9
Hispanic	59	29.9	1.3	49	28.3	1.1	50	29.6	1.1	43	33.3	0.9	52	27.2	1.1
White	65	33.0	2.3	52	30.1	1.8	49	29.0	1.7	40	31.0	1.4	53	27.7	1.8
Other	3	1.5	10.5	4	2.3	19.2	0	0.0	0.0	1	0.8	3.9	3	1.6	11.6
Unknown	38	19.3		23	13.3		26	15.4		19	14.7		42	22.0	
SPA															
1	7	3.6	2.0	5	2.9	1.4	4	2.6	1.1	3	2.3	0.8	2	1.0	0.5
2	43	21.8	2.0	43	24.9	2.0	35	22.4	1.6	22	17.1	1.0	34	17.8	1.5
3	28	14.2	1.6	20	11.6	1.2	19	12.2	1.1	17	13.2	1.0	30	15.7	1.7
4	27	13.7	2.1	15	8.7	1.2	24	15.4	1.9	9	7.0	0.7	38	19.9	3.0
5	23	11.7	3.6	15	8.7	2.3	17	10.9	2.6	6	4.7	0.9	12	6.3	1.8
6	24	12.2	2.3	35	20.2	3.3	14	9.0	1.3	14	10.9	1.3	29	15.2	2.7
7	16	8.1	1.2	18	10.4	1.3	15	9.6	1.1	16	12.4	1.2	12	6.3	0.9
8	19	9.6	1.7	17	9.8	1.5	22	14.1	2.0	12	9.3	1.1	13	6.8	1.2
Unknown	10	5.1		5	2.9		6	3.8		30	23.3				

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

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 2000-2010

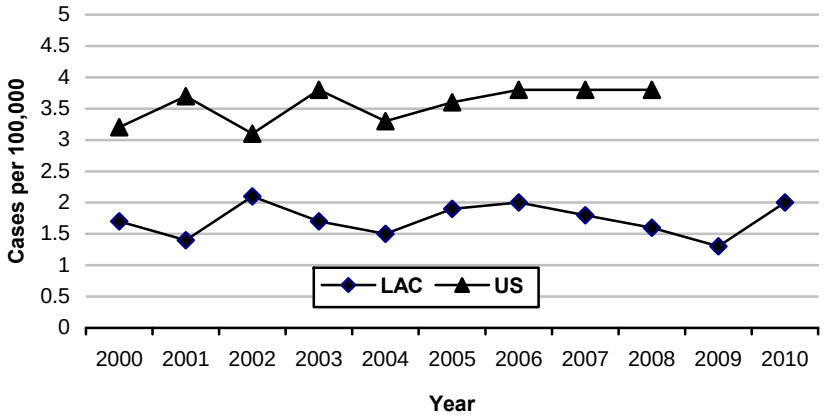
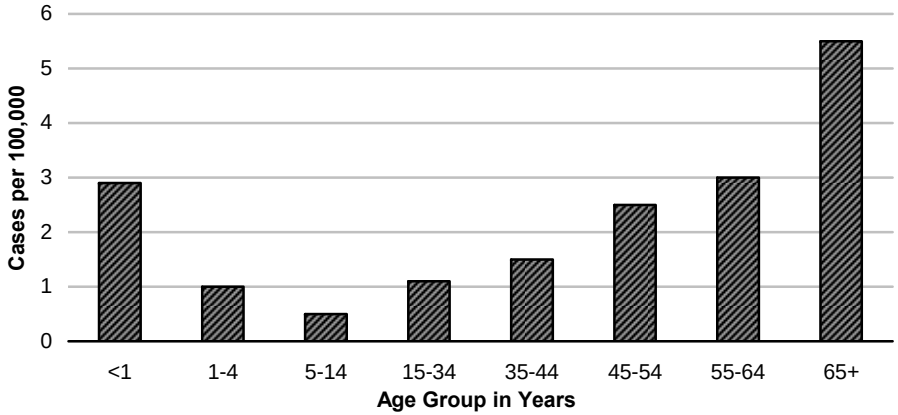
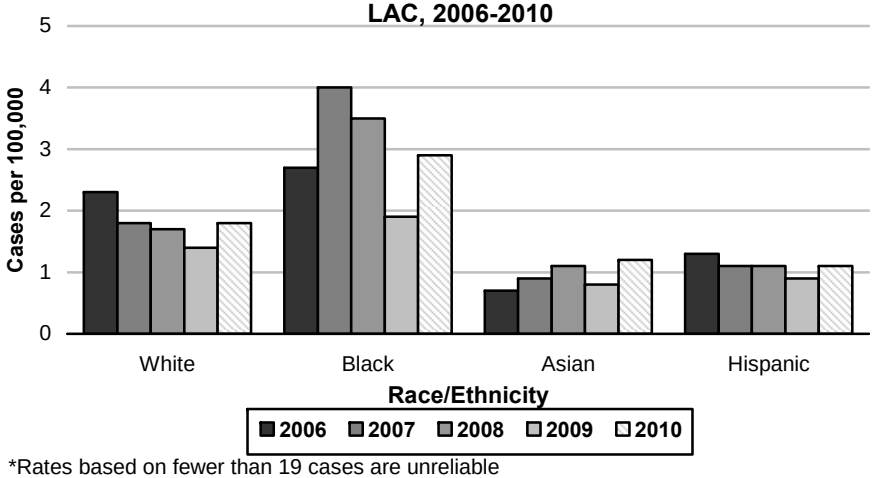


Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2010 (N=191)



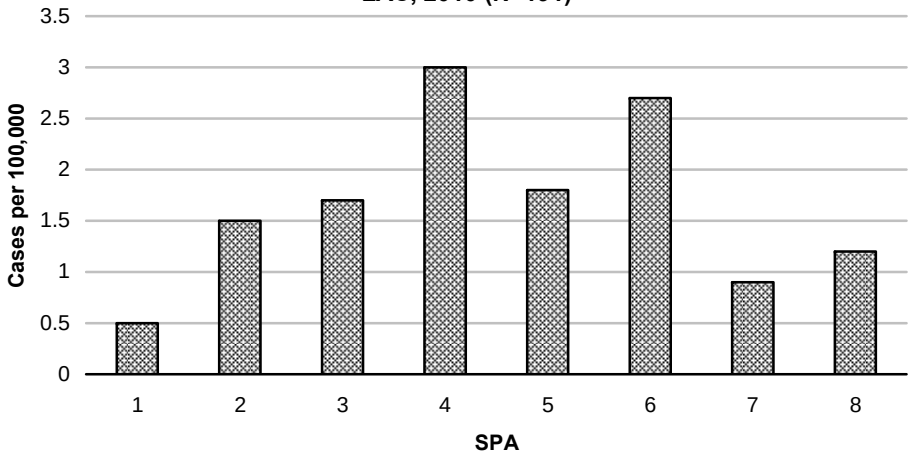
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2006-2010



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2010 (N=191)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2010 (N=191)

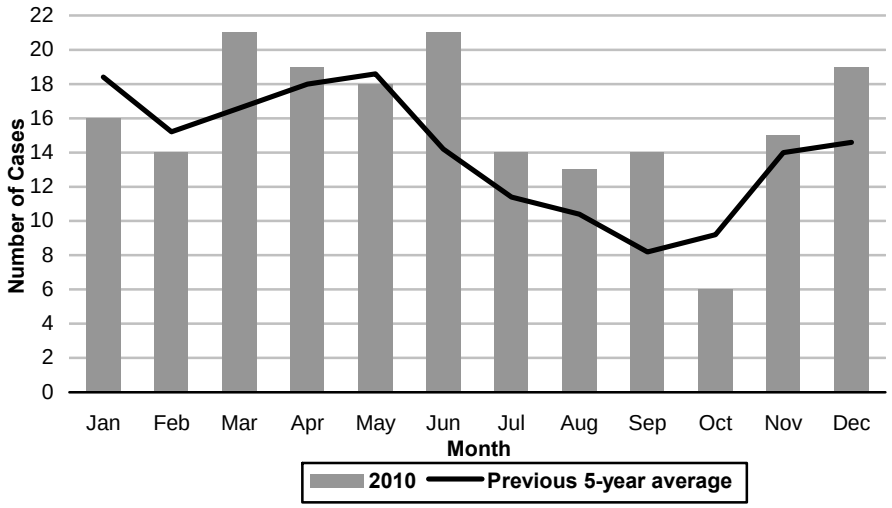


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2010

Syndrome	Number	Percent*
Cellulitis	64	34
Bacteremia (without focus)	50	26
Pneumonia	31	16
STSS	27	14
Non-Surgical Wound Infection	22	12
Necrotizing Fasciitis	12	6
Other	40	21

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

Table 2. Percentage of IGAS Risk Factors – Based on Date of Onset Between 1/1/08-12/31/2010

	2008 (N=138)	2009 (N = 113)	2010 (N =191)
	%	%	%
Alcohol Abuse	10	16	6
Chronic Heart Disease	11	12	12
Chronic Lung Disease	3	4	6
Cirrhosis	5	3	4
Diabetes	21	33	23
History of Blunt Trauma	5	8	10
HIV/AIDS	3	2	1
IV Drug Use	4	3	3
Malignancy	12	10	5
Other	17	17	26
None	43	30	30

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	129
Annual Incidence[a]	
LA County	1.3
California[b]	N/A
United States	--
Age at Diagnosis	
Mean	51
Median	53
Range	0–100 years

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

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for good hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2008 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 1.3 per 100,000 (n=129) during 2009, the lowest it has been in the past ten years (Figure 1).
- Cases aged 65 years and older had the highest rate (3.3 per 100,000) followed by cases aged 55 to 64 years (2.4 per 100,000) (Figure 2). However, while persons aged 65 years and older had the highest rate of IGAS, this age group showed the most significant decrease in rate relative to the previous four years. The incidence rates for all age groups were lower than or similar to previous years with the exception of cases aged 45 to 54 years which had a higher rate in 2009 compared to 2008.
- While blacks continued to have the highest rate of IGAS, the rate decreased in this group relative to the previous four years. The rate among whites and Latinos were also lower than the previous four years while the rate in Asians was within historical norms (Figure 3).
- SPA 6 had the highest incidence rate at 1.3 cases per 100,000 (Figure 4).
- In 2009 the number of cases peaked in January, although the majority of cases occurred during the spring months. There seemed to be an unusually low number of cases in February in 2009 (Figure 5).
- IGAS cases presented most often with bacteremia and cellulitis (Table 1).
- Diabetes was reported more than any other risk factor followed by alcohol abuse and chronic heart disease. A large percentage of cases (30%) reported having none of the traditional risk factors (Table 2).

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

	2005 (N=179)			2006 (N=197)			2007 (N=173)			2008 (N=156)			2009 (N=129)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	4	2.2	2.8	1	0.5	0.7	3	1.7	2.0	2	1.3	1.4	1	0.8	0.7
1-4	8	4.5	1.4	9	4.6	1.6	6	3.5	1.0	6	3.8	1.1	3	2.3	0.5
5-14	11	6.1	0.7	15	7.7	1.0	8	4.6	0.6	14	9.0	1.0	9	7.0	0.7
15-34	20	11.2	0.7	20	10.2	0.7	20	11.6	0.7	24	15.4	0.8	15	11.6	0.5
35-44	28	15.6	1.9	34	17.3	2.3	18	10.4	1.2	22	14.1	1.5	14	10.9	0.9
45-54	30	16.8	2.4	36	18.4	2.8	33	19.1	2.5	13	8.3	1.0	29	22.5	2.1
55-64	30	16.8	3.6	29	14.8	3.3	29	16.8	3.3	27	17.3	3.0	23	17.8	2.4
65+	48	26.8	5.0	52	26.5	5.3	56	32.4	5.5	48	30.8	4.7	35	27.1	3.3
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Race / Ethnicity															
Asian	9	5.0	0.7	9	4.6	0.7	11	6.4	0.9	14	8.3	1.1	10	7.8	0.8
Black	22	12.3	2.6	23	11.7	2.7	34	19.7	4.0	30	17.8	3.5	16	12.4	1.9
Hispanic	70	39.1	1.5	59	29.9	1.3	49	28.3	1.1	50	29.6	1.1	43	33.3	0.9
White	52	29.1	1.8	65	33.0	2.3	52	30.1	1.8	49	29.0	1.7	40	31.0	1.4
Other	5	2.8	17.7	3	1.5	10.5	4	2.3	19.2	0	0.0	0.0	1	0.8	3.9
Unknown	21	11.7		38	19.3		23	13.3		26	15.4		19	14.7	
SPA															
1	10	5.6	2.9	7	3.6	2.0	5	2.9	1.4	4	2.6	1.1	3	2.3	0.8
2	32	17.9	1.5	43	21.8	2.0	43	24.9	2.0	35	22.4	1.6	22	17.1	1.0
3	28	15.6	1.6	28	14.2	1.6	20	11.6	1.2	19	12.2	1.1	17	13.2	1.0
4	21	11.7	1.7	27	13.7	2.1	15	8.7	1.2	24	15.4	1.9	9	7.0	0.7
5	23	12.8	3.6	23	11.7	3.6	15	8.7	2.3	17	10.9	2.6	6	4.7	0.9
6	24	13.4	2.3	24	12.2	2.3	35	20.2	3.3	14	9.0	1.3	14	10.9	1.3
7	11	6.1	0.8	16	8.1	1.2	18	10.4	1.3	15	9.6	1.1	16	12.4	1.2
8	19	10.6	1.7	19	9.6	1.7	17	9.8	1.5	22	14.1	2.0	12	9.3	1.1
Unknown	11	6.1		10	5.1		5	2.9		6	3.8		30	23.3	

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

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 2000-2009

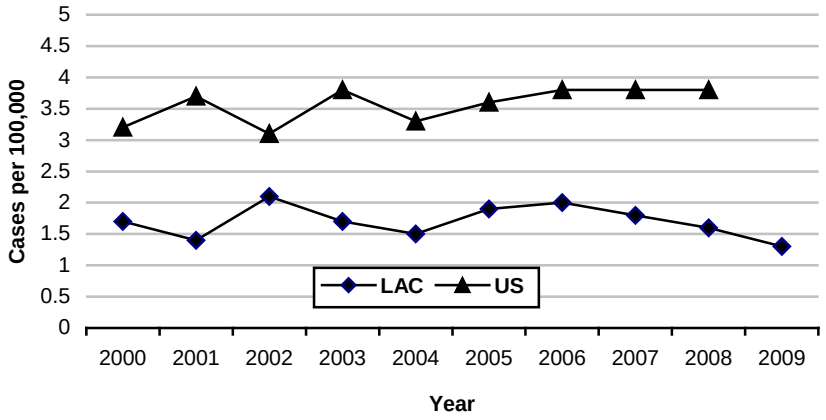
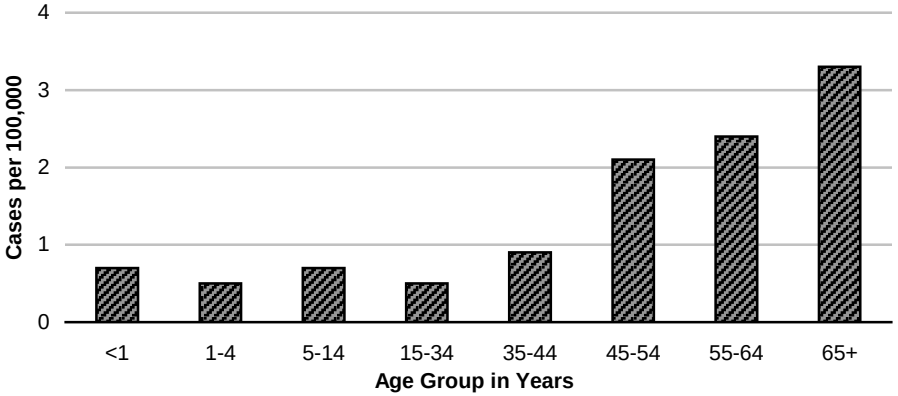
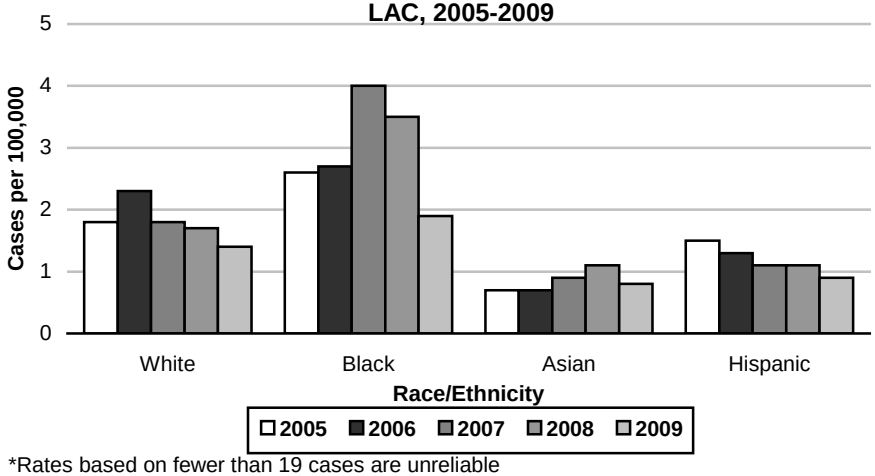


Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2009 (N=129)



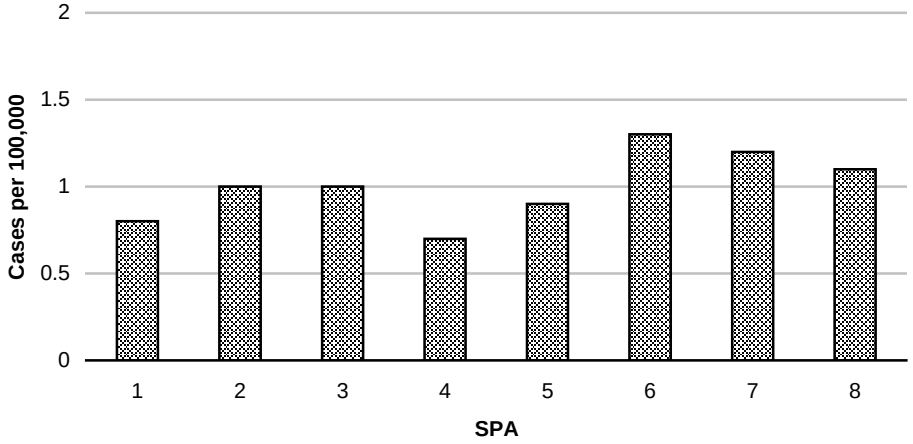
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence by Race/Ethnicity LAC, 2005-2009



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates of Invasive Group A Streptococcus by SPA LAC, 2009 (N=129)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2009 (N=129)

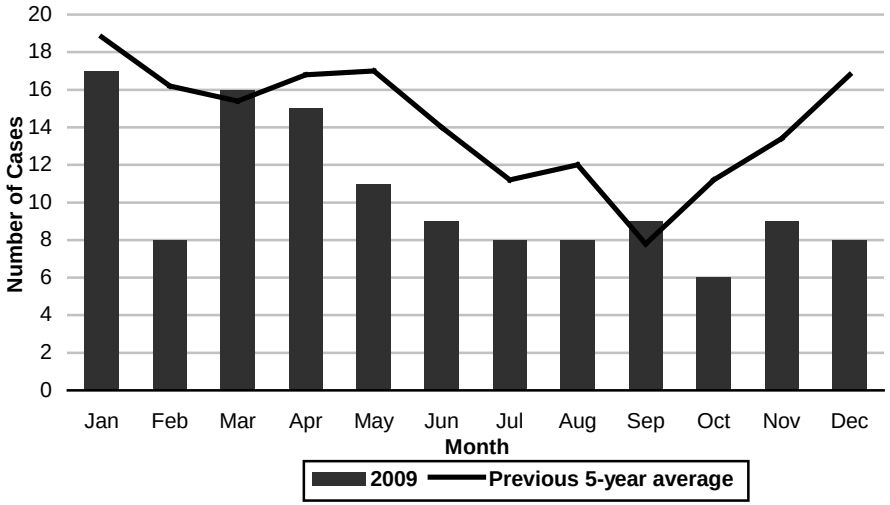


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2009

Syndrome	Number	Percent*
Bacteremia (without focus)	35	30
Cellulitis	35	30
Pneumonia	20	17
Necrotizing Fasciitis	17	15
STSS	17	13†
Non-Surgical Wound Infection	12	10
Other	30	26

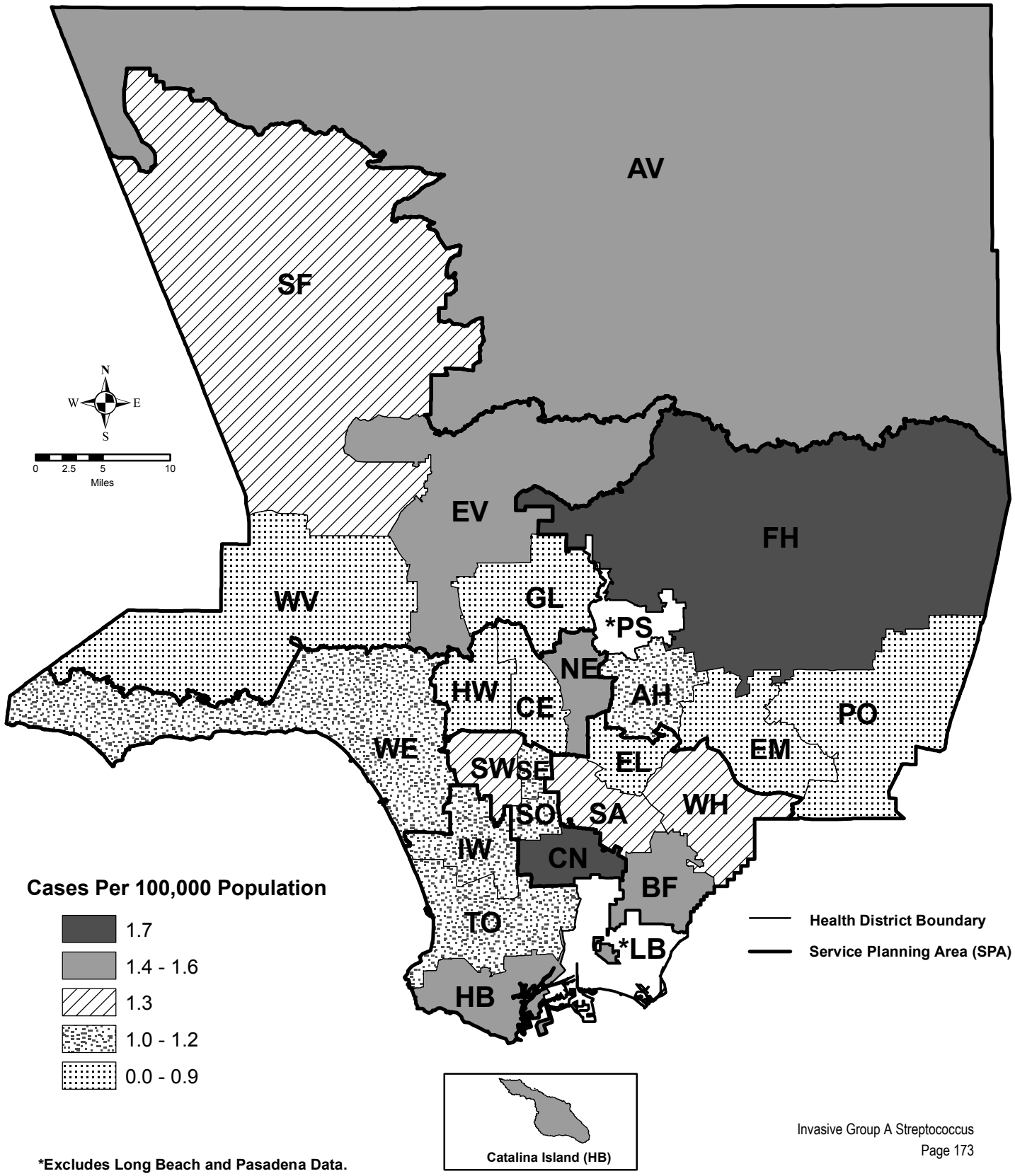
*Overlapping syndromes will total over 100%.
†Denominator data is slightly different for STSS than other syndromes (n=129 for STSS, n=115 for all other syndromes).

Table 2. Percentage of IGAS Risk Factors – Based on Date of Onset Between 1/1/07-12/31/2009

	2007 (N=145)	2008 (N = 138)	2009 (N =113)
	%	%	%
Chronic Heart Disease	19	11	12
Malignancy	10	12	10
IV Drug Use	4	4	3
Alcohol Abuse	14	10	16
Cirrhosis	6	5	3
Diabetes	26	21	33
HIV/AIDS	6	3	2
History of Blunt Trauma	12	5	8
Other	21	17	17
None	33	43	30

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

Map 13. Streptococcus, Group A Invasive Disease Rates by Health District, Los Angeles County, 2009*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	155
Annual Incidence[a]	
LA County	1.6
California[b]	N/A
United States	3.8
Age at Diagnosis	
Mean	50
Median	54
Range	1 month – 94 years

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

DESCRIPTION

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

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

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

The spread of IGAS can be prevented by good hand washing. CDC guidelines for good hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner particularly if experiencing fever, chills, and any redness on the skin.

2008 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS was 1.6 per 100,000 (n=156) during 2008, slightly less than that of 2007 and 2006 (Figure 1).
- Cases aged 65 years and older had the highest rate (4.7 per 100,000) followed by cases aged 55 to 64 years. The incidence rate for cases aged 45 to 54 years was lower than previous years at 1.0 per 100,000 in 2008 compared to 2.5 and 2.8 per 100,000 in 2007 and 2006 respectively (Figure 2).
- While blacks had the highest rate of IGAS, the rate decreased in this group relative to 2007. The rate among whites is the lowest it has been in the past 5 years while the rate in Asians is the highest it has been in the past 5 years. The rate among Hispanics is within historical norms (Figure 3).
- SPA 5 had the highest incidence rate at 2.6 cases per 100,000 (Figure 4).
- Unlike previous years when the number of cases peaked during spring months, in 2008 the number of cases peaked in January and February (Figure 5).
- IGAS cases presented most often with bacteremia and cellulitis (Table 1).
- Diabetes was reported more than any other risk factor followed by malignancy and chronic heart disease. A large percentage of cases reported having none of the traditional risk factors (Table 2).

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

	2004 (N=147)			2005 (N=179)			2006 (N=197)			2007 (N=173)			2008 (N=156)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	0.0	0.0	4	2.2	2.8	1	0.5	0.7	3	1.7	2.0	2	1.3	1.4
1-4	9	6.1	1.6	8	4.5	1.4	9	4.6	1.6	6	3.5	1.0	6	3.8	1.1
5-14	6	4.1	0.4	11	6.1	0.7	15	7.7	1.0	8	4.6	0.6	14	9.0	1.0
15-34	20	13.6	0.7	20	11.2	0.7	20	10.2	0.7	20	11.6	0.7	24	15.4	0.8
35-44	23	15.6	1.5	28	15.6	1.9	34	17.3	2.3	18	10.4	1.2	22	14.1	1.5
45-54	29	19.7	2.3	30	16.8	2.4	36	18.4	2.8	33	19.1	2.5	13	8.3	1.0
55-64	19	12.9	2.4	30	16.8	3.6	29	14.8	3.3	29	16.8	3.3	27	17.3	3.0
65+	41	27.9	4.3	48	26.8	5.0	52	26.5	5.3	56	32.4	5.5	48	30.8	4.7
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Race / Ethnicity															
Asian	11	7.5	0.9	9	5.0	0.7	9	4.6	0.7	11	6.4	0.9	14	8.3	1.1
Black	8	5.4	0.9	22	12.3	2.6	23	11.7	2.7	34	19.7	4.0	30	17.8	3.5
Hispanic	50	34.0	1.1	70	39.1	1.5	59	29.9	1.3	49	28.3	1.1	50	29.6	1.1
White	58	39.5	2.0	52	29.1	1.8	65	33.0	2.3	52	30.1	1.8	49	29.0	1.7
Other	6	4.1	21.6	5	2.8	17.7	3	1.5	10.5	4	2.3	19.2	0	0.0	0.0
Unknown	14	9.5		21	11.7		38	19.3		23	13.3		26	15.4	
SPA															
1	5	3.4	1.5	10	5.6	2.9	7	3.6	2.0	5	2.9	1.4	4	2.6	1.1
2	33	22.4	1.6	32	17.9	1.5	43	21.8	2.0	43	24.9	2.0	35	22.4	1.6
3	22	15.0	1.3	28	15.6	1.6	28	14.2	1.6	20	11.6	1.2	19	12.2	1.1
4	18	12.2	1.5	21	11.7	1.7	27	13.7	2.1	15	8.7	1.2	24	15.4	1.9
5	16	10.9	2.5	23	12.8	3.6	23	11.7	3.6	15	8.7	2.3	17	10.9	2.6
6	14	9.5	1.4	24	13.4	2.3	24	12.2	2.3	35	20.2	3.3	14	9.0	1.3
7	18	12.2	1.3	11	6.1	0.8	16	8.1	1.2	18	10.4	1.3	15	9.6	1.1
8	15	10.2	1.4	19	10.6	1.7	19	9.6	1.7	17	9.8	1.5	22	14.1	2.0
Unknown	6	4.1		11	6.1		10	5.1		5	2.9		6	3.8	

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

Figure 1. Incidence Rates of Invasive Group A Streptococcus LAC and US, 1999-2008

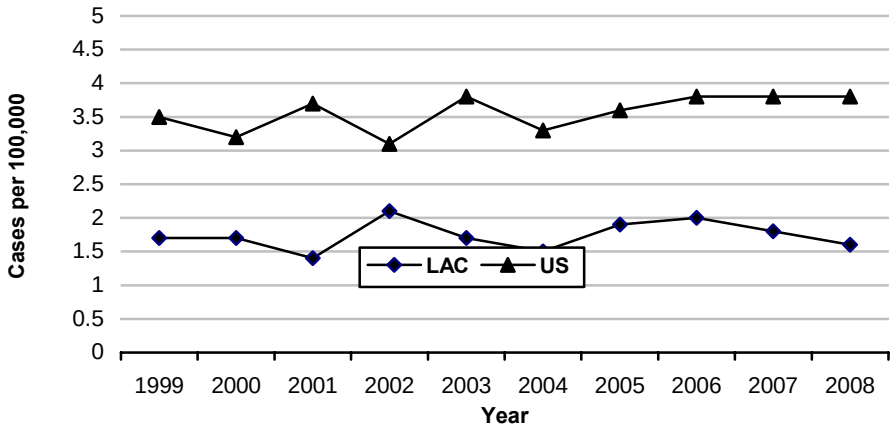
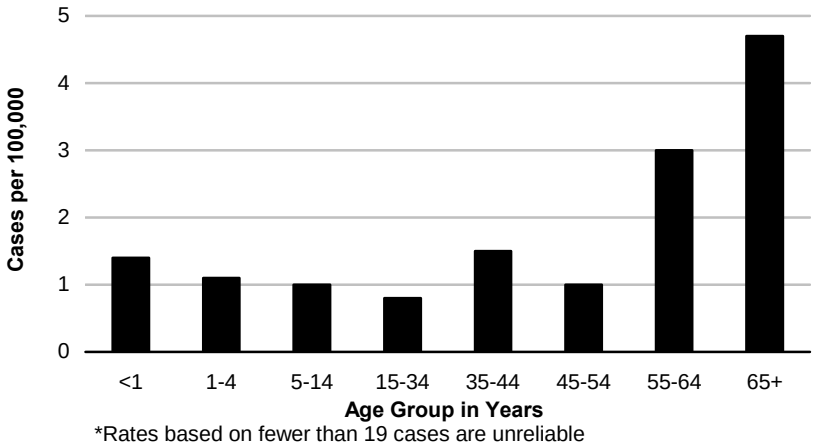
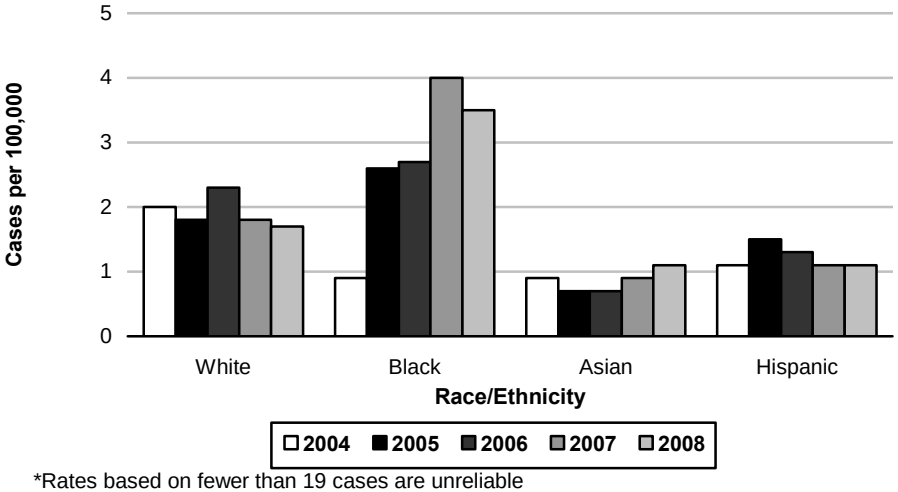


Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group LAC, 2008



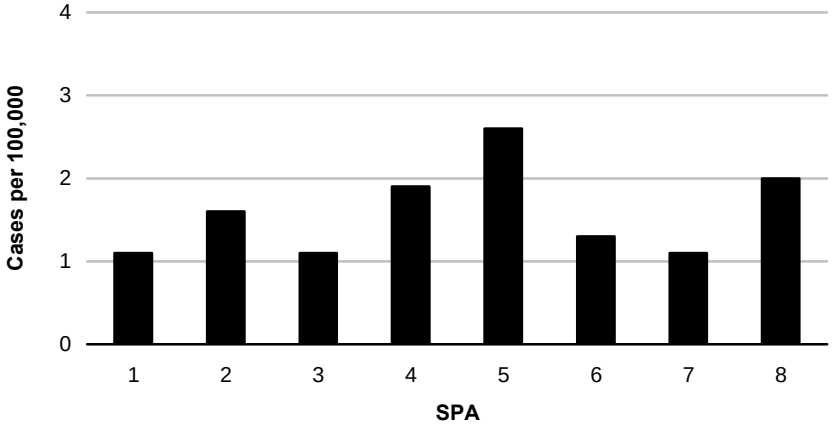
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence by Race/Ethnicity LAC, 2004-2008



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates of Invasive Group A Streptococcus by SPA LAC, 2008



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2008

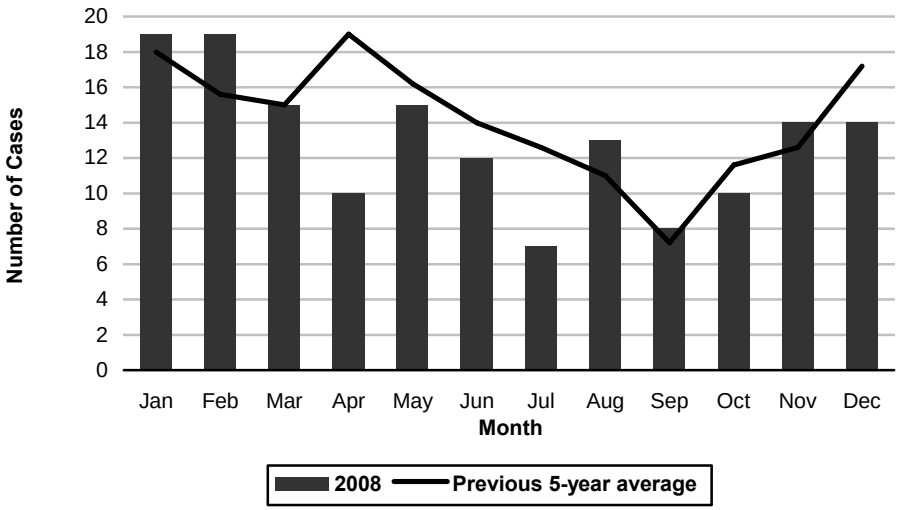


Table 1. Frequency and Percentage of IGAS Clinical Syndromes LAC, 2008

Syndrome	Number	Percent*
Cellulitis	48	29
Bacteremia (without focus)	53	32
STSS	20	11†
Non-Surgical Wound Infection	10	6
Pneumonia	22	13
Necrotizing Fasciitis	14	8
Other	27	16

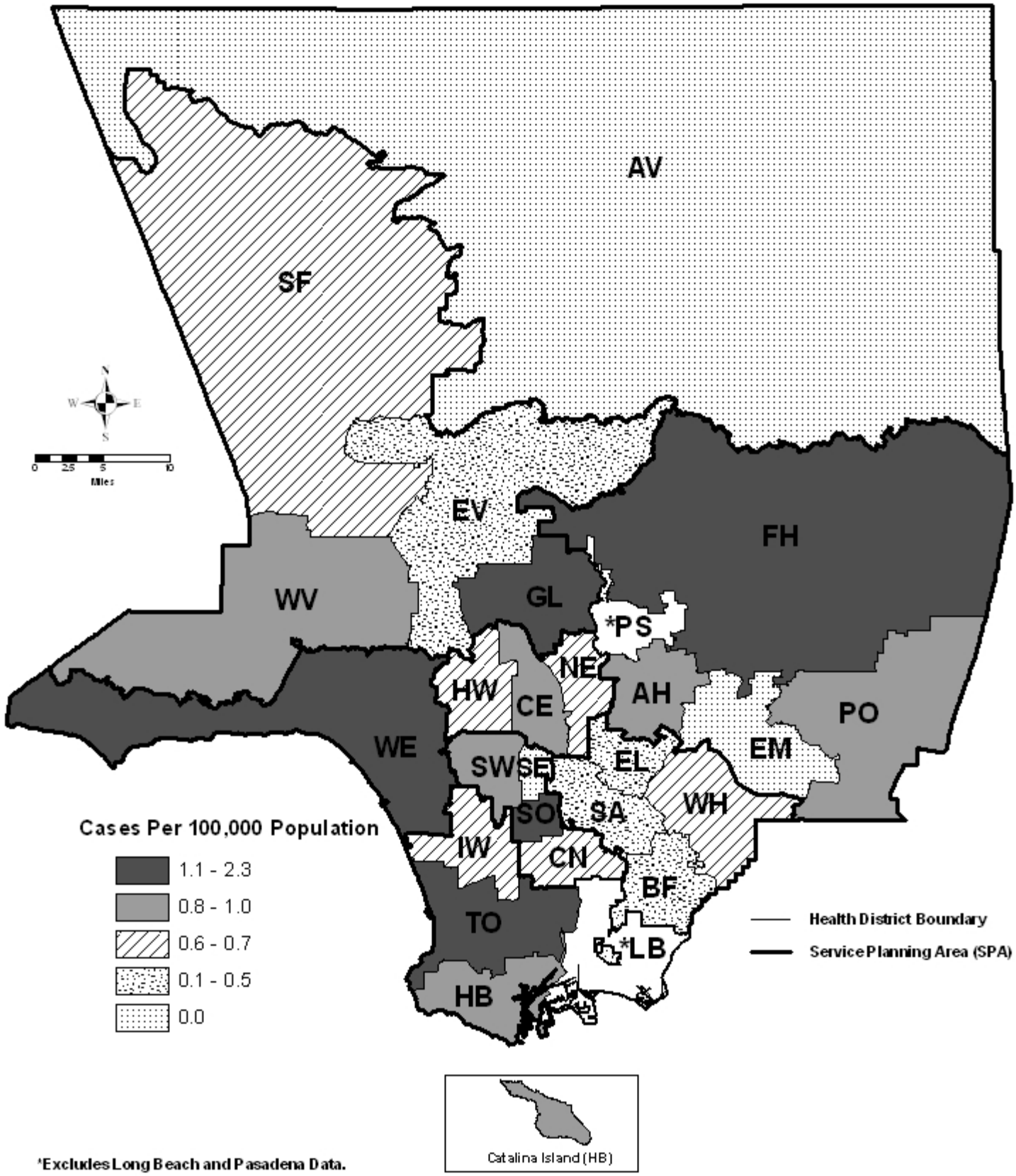
*Overlapping syndromes will total over 100%.
†Denominator data is slightly different for STSS than other syndromes (n=176 for STSS, n=166 for all other syndromes).

Table 2. Percentage of IGAS Risk Factors – Based on Date of Onset Between 1/1/06-12/31/2008

	2006	2007	2008
	N = 156	N = 145	N = 143
Chronic Heart Disease	13%	19%	11%
Malignancy	13	10	12
IV Drug Use	8	4	4
Alcohol Abuse	14	14	10
Cirrhosis	7	6	6
Diabetes	24	26	22
HIV/AIDS	3	6	4
History of Blunt Trauma	15	12	6
Other	12	21	12
None	31	33	41

*Persons with unknown risk factor information excluded.
**Overlapping risk factors will total over 100%.

Map 15. Streptococcus, Group A Invasive Disease Rates by Health District, Los Angeles County, 2008*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

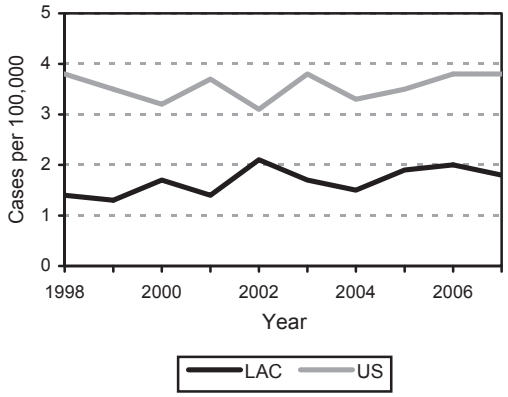
CRUDE DATA	
Number of Cases	171
Annual Incidence[a]	
LA County	1.8
California	---[c]
United States[b]	3.8[b]
Age at Diagnosis	
Mean	52
Median	54
Range	2 months–97 years

[a] Cases per 100,000 population.

[b] National projection of IGAS incidence from Active Bacterial Core Surveillance areas data, 2006 [1]. Data available beginning in 1997.

[c] Not notifiable.

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC and US[b], 1998–2007



DESCRIPTION

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

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

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

DISEASE ABSTRACT

- The case fatality rate has increased compared to previous years.
- No clusters or outbreaks were reported.

STRATIFIED DATA

Trends: The incidence rate of reported IGAS was 1.8 per 100,000 (N=171) during 2007, similar to 2006 where 2.0 cases per 100,000 (N=197) were reported (Figure 1).

Seasonality: Although cases were observed throughout the year, a winter/spring seasonality commonly associated with streptococcal pharyngitis was observed during the spring and winter months. The number of cases in 2007 peaked in May (Figure 2) whereas the highest number of cases for the previous 5 years occurred in April.

Age: The age of cases ranged from 12 months to 97 years with a mean of 52 years and median of 54 years. For all age groups, the incidence rate was equal to or lower than the previous 5-year average with the exception of cases aged 55-64 years. In this group the 2007 incidence rate was slightly higher than the average incidence rate for the previous 5-years. The highest rate of cases occurred in those aged 65 years and older (Figure 3).

Gender: The male-to-female rate ratio decreased from 2:1 in 2005 and 2006 to 1.3:1 in 2007.

Race/Ethnicity: Race/ethnicity was known for 87% of cases. The percentage of cases that were black increased from 14% (n=23) in 2006 to 22% (n=33) in 2007. The incidence rate among blacks was the highest overall and increased from 2.7 per 100,000 in 2006 to 3.9 per 100,000 in 2007 (data not shown).

Location: The incidence rates for SPAs 2, 5, and 6 were higher compared to LAC overall with the highest rate occurring in SPA 6 (3.3 cases per 100,000). The incidence rates for all other SPAs were lower than that of LAC overall (Figure 4). However, stratification of cases by SPA produced small numbers and unstable rates for all SPAs except SPAs 2, 3, and 6.

Clinical Presentation: IGAS cases presented most often with cellulitis and bacteremia (Table 1). The number of cases presenting with pneumonia increased from 9% in 2006 to 13% in 2007. The percentage of cases with STSS (12%) and necrotizing fasciitis (7%) remained approximately equal. Clinical presentation data was available for 88% of cases.

The case fatality rate increased from 10% in 2005 and 14% in 2006 to 17% in 2007. This rate exceeds the 2007 national estimate of 11% (CDC). Of the 15 cases that met the criteria for STSS and for which outcome information was available, 7 (47%) died.

Risk Factors: Risk factor information was collected for 86% of cases, 33% of which reported no risk factors. Diabetes was reported more than any other risk factor (25%), followed by chronic heart disease (19%), alcohol abuse (14%), history of blunt trauma (10%), and malignancy (8%). Alcohol abuse and history of blunt trauma were more common in cases less than 50 years while

Figure 2
IGAS
Cases by Month of Onset
LAC, 2007

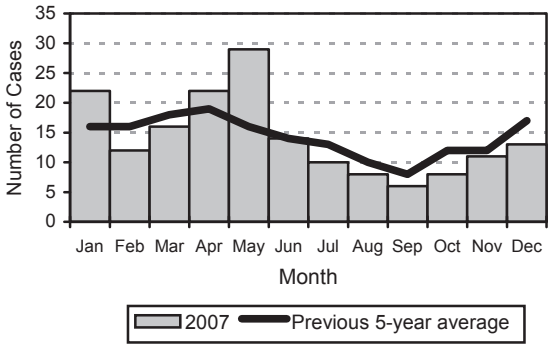
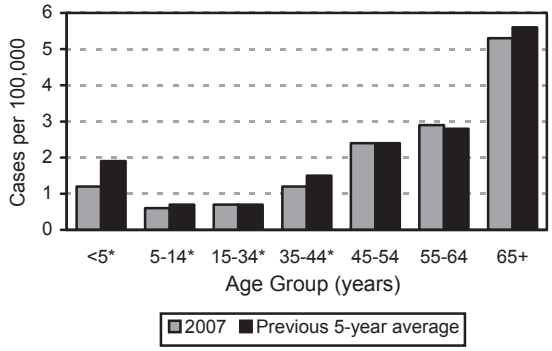
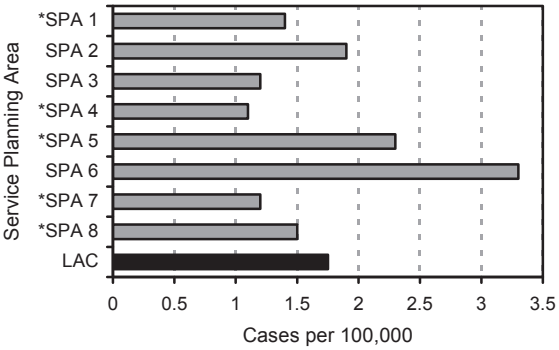


Figure 3
IGAS Incidence Rates by Age Group
LAC, 2007 (n=166)



* Small numbers prduced unstable rates in these age groups.

Figure 4
IGAS Rates by Service Planning Area
LAC, 2007 (n=166)



* Small numbers produced unstable rates for these SPAs.

diabetes, chronic heart disease, and malignancy were more prevalent in cases older than 50 years (data not shown).

Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2007

Syndrome	Number	Percent*
Cellulitis	42	28
Bacteremia (without focus)	37	25
STSS	18	12†
Non-Surgical Wound Infection	17	11
Pneumonia	20	13
Necrotizing Fasciitis	10	7
Other	51	34

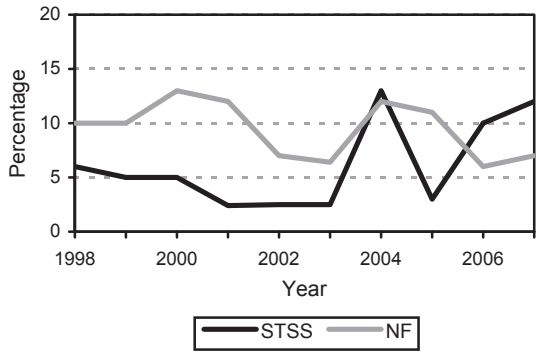
* Overlapping syndromes will total over 100%.
† Denominator data is slightly different for STSS than other syndromes (n=153 for STSS, n=150 for all other syndromes).

COMMENTS

The incidence rate of IGAS has remained relatively unchanged. However, certain demographic groups, including persons aged 65 years and older and blacks, remain at greater risk of infection. In previous years, SPA 5 had the highest incidence rate in the county. However, in 2007, the highest incidence rate was seen in SPA 6 (3.3 cases per 100,000). This change reflects both a decrease in incidence in SPA 5 as well as an increase in incidence in SPA 6. It is uncertain whether this was due to reporting bias or if true changes in incidence of IGAS occurred in these SPAs.

While the percentage of STSS and necrotizing fasciitis cases remained about the same as 2006, the overall case fatality rate increased. Of the 18 STSS cases in 2007, the outcome was known for 15 cases (83%). Of these cases, 7 were fatal (47%). The high case fatality associated with STSS suggests that IGAS case fatality is strongly affected by STSS incidence.

Figure 5
IGAS Clinical Presentation of STSS and NF
LAC, 1998–2007



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

PREVENTION

The spread of IGAS can be prevented by good hand washing. CDC guidelines for good hand washing can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm. All wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner particularly if experiencing fever, chills, and any redness on the skin.

REFERENCE

Centers for Disease Control and Prevention (2007). Active Bacterial Core Surveillance Reports from 1997 to 2007-*Provisional*. Report available at: www.cdc.gov/ncidod/dbmd/abcs/survreports.htm

ADDITIONAL RESOURCES

- General Information – http://www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal_g.htm
- National Institutes of Health – http://www.niaid.nih.gov/factsheets/strep.htm
- IGAS in Los Angeles County –

Bancroft, E.B. & Hagemen, L. (2006). Risk factors for invasive group A streptococcal disease in Los Angeles County, 2004-2006. *Acute Communicable Disease Control Special Studies Report*, 81-84. Available at: http://lapublichealth.org/acd/reports/spclrpts/spcrpt06/spcl06[1].new.pdf

Hageman, L. (2006). Risk factors for invasive group A streptococcal disease. *The Public's Health*, 6(9), 8-9. Available at: http://www.lapublichealth.org/media/docs/TPH_NovDec_2006v4.pdf

IGAS Publications:

American Academy of Pediatrics Committee on Infectious Diseases (1998). Severe invasive group A streptococcal infections: a subject review. *Pediatrics*, 101(1), 136-140.

Centers for Disease Control and Prevention (2002). Prevention of invasive group A streptococcal disease among household contacts of case patients and among postpartum and postsurgical patients. *Clinical Infectious Diseases*, 35(8), 950-959.

O'Brien, K.L., Beall, B., Barrett, N.L., Cieslak, P.R., Reingold, A., Farley, M.M., et al. (2002). Epidemiology of invasive group A streptococcal disease in the United States, 1995-1999. *Clinical Infectious Diseases*, 35(3), 268-276.

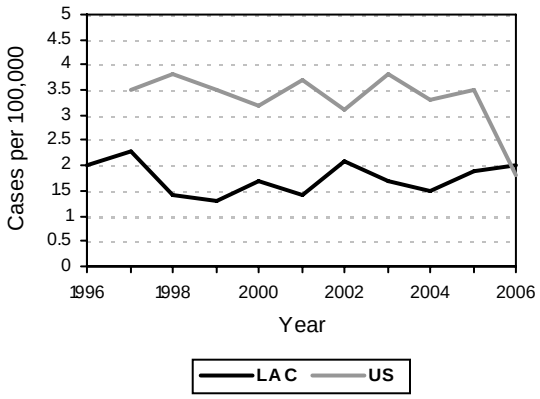
Kaul, R., McGeer, A., Low, D.E., Green, K., Schwartz, B. (1997) Population-based surveillance for group A streptococcal necrotizing fasciitis: clinical features, prognostic indicators, and microbiologic analysis of seventy-seven cases. *American Journal of Medicine*, 103(1), 18-24.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	197
Annual Incidence[a]	
LA County	2.0
California	---[c]
United States [b]	1.82[d]
Age at Diagnosis	
Mean	49
Median	51
Range	1–96 years

[a] Cases per 100,000 population.
[b] National projection of IGAS incidence from Active Bacterial Core Surveillance areas data, 2005 [1]. Data available beginning in 1997.
[c] Not notifiable.
[d] Calculated from 2007 Summary of notifiable diseases issue of MMWR (56:853-863).

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC and US[b], 1996–2006



DESCRIPTION

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

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

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

DISEASE ABSTRACT

- STSS clinical presentation and case fatality rate has increased compared to previous years.
- No clusters or outbreaks were reported.

STRATIFIED DATA

Trends: The incidence rate of reported IGAS was 2.0 per 100,000 (N=197) during 2006, similar to 2005 where 1.9 cases per 100,000 (N=179) were reported (Figure 1).

Seasonality: Although cases were observed throughout the year, a winter/spring seasonality commonly associated with streptococcal pharyngitis was observed as the number of cases increased during the spring and winter months, peaking in April (Figure 2).

Age: The age of cases ranged from 1 to 96 years with a mean of 49 years and median of 51 years. In all age groups the rate of cases in 2006 was higher than the previous 5-year average, with the exception of the less than one year age group, where no cases were reported (4 to 10 reported cases in previous years). The highest rate of cases occurred in those aged 65 years and older (Figure 3).

Gender: Similar to 2005, the male-to-female ratio remained at 2:1 in 2006. In previous years the distribution was nearly equal.

Race/Ethnicity: Race/ethnicity was known for 81% of cases. There has been an increase in the percentage of white cases and a decrease in Latino cases. Similar to 2005, blacks had the highest reported incidence at 2.7 per 100,000 (data not shown).

Location: The incidence rate was highest in SPA 5 (3.3 cases per 100,000) compared to LAC overall (2.0 cases per 100,000). Incidence for SPAs 2, 4, and 8 were slightly higher than LAC overall, while SPAs 3 and 7 had lower rates (Figure 4). However, stratification of cases by SPA produced small numbers and unstable incidence rates for SPAs 1 and 7.

Clinical Presentation: IGAS cases presented most often with cellulitis and bacteremia (Table 1). STSS increased from 5 cases in 2005 (3%) to 18 cases in 2006 (10%) (Figure 5). However, necrotizing fasciitis and pneumonia decreased since 2005 (data not shown). Other syndromes reported include osteomyelitis (5%), septic arthritis (5%), and meningitis (2%). Clinical presentation data was available for 90% of cases.

The case fatality rate has increased from 9% in 2005 to 14% in 2006. This rate is equivalent to the national estimate [1].

Risk Factors: Nearly one third of IGAS cases reported no risk factors (30%). Diabetes was reported more than any other risk factor (24%), followed by history of blunt trauma (15%), alcohol abuse (14%), chronic heart disease (13%), and malignancy (13%). Alcohol abuse and history of blunt trauma were more common in younger cases less than 50 years while diabetes, chronic heart disease, and malignancy were more prevalent in cases older than 50 years (data not shown). Risk factor information was collected for 81% of cases.

Figure 2
IGAS
Cases by Month of Onset
LAC, 2006

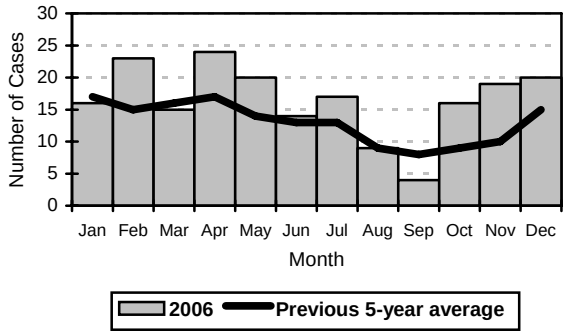


Figure 3
IGAS Incidence Rates by Age Group
LAC, 2006 (n=196)

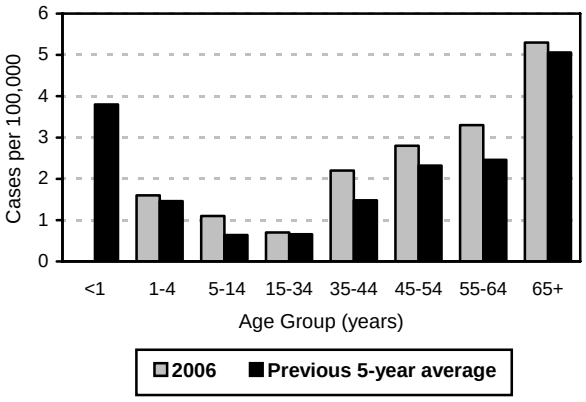
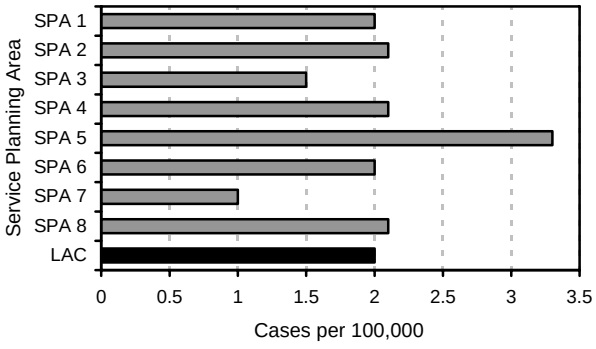


Figure 4
IGAS Rates by Service Planning Area
LAC, 2006 (n=185)



COMMENTS

Although the number of cases increased from 2005, the incidence remained the same at approximately 2 cases per 100,000. However, certain demographic groups in Los Angeles County were at greater risk of infection, including persons aged 65 years and older, blacks, and males. In addition, residents of SPA 5 continued to have the greatest incidence of IGAS disease compared to the rest of the county. It is unknown if this was due to reporting bias or if SPA 5 residents were at increased risk for IGAS infection.

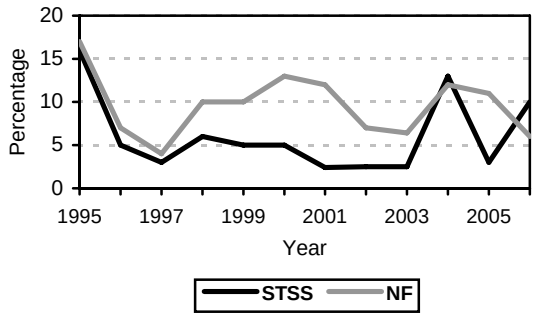
Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2006

Syndrome	Number	Percent*
Cellulitis	63	35
Bacteremia (without focus)	43	24
STSS	18	10
Non-Surgical Wound Infection	18	10
Pneumonia	16	9
Necrotizing Fasciitis	11	6
Other	50	28

*Overlapping syndromes will total over 100%.

The number of STSS cases in 2006 more than tripled from 2005 (18 vs. 5), which most likely accounted for the increase in case fatality. Of the 18 STSS cases in 2006, the outcome was known for 16 cases (89%). Of these cases, 10 were fatal (63%). In the past ten years, with the exception of 2004, the number of STSS cases ranged from three to eight (2-6%). In 2004, there were 17 STSS cases and the overall case fatality was 26% (73% among STSS cases). Interestingly, the majority of STSS cases in 2006 were male (83%) compared to 2004 where the majority were female (65%). The rise in STSS and case fatality in 2004 had been attributed possibly to changes in the reporting of IGAS during that year. However, as reporting methods have not changed and clinical presentation was known for approximately 90% of the cases each year from 2004 to 2006, the pattern of STSS and case fatality in 2004 and 2006 suggests not only that the increases were real trends but also that IGAS case fatality is strongly affected by STSS incidence.

Figure 5
IGAS Clinical Presentation of STSS and NF
LAC, 1995–2006



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

ADDITIONAL RESOURCES

For more information about IGAS visit:

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

For specific information about risk factors for IGAS in Los Angeles County 2004-2006 visit:

- Hageman L. Risk factors for invasive group A streptococcal disease. The Public's Health 2006; 6(9):8-9. Available at: www.lapublichealth.org/media/docs/TPH_NovDec_2006v4.pdf

- Bancroft EB, Lindsey H. Risk factors for invasive group A streptococcal disease in Los Angeles County, 2004-2006. Acute Communicable Disease Control Special Studies Report 2006:81-84. Available at: http://lapublichealth.org/acd/reports/spclrpts/spcrpt06/spcl06[1].new.pdf

IGAS Publications:

- Bancroft EB, Hageman L. Risk factors for invasive group A streptococcal disease in Los Angeles County, 2004-2006. Acute Communicable Disease Control Special Studies Report 2006:81-84. Available at: http://lapublichealth.org/acd/reports/spclrpts/spcrpt06/spcl06[1].new.pdf
- Prevention of invasive group A streptococcal disease among household contacts of case patients and among postpartum and postsurgical patients: recommendations from the Centers for Disease Control and Prevention. Clin Infect Dis 2002; 35(8):950-959.
- O'Brien KL, Beall B, Barret NL, et al. Epidemiology of invasive group A streptococcal disease in the United States, 1995-1999. Clin Infect Dis 2002; 35(3):268-276.
- American Academy of Pediatrics. Committee on Infectious Diseases. Severe invasive group A streptococcal infections: a subject review. Pediatrics 1998; 101(1):136-140.
- Kaul R, McGeer A, Low DE, Green K, Schwartz B. Population-based surveillance for group A streptococcal necrotizing fasciitis: clinical features, prognostic indicators, and microbiologic analysis of seventy-seven cases. Am J Med 1997; 103(1):18-24.

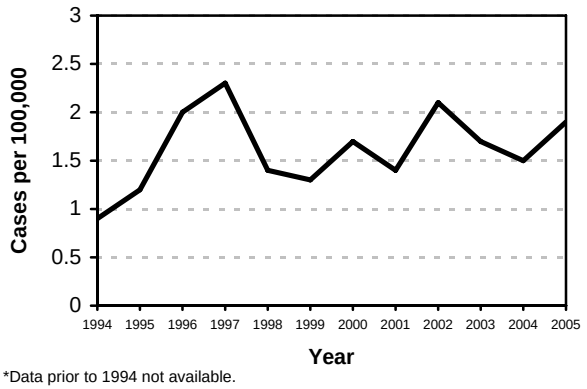
REFERENCE

1. Active Bacterial Core Surveillance Reports from 1997 to 2005 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at: www.cdc.gov/ncidod/dbmd/abcs/survreports.htm

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

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

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



*Data prior to 1994 not available.

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

DESCRIPTION

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

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

DISEASE ABSTRACT

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

STRATIFIED DATA

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

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

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

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

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

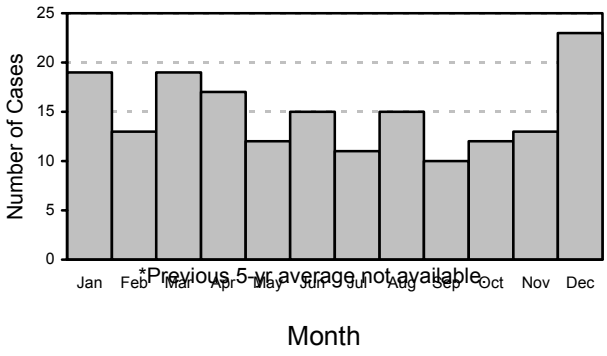
Location: The incidence rate was highest in SPA 5 (3.2 cases per 100,000) compared to LAC overall (1.9 cases per 100,000). Incidence has increased for all SPAs, but is most dramatic in SPA 1, which rose from 1.5 per 100,000 in 2004 to 2.3 per 100,000 in 2005 (Figure 4). However, stratification of cases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

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

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

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

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



*Previous 5-yr average not available

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

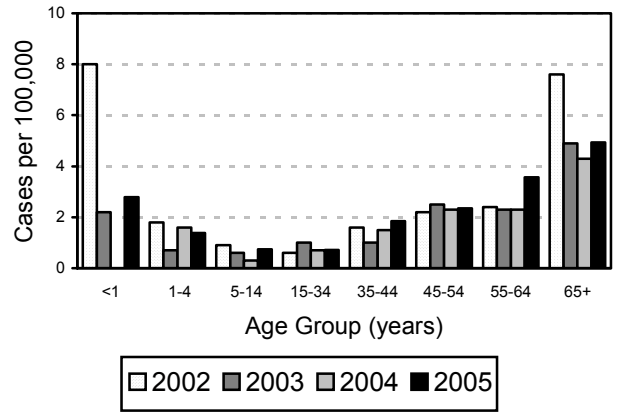


Figure 4
IGAS Rates by Service Planning Area
LAC, 2005

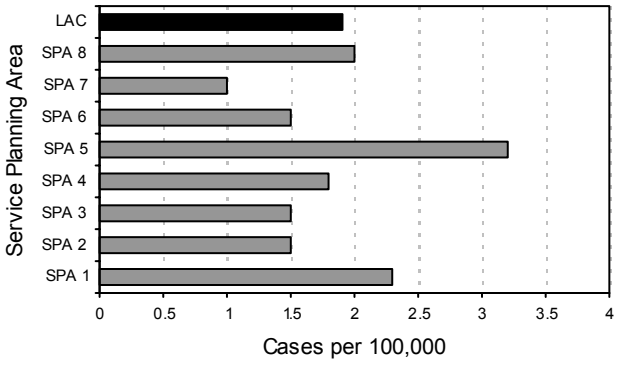


Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2005

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

*Overlapping syndromes will total over 100%.

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

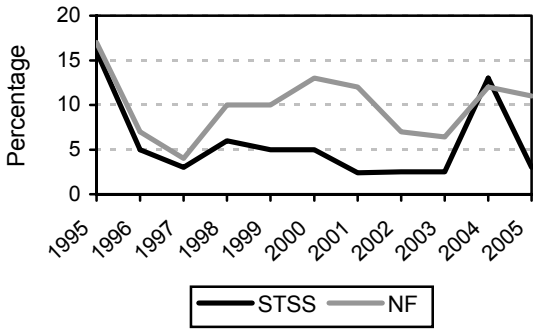
A nosocomial situation was reported at the end of 2005 in which two patients incurred IGAS infections after undergoing surgery from the same physician two months apart. Subsequent culturing of the surgeon yielded negative results and case finding revealed no additional cases. The isolate for the first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

COMMENTS

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

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

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



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

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

ADDITIONAL RESOURCES

For more information about IGAS visit:

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

IGAS Publications:

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

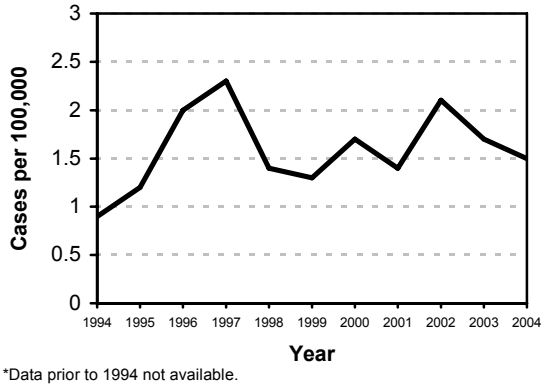
REFERENCES

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

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	146
Annual Incidence[a]	
LA County	1.5
United States [b]	3.9
Age at Diagnosis	
Mean	50
Median	51.5
Range	1-98 years
Case Fatality	
LA County[c]	26%
United States [b]	16%

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC, 1994- 2004



*Data prior to 1994 not available.

[a] Cases per 100,000 population.
[b] National projection of IGAS incidence from Active Bacterial Core Surveillance areas data, 2003 [1].
[c] 75% of outcomes known.

DESCRIPTION

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

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

DISEASE ABSTRACT

- STSS clinical presentation and case fatality rate has substantially increased compared to previous years, most likely due to enhanced surveillance.
- No clusters or outbreaks were reported.

STRATIFIED DATA

Trends: The incidence rate of reported IGAS was 1.5 per 100,000 in 2004 (n=146). This is a 12% decline in incidence as compared to 2003 (1.7 per 100,000, n=157) (Figure 1).

Figure 2
IGAS Cases by Month of Onset
LAC, 2004

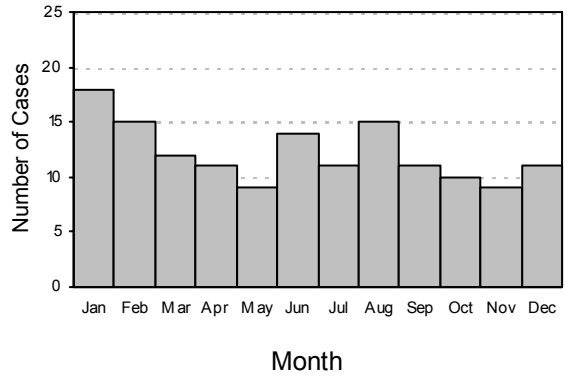


Figure 3
IGAS Incidence Rates by Age Group
LAC, 2001-2004

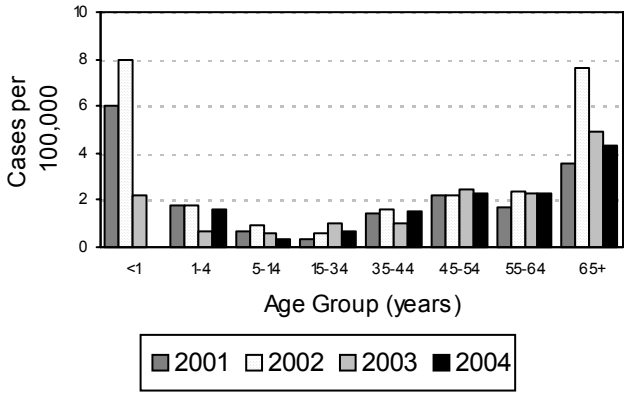


Figure 4
IGAS Rates by Service Planning Area
LAC, 2004

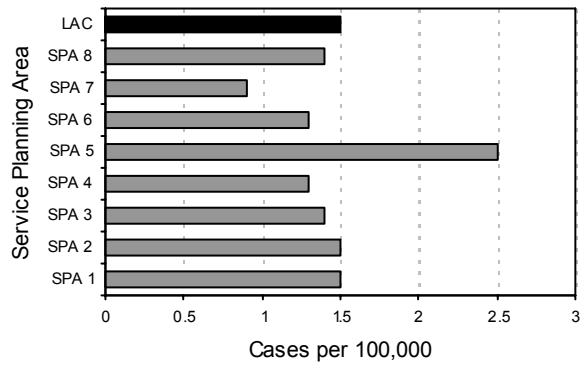


Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2004

Syndrome	Number	Percent*
Bacteremia (without focus)	48	37
Cellulitis	43	33
STSS	17	13
Necrotizing Fasciitis	16	12
Non-Surgical Wound Infection	16	12
Pneumonia	15	12
Septic Arthritis	5	4
Other	42	32

*Overlapping syndromes will total over 100%.

Seasonality: No seasonal trend was apparent. Aside from January, the number of cases remained relatively stable at a range of 9 to 15 per month (Figure 2).

Age: The age of cases ranged from 1 to 98 years with a mean 50 and median of 51.5 (crude data). The highest rate of cases occurred in the over 65 age group (4.3 per 100,000). No cases occurred in the <1 age group in 2004. There has been a striking decrease in incidence rates in this age group since at least 2001 (Figure 3).

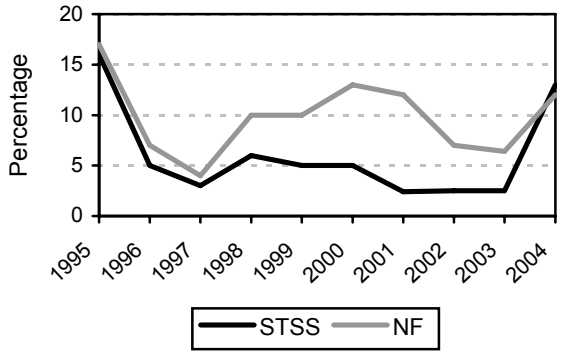
Gender: Cases were evenly distributed between genders. The male to female rate ratio was 1.1:1. However, females comprised 66% of deaths due to IGAS infection (n=19).

Race/Ethnicity: Race/ethnicity was known for 91% of cases. Of these, 44% were White, 38% were Latino, 6% were Black, 8% were Asian, and 5% were other. The race/ethnicity distribution has remained similar since 2001.

Location: The crude incidence rate was highest in SPA 5 (2.5 cases per 100,000) compared to LAC overall (1.5 cases per 100,000) (Figure 4). However, the small number of cases reported in each SPA, except for SPAs 2 and 3, produces unstable incidence rates.

Clinical Syndromes: The most common syndromes presented were bacteremia and cellulitis (Table 1).

Figure 5
IGAS Clinical Presentation of STSS and NF
LAC, 1995-2004



Other syndromes included osteomyelitis, endometritis, and meningitis. There is a substantial increase in STSS, from a range of 2.4–6% in the past 7 years to 13% in 2004 (Figure 5). The case fatality rate has also risen from less than 10% since 2001 to 26%. This may be due to the rise in STSS as 42% of the reported deaths belonged to cases that presented with STSS (case fatality rate of STSS is 73% with two outcomes unknown).

The 17 cases of STSS ranged from 2–83 years in age; the mean was 49 and the median was 47. A majority of cases were female (65%). The most frequently reported risk factors for these cases are history of blunt trauma (n=4, 24%) and diabetes (n=3, 18%).

Risk Factors: Information about risk factors was collected for 74% of cases. Of these cases, roughly one-third reported no risk factors for IGAS (n=35), a third reported a single risk factor (n=39), while another third reported multiple risk factors (n=34). The most common reported risk factor is diabetes (n=25, 23%), followed by malignancy (n=16, 15%) and chronic heart disease (n=15, 14%).

COMMENTS

Although IGAS disease is not a mandated reportable disease in California, LACDHS has required laboratories, hospitals, and healthcare providers to report IGAS disease since 1993. Surveillance has been predominately passive and information pertaining to patient demographics, clinical presentation, intervention, and outcome has often been incomplete. Complete IGAS reporting requires active case follow-up, particularly for STSS and NF as these syndromes require the most intense follow-up.

In 2002 a new IGAS form including a specific section for STSS reporting was developed and distributed to Infection Control Practitioners. Increased information about IGAS and its various clinical syndromes has been systematically collected since that time with increasing success. As an artifact of these changes, however, IGAS trends may have changed dramatically. The upswing in both case fatality and STSS, for example, may be attributed to the improved availability of clinical presentation data which was 89% of cases in 2004, compared with 58% in 2002 and 71% in 2003. There may also be a reporting bias towards IGAS cases with severe presentation and outcomes.

No outbreaks or clusters have been reported, though single cases meeting the case definition of “nosocomial” occurred in six different facilities. However, there has been no evidence of nosocomial spread.

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

ADDITIONAL RESOURCES

For more information about IGAS visit:

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

IGAS Publications:

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

REFERENCES

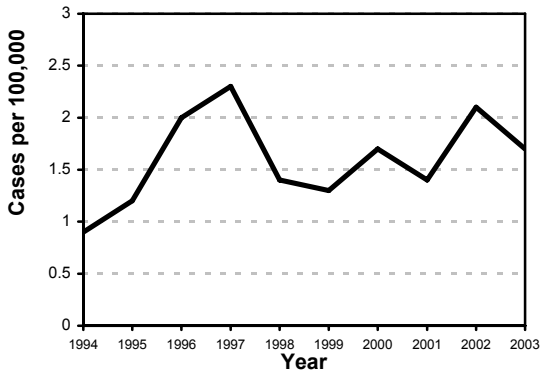
1. Active Bacterial Core Surveillance Reports from 1997 to 2003 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at: www.cdc.gov/ncidod/dbmd/abcs/survreports.htm. Accessed 5/10/2005.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	157
Annual Incidence[a]	
LA County	1.67
United States	N/A
Age at Diagnosis	
Mean	49
Median	50
Range	<1–91 years
Case Fatality	
LA County	10%
United States	N/A

[a] Cases per 100,000 population.

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC, 1994–2003



DESCRIPTION

Invasive Group A Streptococcal (IGAS) disease is caused by the group A beta-hemolytic *Streptococcus pyogenes* bacterium. Transmission is by direct or, rarely, indirect contact. For surveillance purposes in LAC, IGAS is defined as isolation of *Streptococcus pyogenes* from a normally sterile body site (e.g., blood, cerebrospinal fluid, synovial fluid, or from tissue collected during surgical procedures), or from a non-sterile site if associated with streptococcal toxic shock syndrome (STSS) or necrotizing fasciitis (NF). Illness manifests as various clinical syndromes, including: bacteremia without focus; sepsis; cutaneous wound, or deep soft-tissue infection; septic arthritis; and pneumonia. IGAS occurs in all age groups but is most common among the very old. Infection can result in severe illness and death.

In 2003, case patients with a culture positive for GAS from a normally sterile site were categorized as IGAS, with or without identification of a clinical syndrome. Case patients were categorized as STSS if, in addition to a culture positive for GAS, they meet the CDC/Council of State and Territorial Epidemiologists (CSTE) case definition for this syndrome. Case patients were categorized as NF with a culture positive for GAS from a normally sterile or nonsterile site if the diagnosis was made by the treating physician because there is no CDC or CSTE case definition for this syndrome.

DISEASE ABSTRACT

- The number of cases decreased from the previous year.
- Cases were sporadic and unassociated. No clusters or outbreaks were reported.

STRATIFIED DATA

Trends: The number of cases reported decreased in 2003. However, the number of cases of STSS and NF was comparable to those in the previous year (Table 1).

Table 1. Frequency of IGAS, STSS and NF—LAC, 1994–2003					
	IGAS	STSS		NF	
Year	N	N	% IGAS	N	% IGAS
1994	83	29	34.9	18	21.7
1995	103	16	15.5	17	16.5
1996	175	9	5.1	13	7.4
1997	205	7	3.4	9	4.4
1998	128	8	6.3	13	10.2
1999	114	6	5.3	11	9.7
2000	154	8	5.2	20	13.0
2001	127	3	2.4	15	11.8
2002	192	5	2.6	13	6.8
2003	157	4	2.5	10	6.4

Seasonality: Cases occurred throughout the year. The pronounced winter/spring seasonality, commonly associated with streptococcal pharyngitis, continued into the summer (Figure 2).

Age: Incidence was highest among those aged over 65 (4.9 cases per 100,000 population). The incidence in infants <1 year of age decreased substantially from 2002 (from 8.0 to 2.2 per 100,000 population, Figure 3). No reason for the decrease in this age group was apparent.

Gender: The male-to-female rate ratio was 1.61:1.

Race/Ethnicity: Race/ethnicity was known for 88% of cases. Of these, 36% were White, 44% were Latino, 9% were Black, and 12% were Asian.

Figure 2
IGAS
Cases by Month of Onset
LAC, 2003

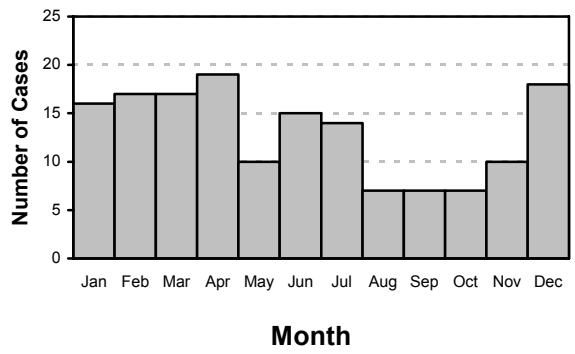
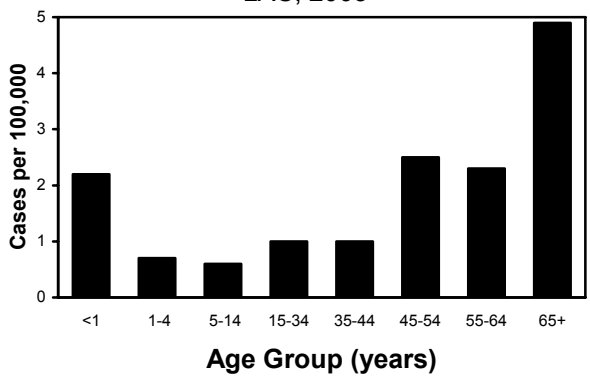


Figure 3
IGAS
Incidence Rates by Age Group
LAC, 2003



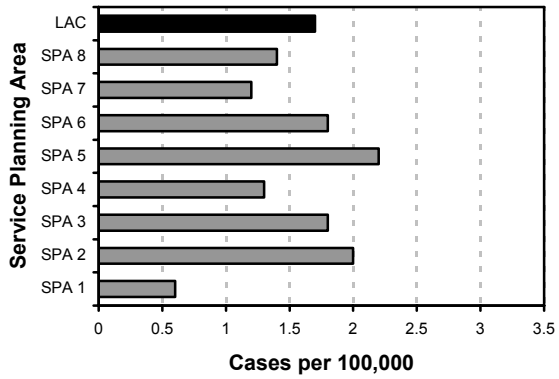
Location: The crude incidence rate was highest in SPA 5 (2.2 cases per 100,000 population), compared with a mean of 1.7 per 100,000 for all of LAC (Figure 4). However, many of the rates are unstable because they are based on small numbers of reported cases.

Clinical Syndromes: The clinical presentation of 111 cases (71%) was available. Thirty cases were reported more than one clinical syndrome (Table 2).

The majority of cases were categorized as cellulitis, bacteremia or nonsurgical wound infection. In contrast, in 2002 the majority of cases were categorized as sepsis, necrotizing fasciitis or septic arthritis.

Of the 10 cases of NF, the mean age was 49 years, the median was 45 years and the range was 33 years to 78 years. Seventy percent were male. The outcome of four cases was unknown but no deaths were reported.

Figure 4
IGAS
Rates by Service Planning Area
LAC, 2003



COMMENTS

Although IGAS disease is not a mandated reportable disease in California, the ACDC program has required laboratories, hospitals, and healthcare providers to report IGAS since 1993. In 2003, 80% of cases were reported by hospitals or healthcare providers and 20% were reported by laboratories. Overall, there was a 19% decrease in the number of cases reported. A reason for the decrease was not apparent.

In 2003, use of a new epidemiology form for collection of specific standardized clinical and laboratory information on IGAS cases was initiated, and detailed case information was obtained on 71% of cases. As a consequence, clinical and outcome data for 2003 more accurately reflect IGAS disease in LAC.

Table 2. Frequency and Percentage of IGAS Clinical Syndromes—LAC, 2003 (N=III)

Syndrome	N	Percent
Cellulitis	41	26
Nonsurgical wound infection	26	17
Bacteremia	26	17
Pneumonia	19	12
Necrotizing fasciitis	10	6
Septic arthritis	6	4
Osteomyelitis	5	3
Other	34	22

ADDITIONAL RESOURCES

For more information about IGAS visit:

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

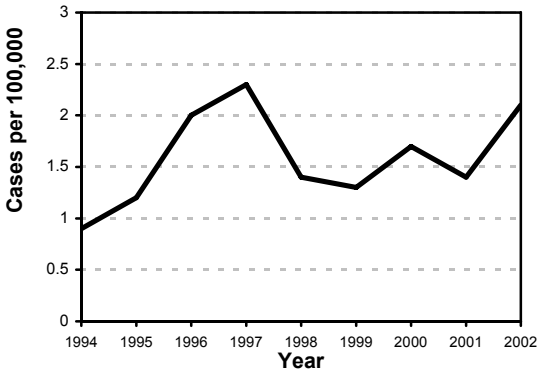
IGAS Publications:

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

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	192
Annual Incidence	
LA County	2.1
United States	N/A
Age at Diagnosis	
Mean	50
Median	52
Range	<1–95 years
Case Fatality	
LA County	8.8%
United States	N/A

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC, 1994–2002*



*Data prior to 1994 not available.

[a] Cases per 100,000 population.

DESCRIPTION

Invasive Group A Streptococcal (IGAS) disease is caused by the group A beta-hemolytic *Streptococcus pyogenes* bacterium. Transmission is primarily by direct contact. For LAC surveillance purposes, IGAS is defined as isolation of *Streptococcus pyogenes* from a normally sterile body site (e.g., blood, cerebrospinal fluid, synovial fluid, or from tissue collected during surgical procedures), or from a non-sterile site if associated with streptococcal toxic shock syndrome (STSS) or necrotizing fasciitis (NF). Illness manifests as various clinical syndromes, including: bacteremia without focus; sepsis; cutaneous wound, or deep soft-tissue infection; septic arthritis; and pneumonia. IGAS occurs in all age groups but is most common among the very old. Infection can result in severe illness, including death.

In 2002, case patients with a culture positive for GAS from a normally sterile site were categorized as IGAS, with or without identification of a clinical syndrome. Case patients with a culture positive for GAS from a sterile or nonsterile site were categorized as having NF or STSS if the diagnosis was made by the treating physician, with or without fulfillment of the CDC or Council of State and Territorial Epidemiologists (CSTE) case definitions for these syndromes.

DISEASE ABSTRACT

- The number of cases increased substantially over the previous year.
- Cases were sporadic and unassociated. No clusters or outbreaks were reported.

STRATIFIED DATA

Trends: The number of reported cases increased 51%, from 127 cases in 2001 to 192 cases in 2002, approaching the peak seen in 1997 (Figure 1). The number of cases of STSS and NF occurring during 2002 were comparable to those the previous year (Table 1).

Table 1: Frequency of IGAS, STSS and NF—LAC, 1994–2002

	IGAS	STSS		NF	
Year	N	N	% IGAS	N	% IGAS
1994	83	29	35.0	18	22.0
1995	103	16	16.0	17	17.0
1996	175	9	5.0	13	7.0
1997	205	7	3.0	9	4.0
1998	128	8	6.0	13	10.0
1999	114	6	5.0	11	10.0
2000	154	8	5.0	20	13.0
2001	127	3	2.4	15	12.0
2002	192	5	2.5	13	7.0

Seasonality: While cases occur throughout the year, a pronounced winter/spring seasonality commonly associated with streptococcal pharyngitis was observed (Figure 2).

Age: Although incidence was highest among infants aged less than 1 year (8.0 cases per 100,000 population), the mean age of cases was 50 years and the median was 52 years (range newborn to 95 years). In 2002, the number of cases in those aged 65 or more increased substantially since the previous year (from 32 to 75, Figure 3). No reason for the increase in this age group was apparent.

Gender: The male-to-female rate ratio was 1.4:1.

Race/Ethnicity: Race/ethnicity was known for 76% of cases, an increase of 22% from 2001. Of these, 40% were White, 39% were Latino, 11% were Black, 8% were Asian and 1% were Other.

Figure 2
IGAS
Cases by Month of Onset
LAC, 2002

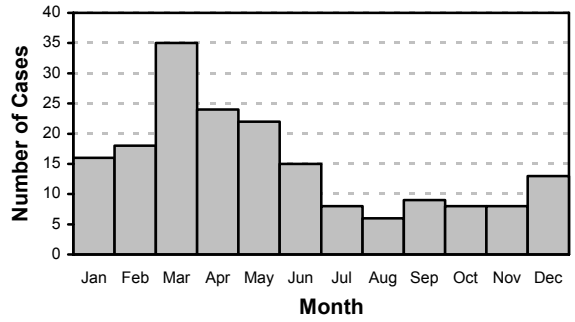
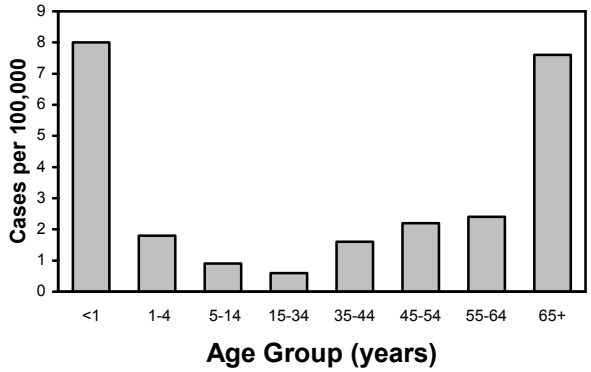


Figure 3
IGAS
Incidence Rates by Age Group
LAC, 2002



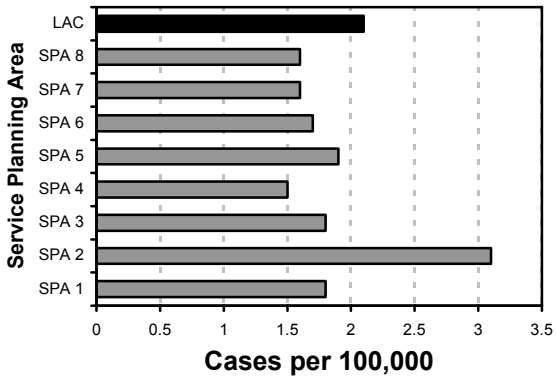
Location: The crude incidence rate for IGAS was highest in SPA 2 (3.1 cases per 100,000 population), compared with a mean of 2.1 per 100,000 for all of LAC (Figure 4). However, many of the rates are unstable because they are based on small numbers.

Clinical Syndromes: The distribution of clinical syndromes among cases is shown in Table 2. The majority of cases (n=73, 38%) were categorized as sepsis, followed by necrotizing fasciitis (n=13, 7%),

septic arthritis (n=7, 4%), pneumonia (n=6, 3%), cellulitis, STSS (n=5, 3%), meningitis (n=1, 0.5%), and other (n=1, 0.5%). The clinical presentation of 80 cases (42%) was not available.

Of the 13 cases of NF, the mean age was 37 years, the median was 37 years and the range was 2 years to 75 years. More than half (54%, n=7) were female. Eight case patients underwent surgical debridement and amputation was reported in three case patients.

Figure 4
IGAS
Rates by Service Planning Area
LAC, 2002



COMMENTS

Although IGAS disease is not a mandated reportable disease in California, ACDC has requested laboratories, hospitals, and healthcare providers to report IGAS disease since 1993. Surveillance has been predominately passive; information pertaining to patient demographics, clinical presentation, intervention, and outcome has often been incomplete. In 2002, 79% of cases were reported by hospitals and 21% by laboratories. Overall, there was a 51% increase in the number of cases reported. The reason for the increase—whether a result of improved awareness by providers, a cyclical upswing or a true increase in morbidity—is unclear.

Table 2: Frequency and Percentage of IGAS Clinical Syndromes, LAC 2002

Syndrome	N	Percent
Sepsis	73	38.0
NF	13	7.0
Septic Arthritis	7	4.0
Cellulitis	6	3.0
Pneumonia	6	3.0
STSS	5	3.0
Meningitis	1	0.5
Other	1	0.5

Case investigation was expanded in 2002, the first year that active efforts were made to collect more detailed data. As a result, collection of demographic and clinical information improved and was obtained on 58% of cases. However, this represents 42% of cases for which clinical information was not obtained. As a consequence, clinical and outcome data for 2002 are incomplete. Although public health interventions to prevent IGAS are limited, active efforts to obtain thorough demographic and clinical information about cases will continue in order to improve data analysis, make meaningful year-to-year comparisons, and identify potential opportunities for prevention.

ADDITIONAL RESOURCES

For information about IGAS and antibiotic resistance in LAC, visit: www.lapublichealth.org/acd/antibio.htm

IGAS Publications:

- The Working Group on Prevention of Invasive group A Streptococcal Infections. Prevention of Group A streptococcal disease among household contacts of case-patients and among postpartum and postsurgical parients: Recommendations from the Centers for Disease Control and Prevention. Clin Infec Dis 2002; 35:950–9.

- O'Brien KL, Beall B, Barret NL, et al. Epidemiology of invasive group A streptococcal disease in the United States, 1995–1999. Clin Infec Dis 2002; 36:268–276.

- Laupland KB, Davies HD, Low DE, et al. Invasive group A streptococcal disease in children and association with varicella-zoster virus infection. Ontario Group A Streptococcal Study Group. Pediatrics 2000; 105(5):E60.

- The Working Group on Prevention of Invasive Group A Streptococcal Infections. Prevention of invasive group A streptococcal disease among household contacts of case-patients: Is prophylaxis warranted? JAMA 1998;15:1206–10.

- American Academy of Pediatrics. Committee on Infectious Diseases. Severe invasive group A streptococcal infections: A subject review. Pediatrics. 1998; 101:136–40.

- Zurawski CA, Bardsley MS, Beall B, et al. Invasive group A streptococcal disease in metropolitan Atlanta: a population-based assessment. Clin Infec Dis 1998; 27:150–7.

- Kaul R, McGeer A, Low D, et al. Population-based surveillance for group A streptococcal necrotizing fasciitis: Clinical features, prognostic indicators, and microbiologic analysis of seventy-seven cases. Am J Med 1997; 103:18–24.

- Davies HD, McGeer A, Schwarz B, et al. Invasive group A streptococcal infections in Ontario, Canada. N Engl J Med 1996; 335:545–54.

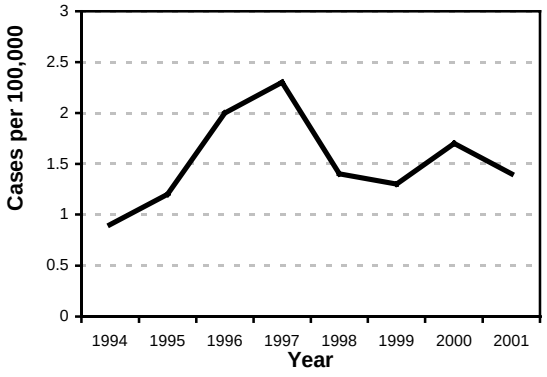
- The Working Group on Severe Streptococcal infections. Defining the group A streptococcal toxic shock syndrome. Rationale and consensus definition. JAMA 1993; 269:390–1.

- CDC. Case Definitions for Infectious Conditions Under Public Health Surveillance. MMWR 1997; 46:1–55.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	127
Annual Incidence[a]	
LA County	1.4
United States	N/A
Age at Diagnosis	
Mean	45
Median	46
Range	0-95 years
Case Fatality	
LA County	8.7%
United States	N/A

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC, 1994 - 2001*



*Data prior to 1994 not available.

[a] Cases per 100,000 population.

DESCRIPTION

Group A *Streptococcus*, *Streptococcus pyogenes,* causes invasive, noninvasive (e.g. "strep throat"), and nonsuppurative (e.g. acute rheumatic fever and poststreptococcal glomerulonephritis) diseases. Invasive group A streptococcal (IGAS) disease is defined as isolation of *Streptococcus pyogenes* from a normally sterile body site (e.g., blood, cerebrospinal fluid, bone, joint fluid, or from tissue collected during surgical procedures). IGAS includes the following potentially overlapping clinical syndromes:

- Streptococcal toxic shock syndrome (STSS) – characterized by early shock and multiorgan system failure;
- Necrotizing fasciitis (NF) – necrosis of subcutaneous soft tissue and skin with signs of severe systemic disease;
- Sterile site infections that do not meet the clinical criteria for STSS or NF, including bacteremia without an apparent focus of infection, and focal infections (e.g., meningitis, pneumonia, peritonitis, osteomyelitis, septic arthritis, and deep soft tissue infections) with or without bacteremia.

A case was defined as isolation of group A *streptococcus* (GAS) from a normally sterile site or from a nonsterile site (e.g., wound culture) in conjunction with NF or STSS. Case patients who had positive results of blood culture for GAS but for whom no clinical syndrome was identified on the initial report were categorized as having only bacteremia without a source. Case patients were categorized as having NF or STSS if the diagnosis was made by the treating physician with or without fulfillment of the case definitions for these syndromes.

DISEASE ABSTRACT

- A small cluster of fatal IGAS cases occurring among children during a four-week period was investigated and the cases were determined to be unrelated
- There has been no sustained increase in the incidence of IGAS in LAC since 1997.
- There was one cluster of 4 cases of IGAS that occurred in a hospital burn unit (see Special Reports).

STRATIFIED DATA

Table 1: Frequency of IGAS, STSS and NF – LAC, 1994-2001

Year	IGAS N	STSS N (% of IGAS)	NF N (% of IGAS)
1994	83	29 (35)	18 (22)
1995	103	16 (16)	17 (17)
1996	175	9 (5)	13 (7)
1997	205	7 (3)	9 (4)
1998	128	8 (6)	13 (10)
1999	114	6 (5)	11 (10)
2000	154	8 (5)	20 (13)
2001	127	3 (2.4)	15 (12)

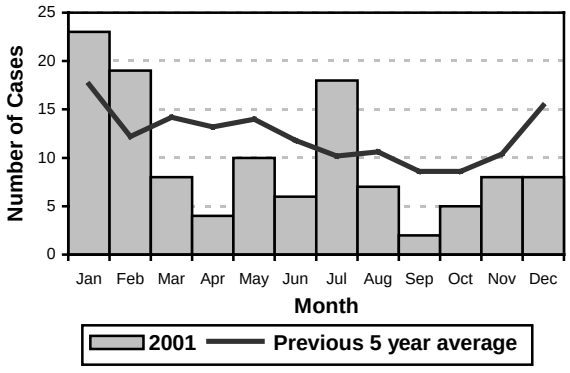
Trends: The number of reported cases decreased 18% from 154 cases in 2000 to 127 cases in 2001 and was below the peak seen in 1996 and 1997 (Figure 1). The year-to-year variation has been substantial, ranging from 83 reported cases in 1994 to a high of 205 cases in 1997 (Table 1).

Seasonality: Cases occurred throughout the year. The pronounced winter/spring seasonality commonly associated with streptococcal pharyngitis was not observed (Figure 2).

Age: The mean age of cases was 45 years and the median was 46 years (range newborn to 95 years). The incidence varied substantially by age (Figure 3), and was highest among infants aged less than 1 year (6.0 cases per 100,000 population), followed by those aged >65 years (3.6 cases per 100,000).

Gender: The male-to-female rate ratio was 1.4:1. More detailed case investigation, including collection of risk factor data such as injection drug use, might serve to explain the gender disparity.

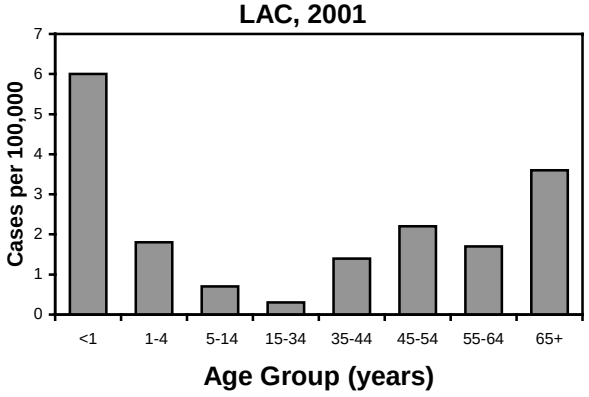
Figure 2
IGAS
Cases by Month of Onset
LAC, 2001



Race/Ethnicity: Race/ethnicity was known for 69 (54%) cases; of these, 25 (38%) were White, 31 (47%) were Latino, 5 (7%) were Black, and 4 (6%) were Asian and 4 (6%) were other.

Clinical Syndromes: The distribution of clinical syndromes among cases is shown in Table 2. The majority of cases (87, 69%) were categorized as bacteremia without an apparent source, followed by necrotizing fasciitis (15 cases, 12%), soft tissue infections, not NF (10 cases, 8%), meningitis (5 cases, 4%), septic arthritis (4 cases, 3%), pneumonia (3 cases, 2%), osteomyelitis (2 cases, 1.6%), and other (3 cases). There were 11 known deaths for an overall IGAS case fatality rate of 8.7 %. This value is lower than the approximately 12% case fatality rate observed in population-based IGAS studies, and probably represents incomplete outcome data in LAC in 2001.

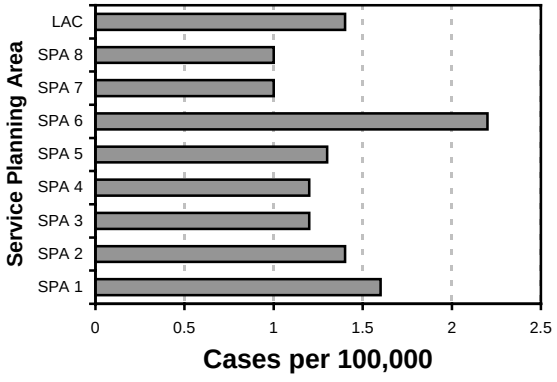
Figure 3
IGAS
Incidence Rates by Age Group
LAC, 2001



Of the 15 cases of NF, the mean age was 45 years, the median was 49 years and the range was 5 years to 72 years. Nine were male. All case patients underwent surgical debridement and four required amputation. There was one known death.

Location: The crude incidence rate for IGAS was highest in Service Planning Area (SPA) 6 (2.2 cases per 100,000 population), compared with a mean of 1.4 per 100,000 for all of LAC (Figure 4). However, many of the rates are unstable because they are based on small numbers of reported cases.

Figure 4
IGAS
Rates by Service Planning Area
LAC, 2001



Cluster of Fatal IGAS Cases Among Children: Between January 19 and February 18, 2001, three fatal cases of STSS occurred among children aged five years (2 cases) and fourteen years (1 case). Multi-limb necrotizing fasciitis accompanied by STSS developed in one of the cases aged 5 years following varicella; for the other two cases, there was no apparent focus of infection. Epidemiologic investigation along with molecular typing of case isolates by pulsed-field gel electrophoresis of GAS isolates showed no relationship among the cases.

COMMENTS

IGAS disease is not a mandated reportable disease in California. Following a cluster of severe IGAS infections among previously healthy children in 1993, the Acute Communicable Disease Control Unit requested reporting of IGAS disease from laboratories, hospitals, and healthcare providers in LAC. Since 1994, surveillance methods have varied from passive during 1994 and 1995, to stimulated passive as part of a special project between 1996-1999 (Communicable Disease Active Surveillance Project [CDAS]), and passive once again since 2000. The CDAS project was primarily laboratory based and laboratories continue to be the principal reporting sources for IGAS. Consequently, information pertaining to clinical presentation, race/ethnicity

and outcome is often incomplete. In 2001, case investigation to collect more detailed demographic, clinical and outcome data was conducted on selected cases known to involve NF, STSS or other severe manifestations.

Case information was obtained from hospital infection control staff for 46 cases, either from the initial report or case follow-up; the remainder of the cases were reported by laboratories only, either by means of laboratory culture reports or Confidential Morbidity Report forms. Information regarding race/ethnicity, clinical syndromes and outcomes was usually not available for cases reported only by laboratories. Consequently, it is likely that the number of deaths and the occurrence of nonbacteremic clinical manifestations are underestimated.

With the exceptions of eliminating varicella as a risk factor for IGAS through vaccination, and preventing nosocomial transmission (especially in obstetrical and surgical settings) and outbreaks in childcare centers, opportunities for public health intervention of IGAS are limited. The extent to which each reported case of IGAS should be investigated must be weighed in the context of available public health resources. However, at a minimum, the completeness of reporting should be assessed in order to make meaningful year-to-year comparisons.

ADDITIONAL RESOURCES

- The Working Group on Severe Streptococcal infections. Defining the group A streptococcal toxic shock syndrome. Rationale and consensus definition. *JAMA* 1993;269:390-1.

- Davies HD, McGeer A, Schwarz B, et al. Invasive group A streptococcal infections in Ontario, Canada. *N Engl J Med* 1996;335:545-54.

- Kaul R, McGeer A, Low D, et al. Population-based surveillance for group A streptococcal necrotizing fasciitis: clinical features, prognostic indicators, and microbiologic analysis of seventy-seven cases. *Am J Med* 1997;103:18-24.

- American Academy of Pediatrics. Committee on Infectious Diseases. Severe invasive group A streptococcal infections: a subject review. *Pediatrics.* 1998;101:136-40.

- Zurawski CA, Bardsley MS, Beall B, et al. Invasive group A streptococcal disease in metropolitan Atlanta: a population-based assessment. *Clin Infec* Dis 1998;27:150-7.

- Laupland KB, Davies HD, Low DE, et al. Invasive group A streptococcal disease in children and association with varicella-zoster virus infection. Ontario Group A Streptococcal Study Group. *Pediatrics* 2000;105(5):E60.

- O'Brien KL, Beall B, Barret NL, et al. Epidemiology of invasive group A streptococcal disease in the United States, 1995-1999. *Clin Infec Dis* 2002;36:268-276.