



## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	468
Annual Incidence <sup>a</sup>	
LA County	4.89
California <sup>b</sup>	N/A
United States <sup>c</sup>	5.03
Age at Diagnosis	
Mean	56
Median	60
Range	0–100 years

<sup>a</sup>Cases per 100,000 population

<sup>b</sup>Not notifiable

<sup>c</sup>Calculated from: CDC. *Notice to Readers: Final 2015 Reports of Nationally Notifiable Infectious Diseases and Conditions Weekly* / November 25, 2016 / 65(46);1306–1321. Available at:

[www.cdc.gov/mmwr/volumes/65/wr/mm6546a9.htm](http://www.cdc.gov/mmwr/volumes/65/wr/mm6546a9.htm)

**Note:** LA County utilizes passive surveillance in all age groups. Passive surveillance is not comparable to US rates due to difference in surveillance methodology.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent *Streptococcus pneumoniae* is spread by direct and indirect contact with respiratory secretions and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection (except bacteremic community acquired pneumonia) are not counted in LAC surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has been tracking IPD as part of a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive *S. pneumoniae* isolate collected from a normally sterile site (e.g., blood, cerebrospinal fluid).

In 2010, ACDC was awarded a grant from the CDC to evaluate the effectiveness of the 13-valent pneumococcal conjugate vaccine (Pneumovax®) among children 2-59 months old. This led to substantial improvements in IPD surveillance data quality for surveillance years 2010 to 2014. However, decreases in funding and staff resources have led to declines in data quality for surveillance year 2015.

Pneumococcal isolates from persons with IPD are sent to the LAC Public Health Laboratory to assess antimicrobial susceptibility, determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints used by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered non-susceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available to prevent pneumococcal disease. First, Pneumovax® is recommended for all children 2-59 months old, children ≥6 years old with certain risk factors for invasive pneumococcal infections, and adults ≥65 years old. Second, the 23-valent pneumococcal polysaccharide vaccines (Pneumovax®23 and Pneumovax®23) are recommended for all adults ≥65 years old and those <2 years old who are at high risk of IPD.

### 2015 TRENDS AND HIGHLIGHTS

- The incidence rate this year of 4.9 cases per 100,000 people was lower than the average annual incidence of 5.8 cases per 100,000 people over the past five years (range 4.9-7.1 cases per 100,000) (Figure 1) and is similar to last year's rate (4.9 cases per 100,000).
- Mortality in 2015 (n=42 deaths, 15.6%) was fairly consistent compared to the annual mortality during the past five years, which ranged from 12.8% to 17.3% among cases with known disease outcome.
- In 2015, 84% of reported cases were hospitalized, which is similar to the previous five-year average of 93%.
- Incidence rates decreased amongst all age groups, compared to the previous five-year average (Figure 2). Among cases <1 year old, the incidence rate decreased 39% (from 7.5 to 4.6



cases per 100,000). This age group is part of the target population for the 13-valent pneumococcal conjugate vaccine released in the spring of 2010. The decrease in incidence in this age group is indicative of vaccine effectiveness (Figure 2).

- All age groups decreased despite no or little conjugate vaccination, indicating decreased transmission in the overall population (Figure 2).
- Cases  $\geq 65$  years old and 55-64 years old had the highest incidence rates (16.2 and 9.3 cases per 100,000, respectively) (Figure 2). High rates among the elderly may be indicative of lower vaccination rates among the elderly ( $\geq 65$  years old) compared to children  $> 5$  years old. Alternatively, the elderly may be affected by different serotypes than are contained in the vaccines. More research is required to further assess this.
- Incidence rates decreased across all race/ethnic groups (Figure 3) compared to the previous five years.
- Consistent with previous years, the 2015 incidence rate in Blacks was substantially higher than rates among all other race/ethnic groups (Figure 3).
- Similar to previous years, SPA 6 had the highest incidence rate of IPD (7.3 cases per 100,000) (Figure 4). Compared to the rest of LAC, SPA 6 historically has had a high number of Hispanics and Blacks in addition to high numbers of individuals with low income and lack of access to

care. These may be contributory factors for the high number of cases in this SPA. More data is needed to study this [1, 2].

- In all SPAs, the incidence rate was lower than that of the previous five-year average. The largest incidence rate decrease among the SPAs occurred in SPA 5. This incidence rate decreased by 25% (from 5.2 to 3.9 cases per 100,000) compared to the previous five-year average (Figure 4).
- The percentage of isolates susceptible to penicillin, erythromycin, cefotaxime, ceftriaxone, levofloxacin, and TMP-SMZ was fairly consistent with the previous five years (Figure 6).

## References

1. Accessed on 7/21/2015 from the Los Angeles County Department of Public Health, LA HealthDataNow!: <https://dqs.publichealth.lacounty.gov/>
2. Senterfitt JW, Long A, Shih M, Teutsch SM. How Social and Economic Factors Affect Health. Social Determinants of Health, Issue no.1. Los Angeles: Los Angeles County Department of Public Health; January 2013.
3. Active Bacterial Core Surveillance Reports from 2005 to 2014 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](http://www.cdc.gov/abcs/reports-findings/surv-reports.html)



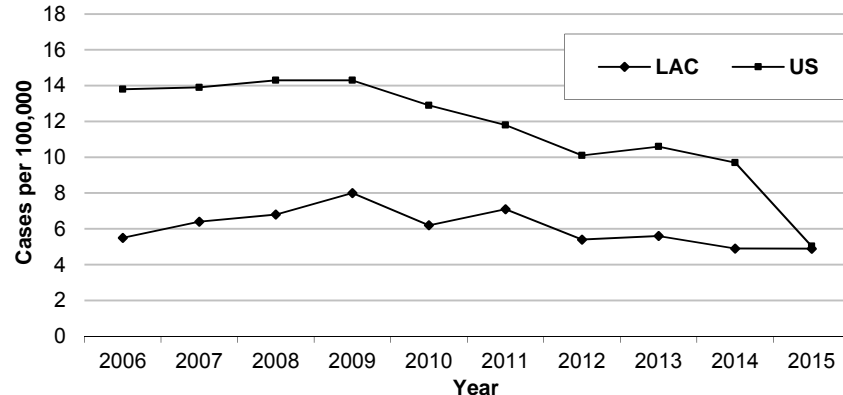
## Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA LAC, 2011-2015

	2011 (N=658)			2012 (N=504)			2013 (N=525)			2014 (N=460)			2015 (N=468)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	7	1.1	5.9	13	2.6	10.9	7	1.3	5	7	1.5	5.9	5	1.1	4.6
1-4	36	5.5	7.5	24	4.8	5.1	24	4.6	4.9	18	3.9	3.7	27	5.8	5.6
5-14	31	4.7	2.6	17	3.4	1.4	23	4.4	1.9	12	2.6	1.0	18	3.8	1.5
15-34	64	9.7	2.3	32	6.3	1.2	32	6.1	1.1	31	6.7	1.1	33	7.1	1.2
35-44	57	8.7	4.3	38	7.5	2.9	40	7.6	2.9	42	9.1	3.2	31	6.6	2.3
45-54	107	16.3	8.3	82	16.3	6.4	63	12.0	4.9	65	14.1	5.0	58	12.4	4.4
55-64	128	19.5	12.9	89	17.7	8.7	108	20.6	10.5	97	21.1	9.1	103	22.0	9.3
65+	227	34.5	21.5	209	41.5	18.8	228	43.4	20.5	188	40.9	16.6	193	41.2	16.2
Unknown	1	0.2	-	0	-	-	0	-	-	0	-	-	0	-	-
<b>Race/Ethnicity</b>															
Asian	49	7.4	3.7	36	7.1	2.7	32	6.1	2.3	34	7.4	2.5	29	6.2	2.1
Black	130	19.8	16.8	96	19.0	12.4	96	18.3	12.2	70	15.2	8.9	87	18.6	11.1
Hispanic	244	37.1	5.4	192	38.1	4.2	209	39.8	4.5	161	35.0	3.5	132	28.2	2.8
White	234	35.6	8.8	172	34.1	6.5	174	33.1	6.5	154	33.5	5.8	119	25.4	4.4
Other	0	-	-	0	-	-	0	-	-	15	3.3	-	14	3.0	-
Unknown	1	0.2	-	8	1.6	-	14	2.7	-	26	5.7	-	87	18.6	-
<b>SPA</b>															
1	31	4.7	8.0	18	3.6	4.6	25	4.8	6.4	16	3.5	4.1	18	3.8	4.5
2	117	17.8	5.5	111	22.0	5.2	99	18.9	4.5	102	22.2	4.7	72	15.4	3.2
3	85	12.9	5.3	79	15.7	4.9	75	14.3	4.6	66	14.3	4.0	64	13.7	3.9
4	87	13.2	7.8	72	14.3	6.4	66	12.6	5.8	55	12.0	4.8	69	14.7	5.9
5	49	7.4	7.7	28	5.6	4.4	20	3.8	3.1	25	5.4	3.8	26	5.6	3.9
6	86	13.1	8.5	72	14.3	7.1	74	14.1	7.2	60	13.0	5.8	77	16.5	7.3
7	81	12.3	6.3	54	10.7	4.1	73	13.9	5.5	56	12.2	4.3	59	12.6	4.5
8	94	14.3	8.9	57	11.3	5.3	75	14.3	6.9	53	11.5	4.9	61	13.0	5.6
Unknown	28	4.3	-	13	2.6	-	18	3.4	-	27	5.9	-	22	4.7	-

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

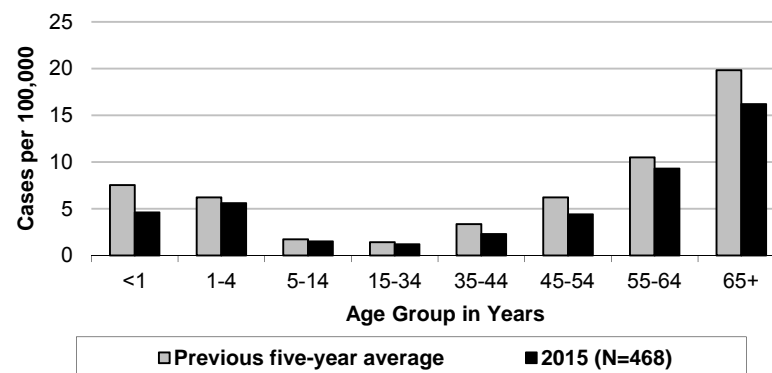


**Figure 1. Annual Incidence Rates\* of Invasive Pneumococcal Disease, LAC, and US, 2006-2015**

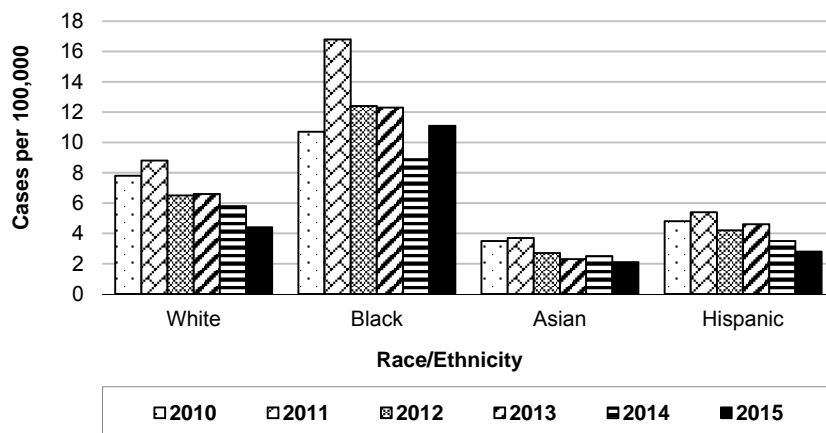


\*US incidence rate estimate from Active Bacterial Core

**Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease 2010-2015**

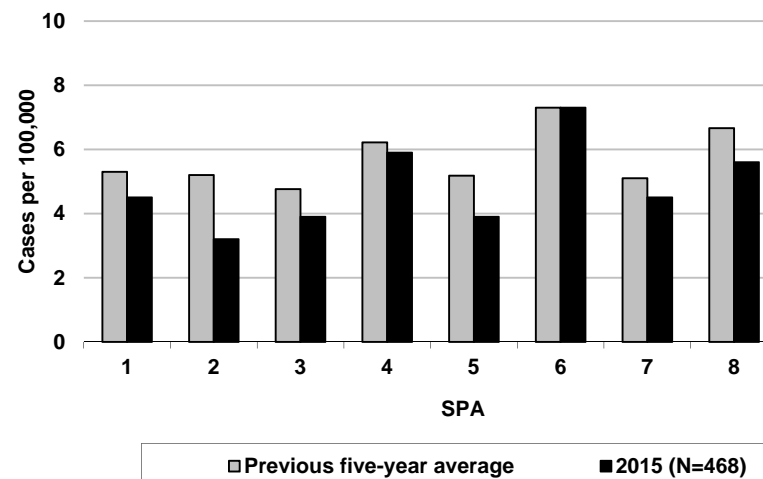


**Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2010-2015\***



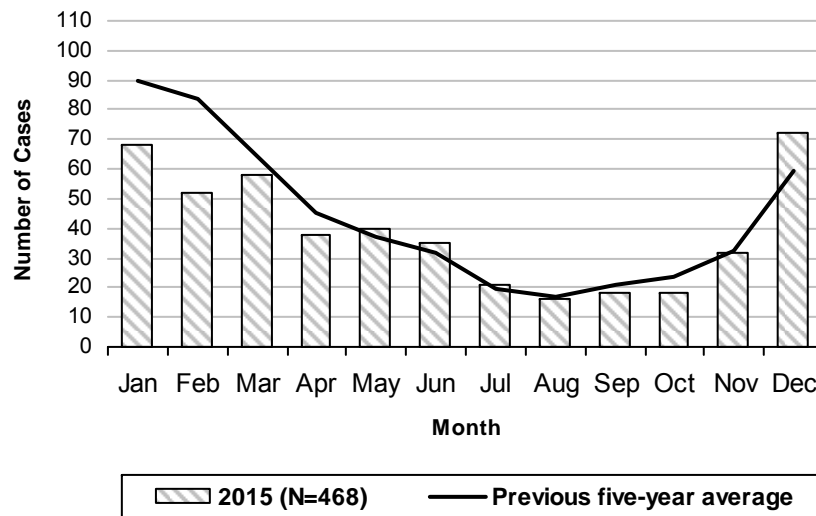
\*For 2010, 2011, 2012, 2013, 2014, and 2015 total numbers of cases (and percent with race-ethnicity missing) were 576 (4%), 658 (0%), 504 (2%), 525 (3%), 460 (10%), and 468 (19%), respectively.

**Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2010-2015**

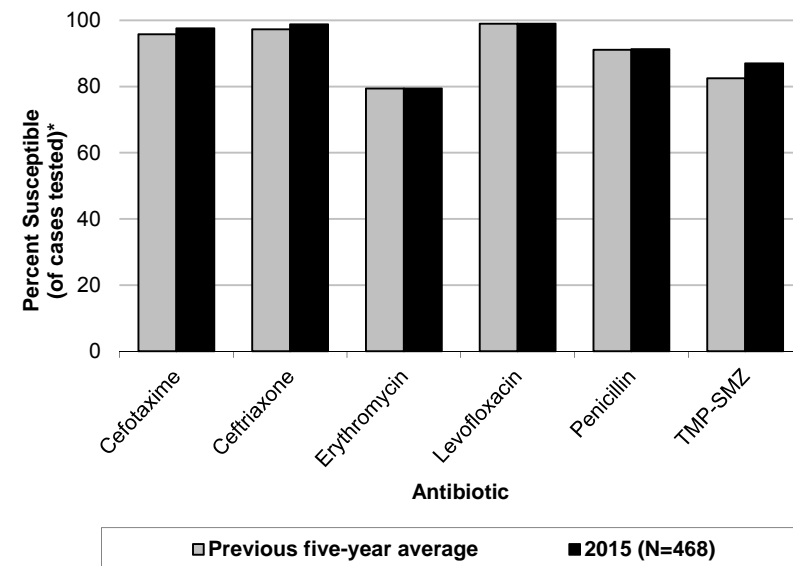




**Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2010-2015**

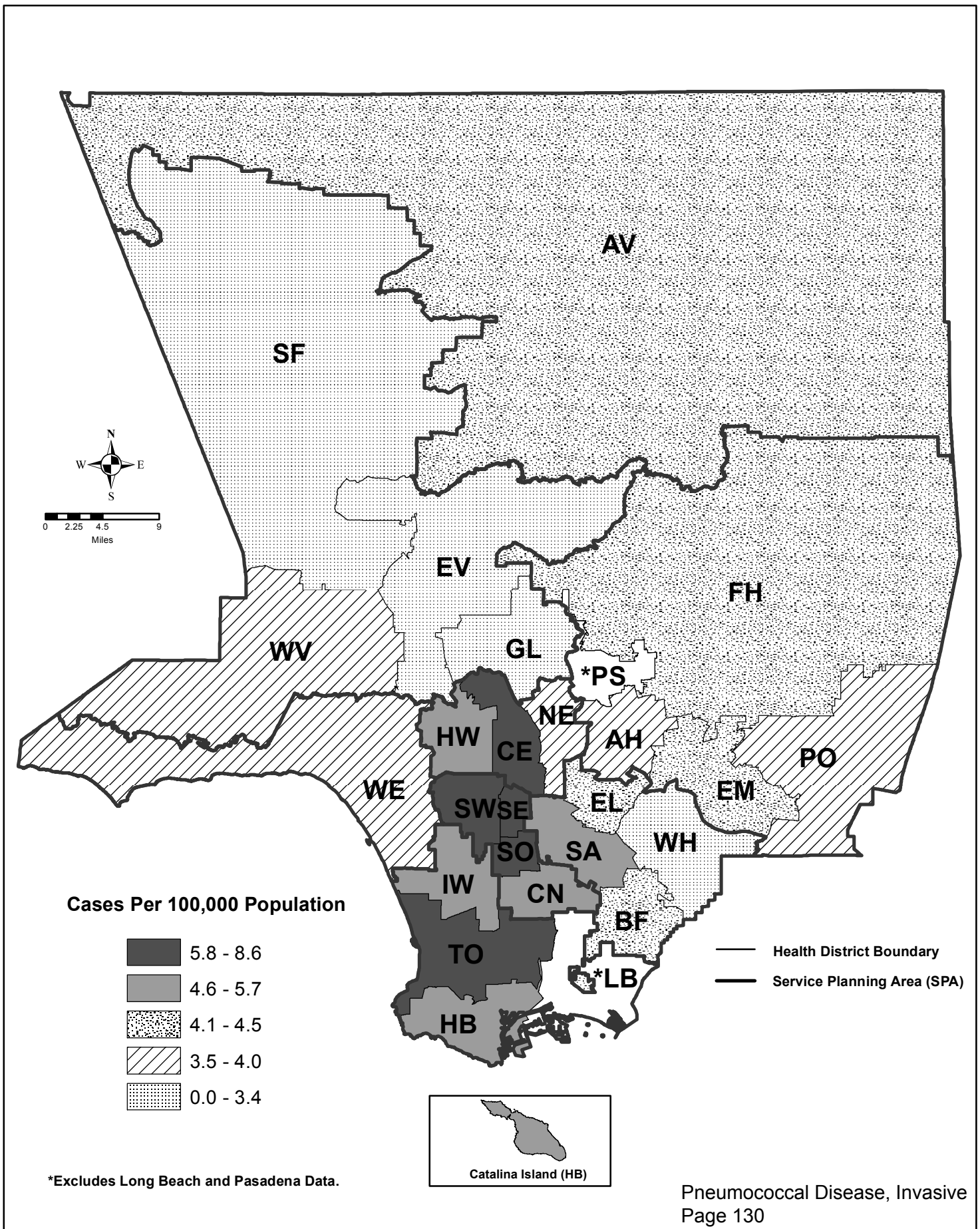


**Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2010-2015**



\*Range of number of isolates tested 2010-2015: Cefotaxime (212-316), Ceftriaxone (328-431), Erythromycin (218-363), Levofloxacin (240-367), Penicillin (391-596), and TMP-SMZ (193-279).

# **Map 10. Pneumococcal Disease, Invasive (IPD) Rates by Health District, Los Angeles County, 2015\***





## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	460
Annual Incidence <sup>a</sup>	
LA County	4.87
California <sup>b</sup>	N/A
United States <sup>b</sup>	10.7
Age at Diagnosis	
Mean	57
Median	60
Range	0–98 years

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable. United States incidence rate estimate from Active Bacterial Core Surveillance Report, 2013.

Note: LA County utilizes passive surveillance in all age groups >5. Passive surveillance in age groups > 5 is not comparable to U.S. rates due to difference in surveillance methodology.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory secretions and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection (exclusion of bacteremic community acquired pneumonia) are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has tracked IPD as part of a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive *S. pneumoniae* isolate collected from a normally sterile site (e.g., blood, cerebrospinal fluid).

In 2010, ACDC was awarded a grant from the Centers for Disease Control and Prevention (CDC) to evaluate the effectiveness of the 13-valent pneumococcal conjugate vaccine

(Pneumovax®) amongst children aged 2-59 months. This has led to substantial improvements in IPD surveillance data quality.

Pneumococcal isolates from persons with IPD are sent to the LAC Public Health Laboratory for antimicrobial susceptibility, determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints used by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered non-susceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available to prevent pneumococcal disease: Pneumovax® is recommended for all children aged 2-59 months, children ≥6 years with certain risk factors for invasive pneumococcal infections, and adults 65 years and older. The 23-valent pneumococcal polysaccharide vaccine (Pnu-Imune®23 and Pneumovax®23) are recommended for all adults 65 years and older and those less than 2 years of age who are at high risk of IPD.

### 2014 TRENDS AND HIGHLIGHTS

- The incidence rate this year of 4.87 cases per 100,000 people was lower than the average annual incidence of 6.5 cases per 100,000 people over the past five years (range 5.4-8.0 cases per 100,000) (Figure 1) and is 15% lower than last year's rate (5.6 cases per 100,000).
- Mortality in 2014 (16.1%, n=74 deaths) was fairly consistent compared to the annual mortality during 2009-2013 which ranged from 12.8% to 17.4% among cases with known disease outcome.
- In 2014, 93% of reported cases were hospitalized, which is similar to the previous five-year average of 89%.
- Incidence rates decreased amongst all age groups, compared to the previous five-year average (Figure 2). Amongst cases <1 year old, the incidence rate decreased 37% (from 9.4 to 5.9 cases per 100,000). Amongst cases aged 1 to 4 years old, the incidence rate was 51% lower (from 7.5 to 3.7 cases per 100,000). These age groups are part of the target population for the 13-valent pneumococcal conjugate vaccine released in





the spring of 2010. The decrease in incidence in these two age groups is indicative of vaccine effectiveness (Table).

- All age groups decreased despite no or little conjugate vaccination, indicating decreased transmission in the population.
- Cases aged 65 years and older and 55-64 years had the highest incidence rates (16.6 and 9.1 cases per 100,000, respectively) (Table, Figure 2). High rates among the elderly may be indicative of lower vaccination rates among the elderly (65 years and older) compared to children less than 5 years old. More research is required to further assess this.
- Incidence rates decreased across all race/ethnic groups from 25% (Whites) up to 31% (Blacks) (Table, Figure 3), compared to 2010-2013 (the years for which good data on race/ethnicity are available).
- Similar to previous years, the 2014 incidence rate in blacks was substantially higher than rates among other race/ethnic groups (Table, Figure 3).
- Similar to previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (5.8 cases per 100,000; Table, Figure 4). Compared to the rest of LAC, SPA 6 has historically had a high number of Hispanics and African Americans along with high numbers of individuals with low income and lack of access to care. These may be contributory factors for the high number of cases in this SPA. More data is needed to study this (1, 2).
- In all SPAs, the incidence rate was lower than the previous five-year average. The largest incidence rate decrease among the SPAs occurred in SPA 5. This incidence rate decreased by 36% (from 6.1 to 3.8 cases per 100,000) compared to the previous five-year average (Table, Figure 4).
- The percentage of isolates susceptible to penicillin, erythromycin, cefotaxime, ceftriaxone, levofloxacin and TMP-SMZ was fairly consistent with the previous five years (Figure 6).





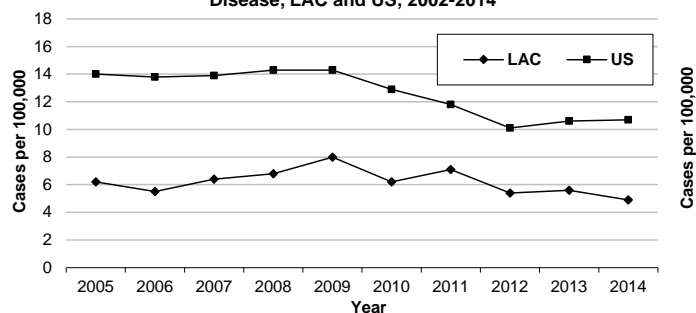
**Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA  
Los Angeles County, 2010-2014**

	2010 (N=576)			2011 (N=658)			2012 (N=504)			2013 (N=525)			2014 (N=460)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	12	2.1	10	7	1.1	5.9	13	2.6	10.9	7	1.3	5	7	1.5	5.9
1-4	48	8.3	9.9	36	5.5	7.5	24	4.8	5.1	24	4.6	4.9	18	3.9	3.7
5-14	21	3.6	1.7	31	4.7	2.6	17	3.4	1.4	23	4.4	1.9	12	2.6	1.0
15-34	38	6.6	1.4	64	9.7	2.3	32	6.3	1.2	32	6.1	1.1	31	6.7	1.1
35-44	47	8.2	3.5	57	8.7	4.3	38	7.5	2.9	40	7.6	2.9	42	9.1	3.2
45-54	84	14.6	6.5	107	16.3	8.3	82	16.3	6.4	63	12.0	4.9	65	14.1	5.0
55-64	108	18.8	11.3	128	19.5	12.9	89	17.7	8.7	108	20.6	10.5	97	21.1	9.1
65+	218	37.8	21.7	227	34.5	21.5	209	41.5	18.8	228	43.4	20.5	188	40.9	16.6
Unknown	0	-	-	1	0.2	-	0	-	-	0	-	-	0	-	-
<b>Race/Ethnicity</b>															
Asian	46	8.0	3.5	49	7.4	3.7	36	7.1	2.7	32	6.1	2.3	34	7.4	2.5
Black	83	14.4	10.7	130	19.8	16.8	96	19.0	12.4	96	18.3	12.2	70	15.2	8.9
Hispanic	213	37.0	4.8	244	37.1	5.4	192	38.1	4.2	209	39.8	4.5	161	35.0	3.5
White	209	36.3	7.8	234	35.6	8.8	172	34.1	6.5	174	33.1	6.5	154	33.5	5.8
Other	2	0.3	11.4	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	23	4.0	-	1	0.2	-	8	1.6	-	14	2.7	-	41	8.7	-
<b>SPA</b>															
1	13	2.3	3.4	31	4.7	8.0	18	3.6	4.6	25	4.8	6.4	16	3.5	4.1
2	130	22.6	6.1	117	17.8	5.5	111	22.0	5.2	99	18.9	4.5	102	22.2	4.7
3	80	13.9	5	85	12.9	5.3	79	15.7	4.9	75	14.3	4.6	66	14.3	4.0
4	70	12.2	6.3	87	13.2	7.8	72	14.3	6.4	66	12.6	5.8	55	12.0	4.8
5	44	7.6	6.9	49	7.4	7.7	28	5.6	4.4	20	3.8	3.1	25	5.4	3.8
6	79	13.7	7.9	86	13.1	8.5	72	14.3	7.1	74	14.1	7.2	60	13.0	5.8
7	69	12.0	5.3	81	12.3	6.3	54	10.7	4.1	73	13.9	5.5	56	12.2	4.3
8	77	13.4	7.3	94	14.3	8.9	57	11.3	5.3	75	14.3	6.9	53	11.5	4.9
Unknown	14	2.4	-	28	4.3	-	13	2.6	-	18	3.4	-	27	5.9	-

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

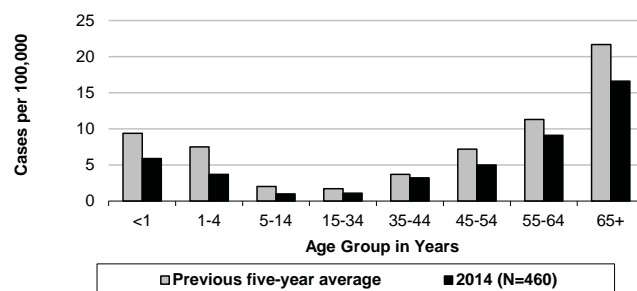


**Figure 1. Annual Incidence Rates\* of Invasive Pneumococcal Disease, LAC and US, 2002-2014**

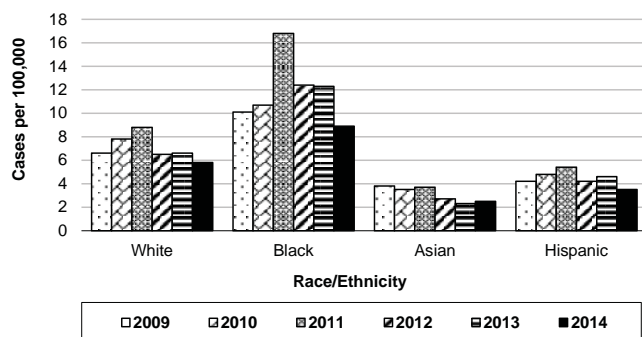


\* United States incidence rate estimate from Active Bacterial Core Surveillance [3]

**Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease 2009-2014**

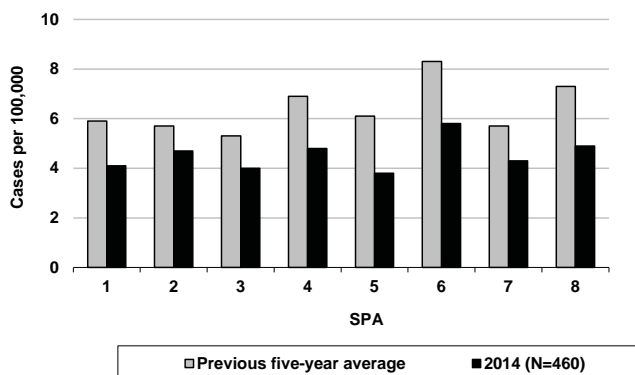


**Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2009-2014\***



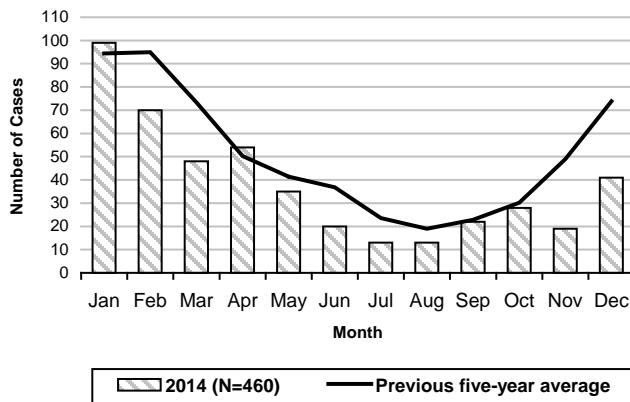
\* For 2009, 2010, 2011, 2012, 2013, and 2014 total numbers of cases (and percent with race-ethnicity missing) were 785 (32%), 576 (4%), 658 (0%), 504 (2%), 525 (3%), and 460 (10%), respectively.

**Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2009-2014**

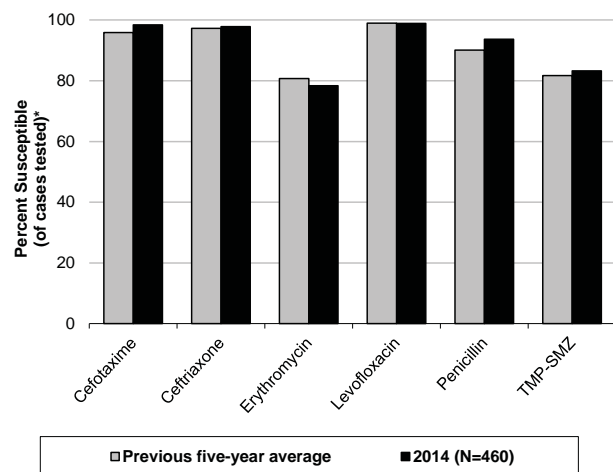




**Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2009-2014**



**Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2009-2014**

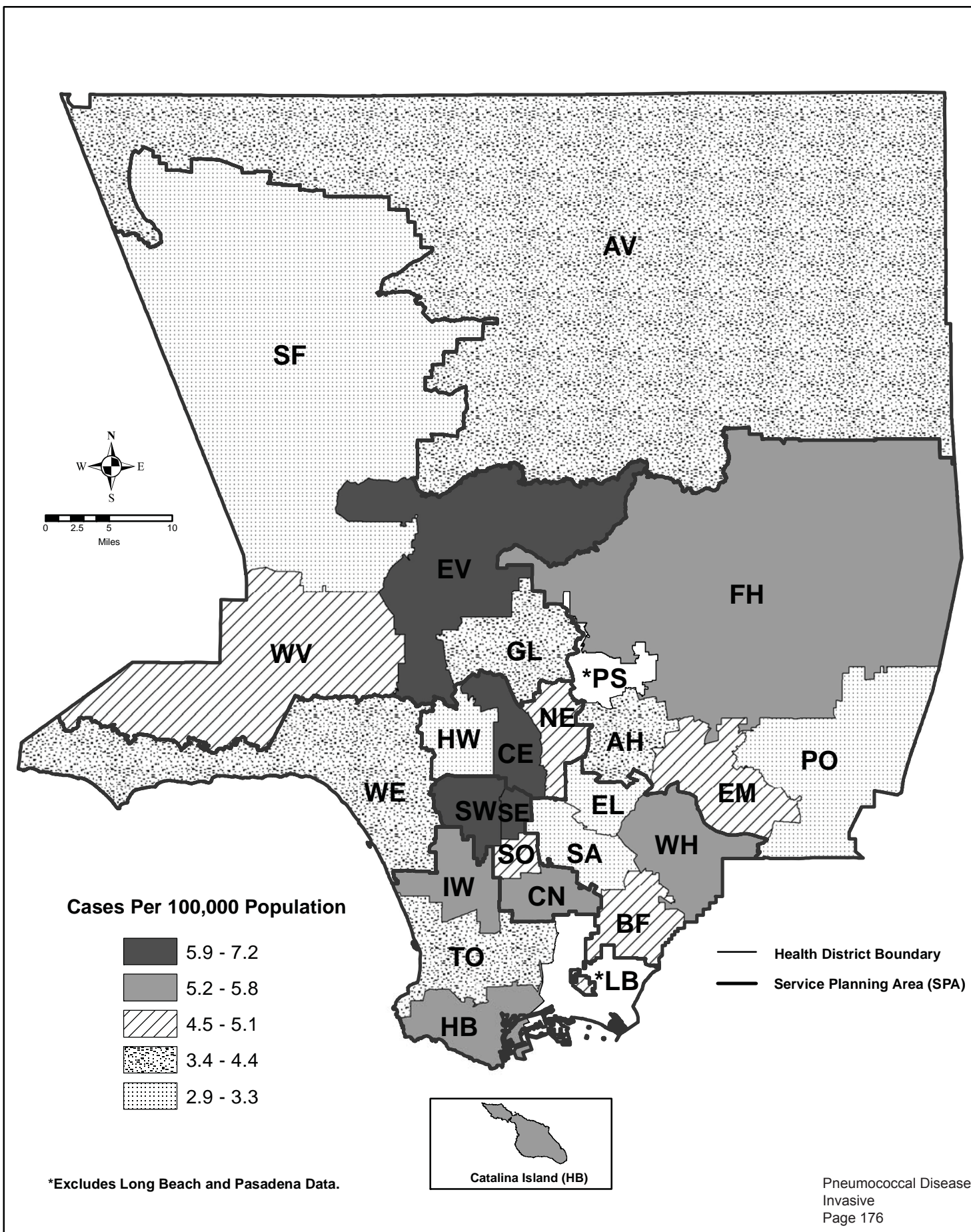


\*Range of number of isolates tested 2009-2014: Cefotaxime (245-389), Ceftriaxone (325-485), Erythromycin (243-455), Levofloxacin (276-394), Penicillin (403-667), and TMP-SMZ (211-330).

**Reference:**

1. Accessed on 7/21/2015 from the Los Angeles County Department of Public Health, LA HealthDataNow!: <https://dqs.publichealth.lacounty.gov/>
2. Senterfitt JW, Long A, Shih M, Teutsch SM. How Social and Economic Factors Affect Health. Social Determinants of Health, Issue no.1. Los Angeles: Los Angeles County Department of Public Health; January 2013.
3. Active Bacterial Core Surveillance Reports from 2005 to 2013 from the Centers for Disease Control and Prevention's Division of Bacterial Diseases. Report available at: <http://www.cdc.gov/abcs/reports-findings/surv-reports.html>

# Map 11. Pneumococcal Disease, Invasive Rates by Health District, Los Angeles County, 2014\*





## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	522
Annual Incidence <sup>a</sup>	
LA County	5.54
California <sup>b</sup>	N/A
United States <sup>b</sup>	10.6
Age at Diagnosis	
Mean	58
Median	62
Range	0 mos – 105 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable. United States incidence rate estimate from Active Bacterial Core Surveillance Report, 2013.

Note: LA County utilizes passive surveillance in all age groups >5. Passive surveillance in age groups > 5 is not comparable to U.S. rates due to difference in surveillance methodology.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory secretions and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has followed IPD as a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid).

In the context of successful ongoing surveillance of IPD, ACDC was awarded a grant from the Centers for Disease Control and Prevention (CDC) to evaluate the effectiveness of the 13-valent pneumococcal conjugate vaccine

(Pneumovax<sup>®</sup>23) amongst children aged 2-59 months. Starting in 2010, the ongoing grant significantly enhanced epidemiologic capacity for surveillance across all age groups. This is evidenced by improvements in IPD

surveillance data quality and completeness since 2010 (Table).

Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available to prevent pneumococcal disease: Pneumovax<sup>®</sup>23 is recommended for all children aged 2-59 months, and for children aged 60-71 months at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults ≥65 years and those >2 years at high risk of IPD. Since the release of these vaccines in 2010, there has been a decrease in IPD incidence rate.

### 2013 TRENDS AND HIGHLIGHTS

- The incidence rate and number of cases identified this year (5.54 cases per 100,000, N=522) was lower than the average annual incidence of 6.7 cases per 100,000 people of the past five years (range 5.4-8.0 cases per 100,000) (Figure 1). This year's incidence rate was slightly higher (4%) than last year's rate (5.4 cases per 100,000, N=503).
- Mortality in 2013 (17.8%, N=93 deaths) was the highest compared to the past three years (15%, 12.8%, 16.5% consecutively). Despite higher mortality in 2013 than recent years, no clear trend exists.
- In 2013, 95% (n=495) of cases were reported hospitalized, which is slightly higher than 2010-2012 (92%, mean=533).
- Incidence rates decreased amongst all age groups, except cases aged 5 to 14 years old, compared to the previous five-year average (Figure 2). The 2013 incidence rate





among cases aged 5 to 14 years old was similar to the previous five-year average (from 1.8 to 1.9 cases per 100,000). Amongst cases <1 year old, the incidence rate decreased 53% (from 10.6 to 5 cases per 100,000). Amongst cases aged 1 to 4 years old, the incidence rate was 42% lower (from 8.5 to 4.9 cases per 100,000). These age groups are part of the target population for the new 13-valent pneumococcal conjugate vaccine released in the spring of 2010. The decrease in incidence (Table) in these two age groups is indicative of vaccine effectiveness.

- For all other age groups, incidence rates decreased by 10% (55-64 year olds and 65 years and older) to 36% (45-54 year olds), compared to the previous five-year average.
- Cases aged 65 years and older and 55-64 years had the highest incidence rates (20.5 and 10.5 cases per 100,000, respectively) (Table, Figure 2).
- Incidence rates decreased across all race/ethnic groups from 7% (Hispanics) to 29% (Asians) (Table, Figure 3), compared to 2010-2012.
- Similar to previous years, the 2013 incidence rate in blacks was the highest compared to rates of the other race/ethnic groups (Table, Figure 3).
- Valid comparisons cannot be made across five-year averages as race information was missing for 32% of cases in 2009. Percent of cases missing race/ethnicity information for 2010-2013 was 0% to 4%.
- As in previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (7.2 cases per 100,000; Table, Figure 4).
- Compared to the previous five-year average, the incidence rate and number of cases in SPA 1 increased by 15% (from 5.6 to 6.4 cases per 100,000) (Table).
- For all other SPAs, the incidence rate decreased compared to the previous five-year average. Notably in SPA 5, the incidence rate decreased by 55% (from 6.9 to 3.1 cases per 100,000) compared to the previous five-year average (Table).
- The percentage of isolates susceptible to penicillin increased 5% compared to the previous five years (Figure 6).
- Susceptibility to erythromycin, cefotaxime, ceftriaxone, levofloxacin and TMP-SMZ was similar to the previous five years (Figure 6).



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

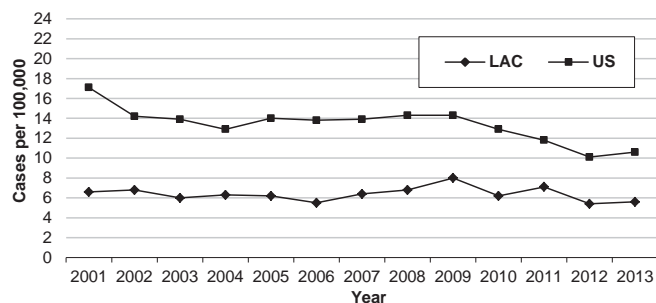
	2009 (N=785)			2010 (N=576)			2011 (N=658)			2012 (N=504)			2013 (N=522)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	20	2.5	14.6	12	2.1	10	7	1.1	5.9	13	2.6	10.9	6	1.1	5
1-4	56	7.1	10	48	8.3	9.9	36	5.5	7.5	24	4.8	5.1	24	4.6	4.9
5-14	33	4.2	2.4	21	3.6	1.7	31	4.7	2.6	17	3.4	1.4	23	4.4	1.9
15-34	64	8.2	2.3	38	6.6	1.4	64	9.7	2.3	32	6.3	1.2	32	6.1	1.1
35-44	75	9.6	5.0	47	8.2	3.5	57	8.7	4.3	38	7.5	2.9	39	7.5	2.9
45-54	136	17.3	9.9	84	14.6	6.5	107	16.3	8.3	82	16.3	6.4	63	12.1	4.9
55-64	123	15.7	12.9	108	18.8	11.3	128	19.5	12.9	89	17.7	8.7	108	20.7	10.5
65+	277	35.3	26.1	218	37.8	21.7	227	34.5	21.5	209	41.5	18.8	227	43.5	20.5
Unknown	1	0.1		0	0.0		1	0.2		0	0.0		0	0.0	
<b>Race/Ethnicity</b>															
Asian	50	6.4	3.8	46	8.0	3.5	49	7.4	3.7	36	7.1	2.7	32	6.1	2.3
Black	86	11.0	10.1	83	14.4	10.7	130	19.8	16.8	96	19.0	12.4	95	18.2	12.2
Hispanic	197	25.1	4.2	213	37.0	4.8	244	37.1	5.4	192	38.1	4.2	206	39.5	4.5
White	192	24.5	6.6	209	36.3	7.8	234	35.6	8.8	172	34.1	6.5	172	33.0	6.5
Other	9	1.1	35.4	2	0.3	11.4	0	0.0	0	0	0.0	0	0	0.0	0
Unknown	252	32.1		23	4.0		1	0.2		8	1.6		17	3.3	
<b>SPA</b>															
1	25	3.2	6.8	13	2.3	3.4	31	4.7	8.0	18	3.6	4.6	25	4.8	6.4
2	156	19.9	7	130	22.6	6.1	117	17.8	5.5	111	22.0	5.2	97	18.6	4.5
3	116	14.8	6.7	80	13.9	5	85	12.9	5.3	79	15.7	4.9	74	14.2	4.6
4	103	13.1	8.3	70	12.2	6.3	87	13.2	7.8	72	14.3	6.4	66	12.6	5.8
5	54	6.9	8.3	44	7.6	6.9	49	7.4	7.7	28	5.6	4.4	20	3.8	3.1
6	111	14.1	10.6	79	13.7	7.9	86	13.1	8.5	72	14.3	7.1	73	14.0	7.2
7	102	13	7.4	69	12.0	5.3	81	12.3	6.3	54	10.7	4.1	72	13.8	5.5
8	89	11.3	7.9	77	13.4	7.3	94	14.3	8.9	57	11.3	5.3	74	14.2	6.9
Unknown	29	3.7		14	2.4		28	4.3		13	2.6		21	4.0	

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



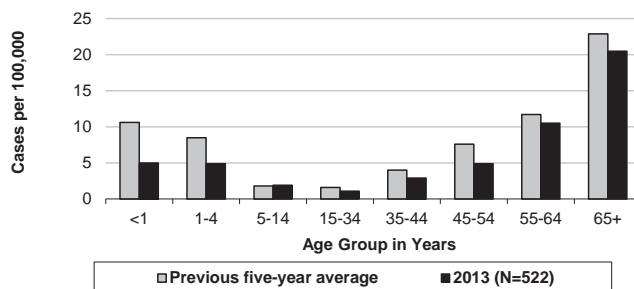


**Figure 1. Annual Incidence Rates\* of Invasive Pneumococcal Disease, LAC and US, 2000-2013**

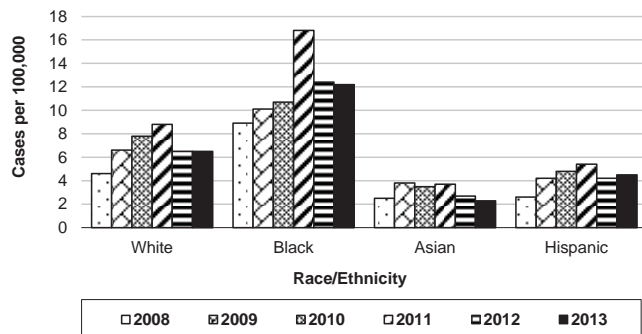


\* United States incidence rate estimate from Active Bacterial Core Surveillance [1]

**Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease 2008-2013**

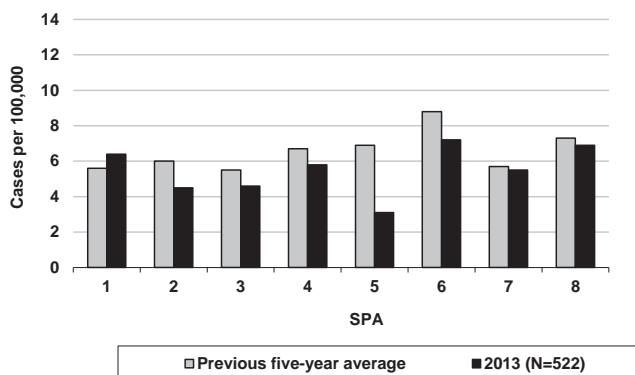


**Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2008-2013\***



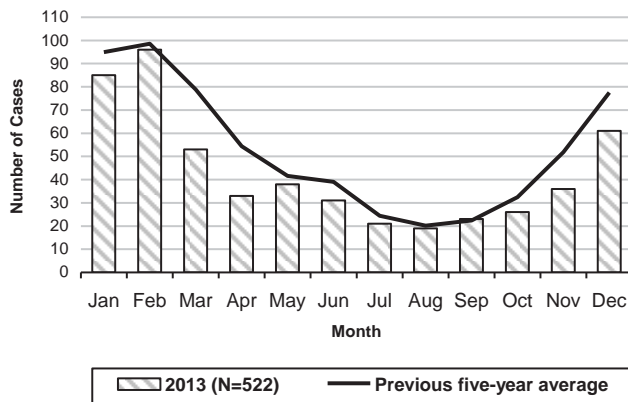
\* For 2008, 2009, 2010, 2011, 2012, and 2013 total numbers of cases (and percent with race-ethnicity missing) were 662 (45%), 785 (33%), 576 (4%), 658 (0%), 504 (2%), and 522 (3%), respectively.

**Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2008-2013**

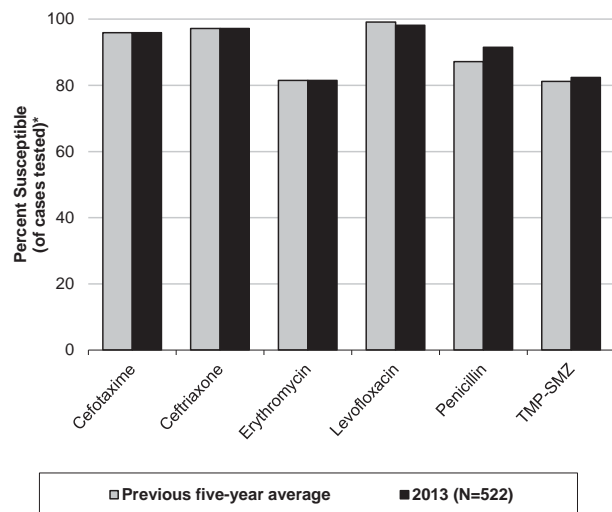




**Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2008-2013**



**Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2008-2013**

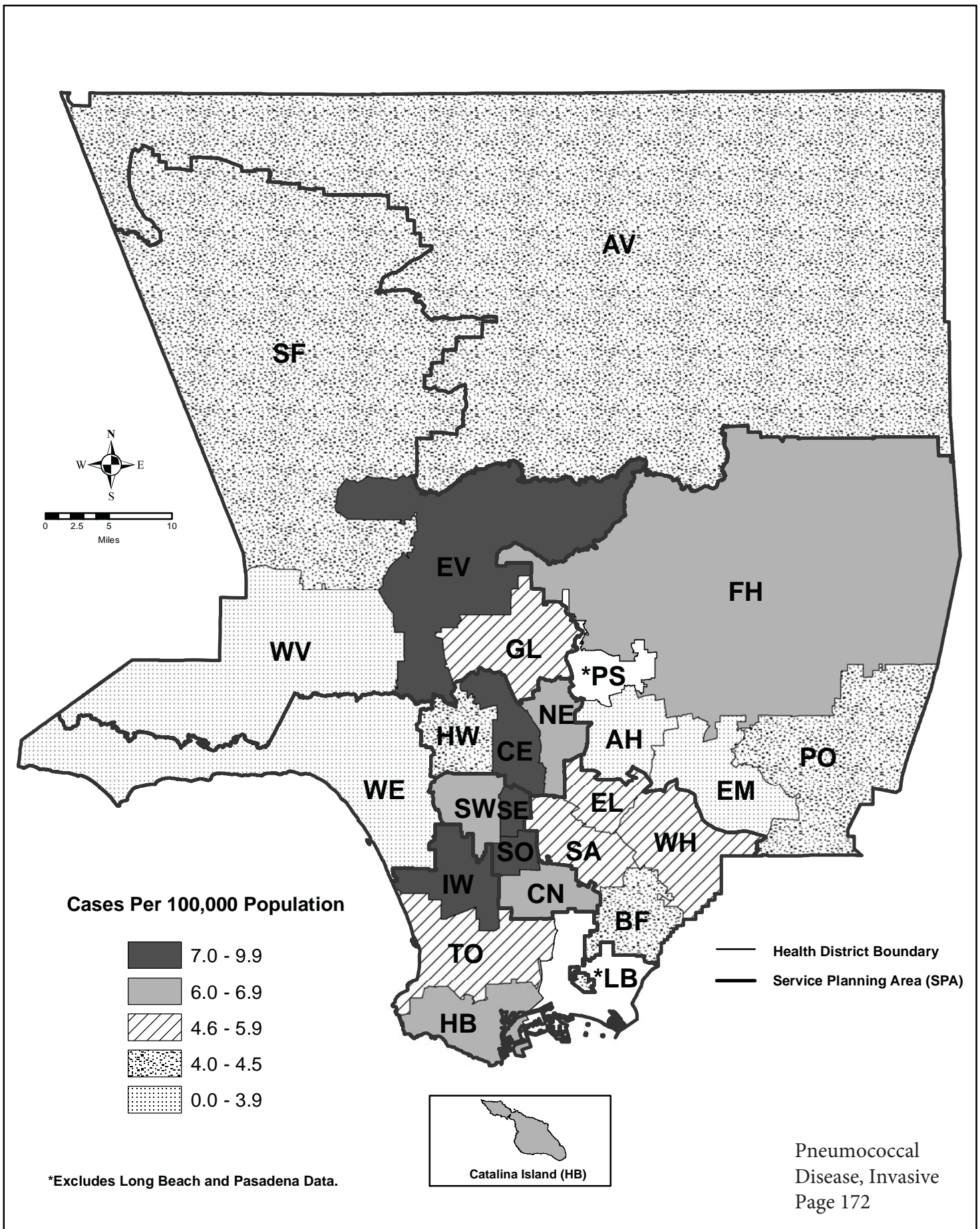


\*Range of number of isolates tested 2008-2013: Cefotaxime (244-389), Ceftriaxone (345-485), Erythromycin (302-455), Levofloxacin (288-394), Penicillin (460-667), and TMP-SMZ (226-330).

**Reference:**

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: <http://www.cdc.gov/abcs/reports-findings/surv-reports.html>

# **Map 12. Pneumococcal Disease, Invasive Rates by Health District, Los Angeles County, 2013\***





## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	503
Annual Incidence <sup>a</sup>	
LA County	5.4
California <sup>b</sup>	N/A
United States <sup>b</sup>	11.8
Age at Diagnosis	
Mean	56
Median	59
Range	0 mos – 102 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable, 2011 rate based on CDC ABCS report.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory discharge and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has followed IPD as a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid).

Led by successful ongoing surveillance of IPD, ACDC was awarded a grant from the Centers for Disease Control and Prevention (CDC) to evaluate the effectiveness of the 13-valent pneumococcal conjugate vaccine (Pneumovax®) amongst children aged 2-59 months. Starting in 2010, the ongoing grant significantly enhanced epidemiologic capacity across all age groups. This is evidenced by improvements in IPD

surveillance data quality and completeness since 2010 (Table).

Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available for pneumococcal disease. In February 2010, Pneumovax® was licensed and it is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children aged 2-59 months, and for children aged 60-71 months at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune®23 and Pneumovax®23) are recommended for all adults ≥65 years and those >2 years at high risk of IPD. For children aged 2 to 5 years at high risk of invasive pneumococcal infections, ACIP recommends the use of pneumococcal conjugate vaccine followed at least 2 months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited. Between 2006 and 2009, IPD incidence rate increased from 5.5 to 8.0 cases per 100,000 people. Since the release of the new vaccine in 2010, there has been a general decrease in IPD incidence rate.

### 2012 TRENDS AND HIGHLIGHTS

- The incidence (N=503) rate this year of 5.4 cases per 100,000 people was lower than the average annual incidence of 6.9 cases per 100,000 people of the past five years (range 6.2-8.0 cases per 100,000) (Figure 1). This year's incidence rate was 24% lower than last year's rate (7.1 cases per 100,000, N=658). The large decreases in incidence rate and number of cases may be attributable to a herd immunity effect from the 13-valent pneumococcal conjugate vaccine which is also shown in Figure 2 and the Table.
- Mortality in 2012 (15.5%, n=78 deaths) was similar to 2010 (15.3%, n=88 deaths) and





slightly higher than in 2011 (12.8%, n=84 deaths). Annual mortality during 2007-2009 ranged from 14.8% to 17.4% (34–84 deaths) among cases with known disease outcome; however, validating and interpreting a mortality trend is difficult because disease outcome data were missing for 50% of the cases during 2007-2009 versus 4% of the cases in 2010-2012.

- In 2012, 93% (n=428) of cases were reported hospitalized, which is similar to 2010-2011 (92%, mean=566). In 2007-2009, the annual percentage of cases hospitalized ranged from 89% to 94% among cases with hospitalization data; however, trend analysis may be inaccurate because 20% of cases during 2007-2009 were missing hospitalization data, versus 0% of cases in 2010-2011 missing such data.
- Median length of hospital stay was 6 days (n=410 cases; mean=9.6 days and range=0-97 days) which was similar to 2010-2011 (median=6 days, mean=9.7 days, range=0-159 days). Length of hospital stay was not recorded for most of 2009 and all of 2007-2008.
- Incidence rates decreased amongst all age groups compared to the previous 5-year average (Figure 2). Amongst cases aged 1 to 4 years old, the incidence rate was 47% lower (from 9.1 to 4.8 cases per 100,000) and the number of cases was 53% lower (from 49 to 23 cases) than the previous 5-year average. This age group is part of the target population for the new 13-valent pneumococcal conjugate vaccine released in the spring of 2010. The decrease in incidence (Table) in this group is indicative of vaccine effectiveness.
- Amongst cases 35-44 years of age, the incidence rate decreased 36% (from 4.4 to 2.8 cases per 100,000) and the number of cases decreased 41% (from 62.6 to 37 cases).
- For all other age groups, incidence rates decreased by 12% (<1 year olds) up to 31% (15-34 year olds), compared to the previous 5-year average.
- Cases aged 65 years and older and <1 had the highest incidence rates (18.9 and 10.1 cases per 100,000, respectively) (Table, Figure 2).
- Incidence rates decreased by 15% (blacks) up to 24% (Hispanics) across all race/ethnic

groups (Table, Figure 3), compared to 2010-2011.

- Similar to previous years, the 2012 incidence rate in blacks was the highest compared to rates of the other race/ethnic groups (Table, Figure 3).
- Valid comparisons cannot be made across 5-year averages as race information was missing for 32% to 45% of cases in previous years. Percent of cases missing race/ethnicity information was similar for 2010-2011 (2%) and 2012 (5%).
- As in previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (6.9 cases per 100,000; Table, Figure 4).
- Compared to the previous 5-year average, the incidence rate and number of cases in SPA 5 both decreased by 43% (from 7.2 to 4.1 cases per 100,000) and 44% (from 46.2 to 26 cases), respectively (Table).
- Incidence rate decreased across all SPAs except SPA 4 which stayed about the same compared to the previous 5-year average.
- IPD peaked in March (n=84 cases) instead of February as seen in the previous five years (Figure 5).
- The percentage of isolates susceptible to penicillin increased 7% compared to the previous five years (Figure 6).
- The percentage of isolates susceptible to TMP-SMZ decreased 9% compared to the previous five years (Figure 6).
- Susceptibility to erythromycin, cefotaxime, ceftriaxone, and levofloxacin was similar to the previous 5 years (Figure 6).



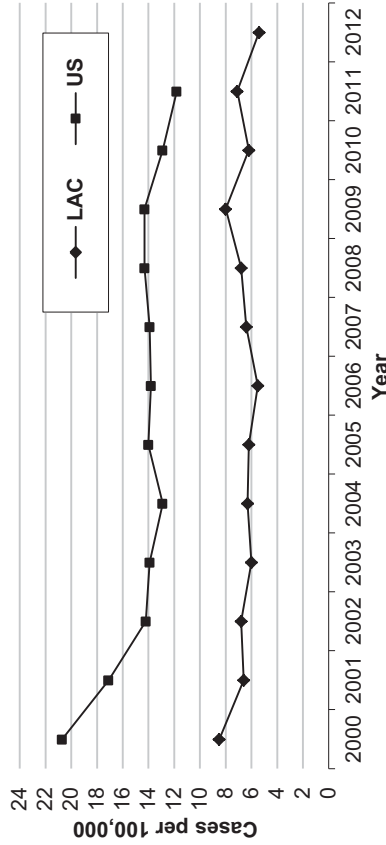
## Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA Los Angeles County, 2008-2012

Age Group	2008 (N=662)			2009 (N=785)			2010 (N=576)			2011 (N=658)			2012 (N=503)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<1	19	2.4	11.5	20	2.5	14.6	12	2.1	10.0	7	1.1	5.9	12	2.4	10.1
1-4	57	8.6	10.1	56	7.1	10.0	48	8.3	9.9	36	5.3	7.5	23	4.6	4.8
5-14	11	1.8	0.9	33	4.2	2.4	21	3.6	1.7	31	4.7	2.6	17	3.4	1.4
15-34	30	4.4	1.0	64	8.1	2.3	38	6.6	1.4	64	9.7	2.3	33	6.6	1.2
35-44	67	10.6	4.6	75	9.5	5.0	47	8.2	3.5	57	8.7	4.3	37	7.4	2.8
45-54	98	14.2	7.0	136	17.3	9.9	84	14.6	6.5	107	16.3	8.3	81	16.1	6.3
55-64	114	17.4	12.6	123	15.6	12.9	108	18.8	11.3	128	19.5	12.9	90	17.9	8.8
65+	264	40.2	26.1	278	34.4	26.2	218	37.8	21.7	227	34.6	21.5	210	41.7	18.9
Unknown	2	0.3		1	0.1		0	0.0		1	0.2		0	0.0	
<b>Race/Ethnicity</b>															
Asian	32	4.8	2.5	50	6.4	3.8	46	8.0	3.5	49	7.5	3.7	38	7.6	2.9
Black	76	11.5	8.9	86	10.9	10.1	83	14.2	10.7	130	19.8	16.8	90	17.9	11.6
Hispanic	124	18.7	2.6	197	25.1	4.2	213	37.0	4.8	244	37.1	5.4	176	35.0	3.9
White	135	20.4	4.6	192	24.4	6.6	209	36.3	7.8	234	35.5	8.8	172	34.2	6.5
Other	0	0.0	0.0	9	1.1	35.4	2	0.3	11.4	0	0	0.0	4	0.8	0
Unknown	295	44.6		252	32.1		23	4.0		1	0.2		23	4.6	
<b>SPA</b>															
1	18	2.7	4.9	25	3.2	6.8	13	2.3	3.4	17	2.6	4.4	18	3.6	4.6
2	137	20.7	6.3	156	19.8	7.0	130	22.6	6.1	127	19.3	5.9	110	21.9	5.1
3	99	15.0	5.7	116	14.8	6.7	80	13.9	5.0	85	12.9	5.3	77	15.3	4.8
4	62	9.4	4.9	103	13.1	8.3	70	12.2	6.3	93	14.2	8.3	69	13.7	6.1
5	48	7.3	7.4	54	6.9	8.3	44	7.6	6.9	49	7.5	7.7	26	5.2	4.1
6	107	16.2	10.1	111	14.1	10.6	79	13.7	7.9	90	13.7	8.9	70	13.9	6.9
7	73	11.0	5.3	102	13.0	7.4	69	12.0	5.3	81	12.3	6.3	53	10.5	4.1
8	78	11.8	6.9	89	11.3	7.9	77	13.4	7.3	90	13.7	8.5	57	11.3	5.3
Unknown	40	6.0		29	3.8		14			25	3.8		23	4.6	

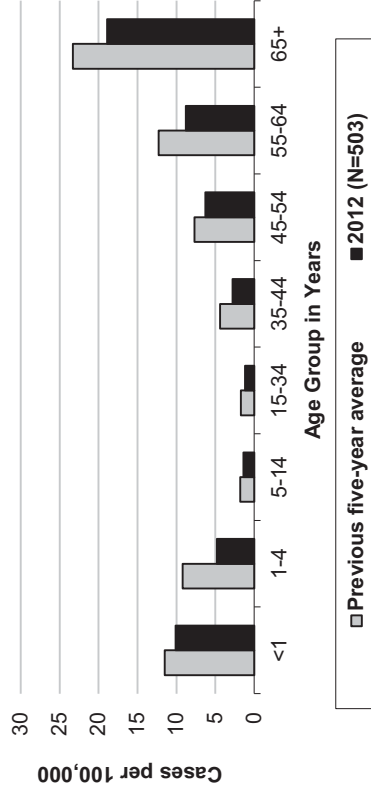
\*Rates calculated based on less than 19 cases or events are considered unreliable.



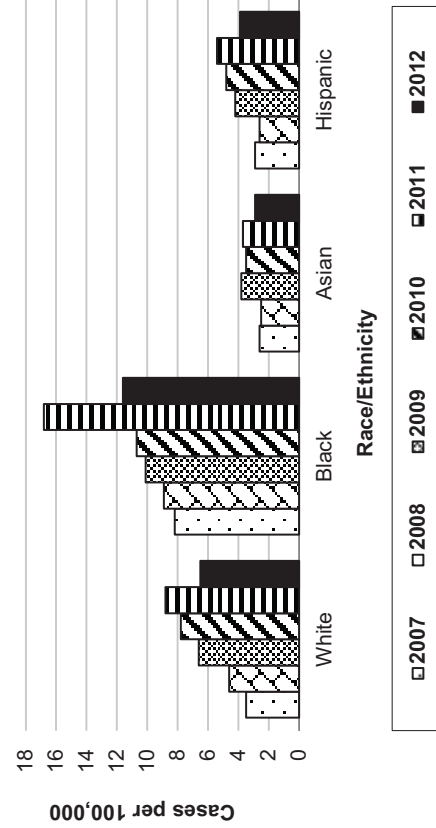
**Figure 1. Annual Incidence Rates of Invasive Pneumococcal Disease, LAC and US, 2000-2012**



**Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease 2007-2012**



**Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2007-2012**



\* For 2007, 2008, 2009, 2010, 2011, and 2012 total numbers of cases (and percent with race-ethnicity missing) were 624 (46%), 662 (45%), 785(32%), 576 (4%), 657 (0%), and 503 (5%), respectively.

**Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2007-2012**

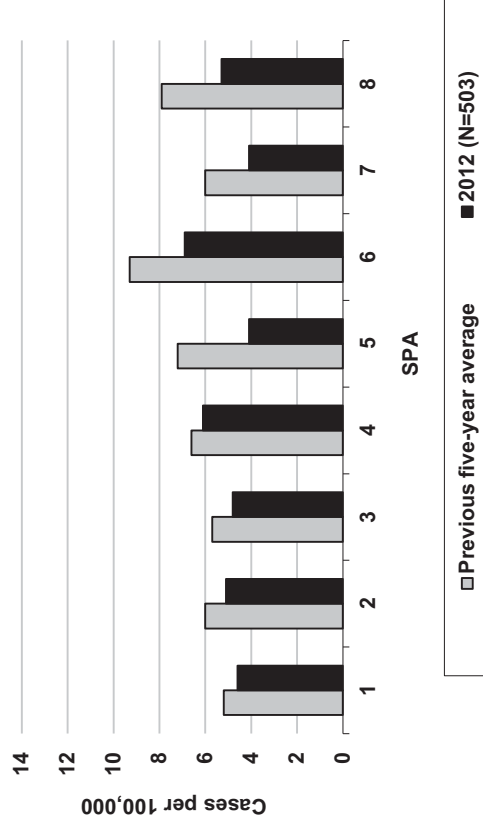






Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2007-2012

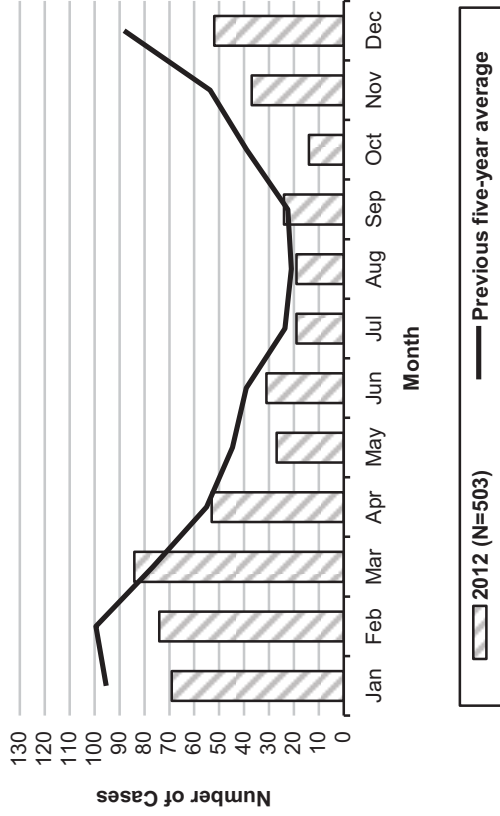
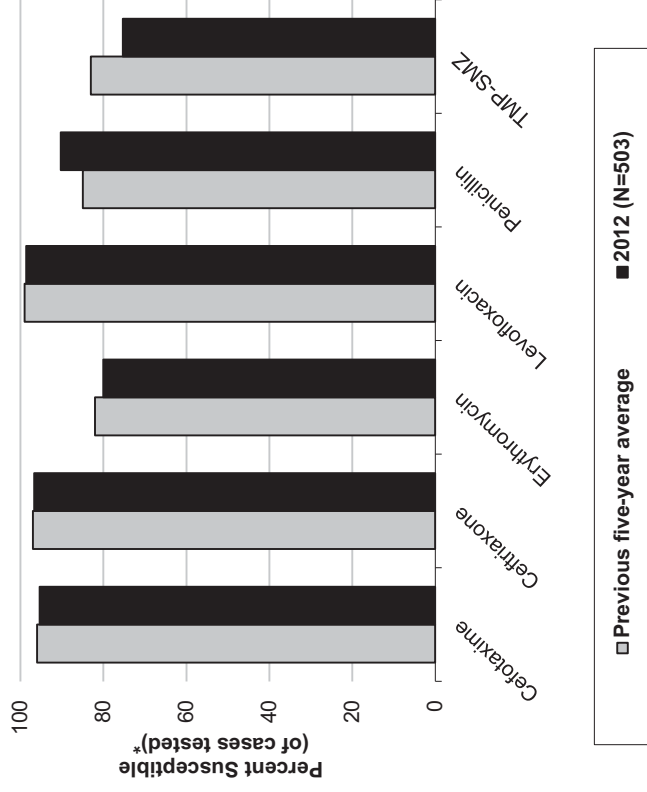
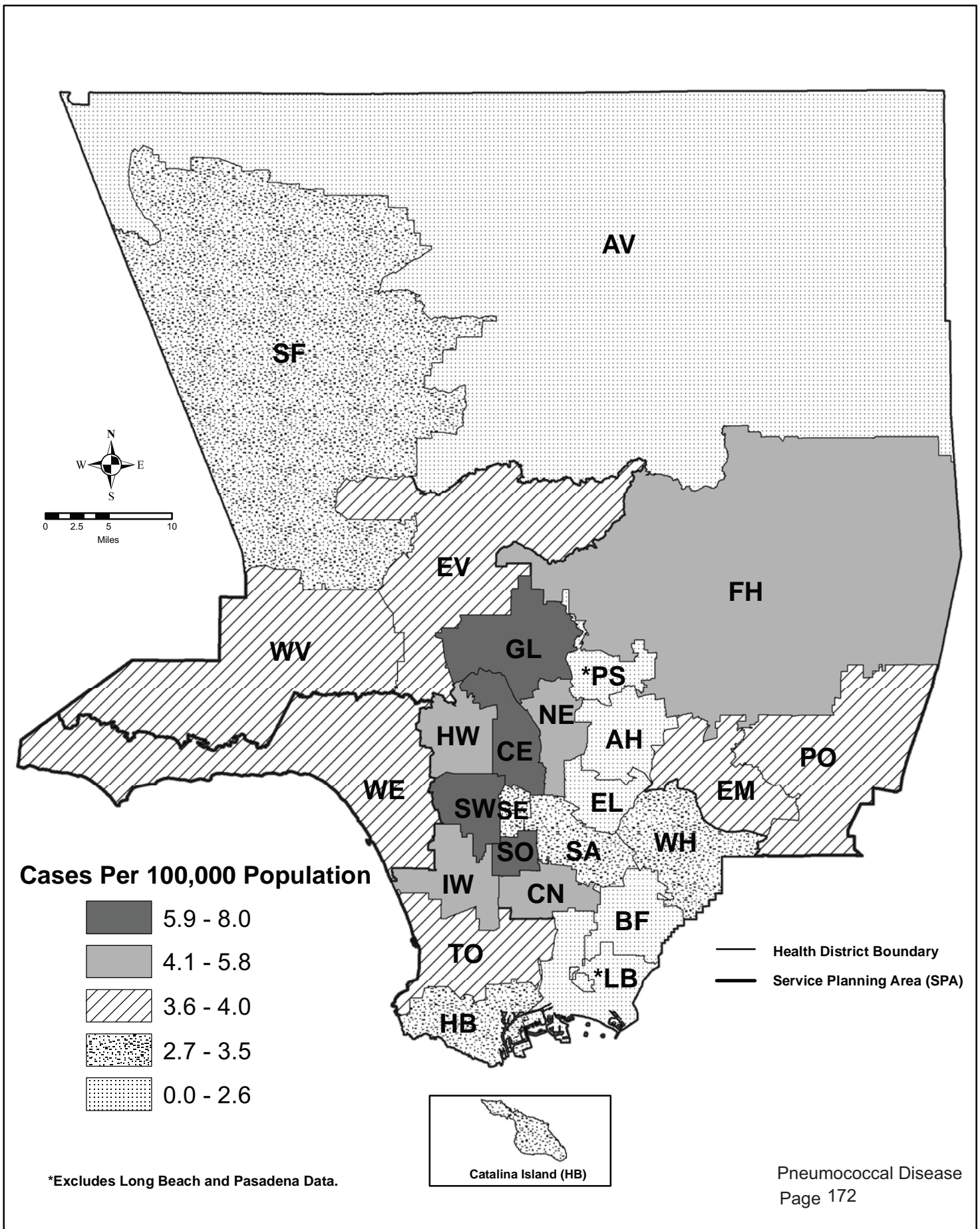


Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2007-2012



\*Range of number of isolates tested 2007-2012: Cefotaxime (238-389), Ceftriaxone (330-485), Erythromycin (294-455), Levofloxacin (261-394), Penicillin (443-667), and TMP-SMZ (199-330).

# Map 10. Pneumococcal Disease, Invasive Rates by Health District, Los Angeles County, 2012\*





## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	657
Annual Incidence <sup>a</sup>	
LA County	7.1
California <sup>b</sup>	N/A
United States <sup>b</sup>	12.9
Age at Diagnosis	
Mean	53
Median	56
Range	1 mos – 107 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable, 2010 rate based on CDC ABCs report.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory discharge and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has followed IPD as a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid).

Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available for pneumococcal disease. In February 2010, the 13-valent pneumococcal conjugate vaccine (Prevnam13<sup>®</sup>) was licensed and is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children aged 2-59 months, and for children aged 60-71 months at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults ≥65 years and those >2 years at high risk of IPD. For children aged 2 to 5 years at high risk of invasive pneumococcal infections, ACIP recommends the use of pneumococcal conjugate vaccine followed at least 2 months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited. Between 2006 and 2009, increases in the rate of IPD were seen in LAC, followed by a decrease in 2010. In 2011, IPD incidence has increased.

### 2011 TRENDS AND HIGHLIGHTS

- The incidence (N=657) rate this year of 7.1 cases per 100,000 people was similar to the average annual incidence of 6.6 cases per 100,000 people of the past five years (range 5.5-8.0 cases per 100,000) (Figure 1). This year's incidence rate was 14% higher than last year's rate (6.2 cases per 100,000, N=576).
- Mortality in 2011 (12.8%, n=84 deaths) was lower than in 2010 (15.3%, n=88 deaths). Annual mortality during 2006-2009 ranged from 14.3% to 17.4% (34–88 deaths) among cases with known disease outcome; however, validating and interpreting a mortality trend is difficult because disease outcome data were missing for 50% of the cases during 2006-2009 versus 2% and 0% of the cases in 2010 and 2011, respectively.
- In 2011, 93% (n=608) of cases were reported hospitalized, which is a similar percentage of 2010 (91%, n=524). In 2006-2009, the annual percentage of cases hospitalized ranged from 89% to 94% among cases with hospitalization data; however, trend analysis may be inaccurate because 20% of cases during 2006-2009 were missing hospitalization data, versus 0% of cases in 2010 and 2011 missing such data.



- Median length of hospital stay was 6 days (n=608 cases; mean=9.5 days and range=0-159 days). Median length of hospital stay was the same as in 2010 (n=502 cases; mean=10 days and range=0-130 days). Length of hospital stay was not recorded for most of 2009 and all of 2006-2008.
- Incidence rates varied amongst all age groups compared to the previous 5-year average (Figure 2). Amongst cases <1 year old, the incidence rate was 51% lower (from 12.0 to 5.9 cases per 100,000) and the number of cases was 58% lower (from 16.6 to 7 cases) than the previous 5-year average. Similarly, amongst cases 1-4 years of age, the incidence rate decreased 21% (from 9.2 to 7.3 cases per 100,000) and the number of cases decreased 31% (from 51.0 to 35 cases). These age groups are the target population for the new 13-valent pneumococcal conjugate vaccine released in the spring of 2010. The decreases in incidence (Table) in these two age groups are indicative of vaccine effectiveness.
- Compared to the previous 5-year average, incidence rates increased amongst age groups 5-14 (68%), 15-34 (52%) and 45-54 (12%). The number of cases also increased amongst age groups 5-14 (49%, from 20.8 to 31 cases), 15-34 (50%, from 42.6 to 64 cases), and 55-64 (17%, from 108.0 to 128 cases).
- Incidence rate and number cases for the other age groups remained within 10% of their previous 5-year averages.
- Cases aged 65 years and older and 55-64 years had the highest incidence rates (21.5 and 12.9 per 100,000, respectively) (Table, Figure 2), consistent with previous years.
- Similar to previous years, the 2011 incidence rate in blacks was the highest compared to rates of the other race/ethnic groups (Table, Figure 3). Compared to 2010, there was a 57% increase in 2011 incidence rate (from 10.7 to 16.8 cases per 100,000) and number of cases (from 83 to 130 cases) amongst blacks.
- In comparing 2011 to 2010, incidence rate and number of cases increased amongst Hispanics by 13% (from 4.8 to 5.4 cases per 100,000) and 15% (from 213 to 244 cases), respectively. Similarly, incidence rate and number of cases increased amongst whites by 12% (from 7.8 to 8.8 cases per 100,000) and 11% (from 209 to 233 cases), respectively.
- Valid comparisons cannot be made across 5-year averages as race information was missing for 32% to 46% of cases in previous years. Percent of cases missing race/ethnicity information was similar for 2010 (4%) and 2011 (0.2%).
- As in previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (8.9 cases per 100,000; Table, Figure 4).
- Compared to the previous 5-year average, the incidence rate and number of cases in SPA 4 both increased by 44% (from 5.8 to 8.3 cases per 100,000) and 32% (from 70.6 to 93 cases), respectively (Table).
- IPD peaked in January (51% increase in cases, n=127, compared to the previous 5-year average for January) instead of December as seen in the previous five years (Figure 5). While incidence is typically high in February, in 2011 there were substantially more February cases (n=125, 42% more than the previous 5-year average for February of 88.2). Compared to the average monthly incidence of the previous five years, the numbers of IPD cases in 2011 were substantially lower in November (30% lower, n=38) and December (25% lower, n=68).
- The percentage of isolates susceptible to penicillin increased 12% compared to the previous five years. Susceptibility to erythromycin (80% of isolates) was slightly lower than the previous 5 years (84%, Figure 6).
- Improvements in data quality have been made in 2011; outcome, hospitalization, and/or race-ethnicity were missing for ≤1% of cases compared to up to 63% missing in the previous five years.





## Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA Los Angeles County, 2007-2011

Age Group	2007 (N=624)			2008 (N=662)			2009 (N=785)			2010 (N=576)			2011 (N=657)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<1	23	3.7	15.6	19	2.4	11.5	20	2.5	14.6	12	2.1	10.0	7	1.1	5.9
1-4	48	7.7	8.3	57	8.6	10.1	56	7.1	10.0	48	8.3	9.9	35	5.3	7.3
5-14	23	3.7	1.6	11	1.8	0.9	33	4.2	2.4	21	3.6	1.7	31	4.7	2.6
15-34	47	7.5	1.7	30	4.4	1.0	64	8.1	2.3	38	6.6	1.4	64	9.7	2.3
35-44	67	10.7	4.5	67	10.6	4.6	75	9.5	5.0	47	8.2	3.5	57	8.7	4.3
45-54	90	14.4	6.8	98	14.2	7.0	136	17.3	9.9	84	14.6	6.5	107	16.3	8.3
55-64	106	17.0	11.9	114	17.4	12.6	123	15.6	12.9	108	18.8	11.3	128	19.5	12.9
65+	214	34.3	21.2	264	40.2	26.1	278	34.4	26.2	218	37.8	21.7	227	34.6	21.5
Unknown	6	1.0		2	0.3		1	0.1		0	0.0		1	0.2	
<b>Race/Ethnicity</b>															
Asian	33	5.3	2.6	32	4.8	2.5	50	6.4	3.8	46	8.0	3.5	49	7.5	3.7
Black	70	11.2	8.2	76	11.5	8.9	86	10.9	10.1	83	14.2	10.7	130	19.8	16.8
Hispanic	135	21.6	2.9	124	18.7	2.6	197	25.1	4.2	213	37.0	4.8	244	37.1	5.4
White	102	16.3	3.5	135	20.4	4.6	192	24.4	6.6	209	36.3	7.8	233	35.5	8.8
Other	0	0.0	0.0	0	0.0	0.0	9	1.1	35.4	2	0.3	11.4	0	0	0.0
Unknown	284	45.5		295	44.6		252	32.1		23	4.0		1	0.2	
<b>SPA</b>															
1	24	3.8	6.7	18	2.7	4.9	25	3.2	6.8	13	2.3	3.4	17	2.6	4.4
2	100	16.0	4.6	137	20.7	6.3	156	19.8	7.0	130	22.6	6.1	127	19.3	5.9
3	104	16.7	6.0	99	15.0	5.7	116	14.8	6.7	80	13.9	5.0	85	12.9	5.3
4	66	10.6	5.2	62	9.4	4.9	103	13.1	8.3	70	12.2	6.3	93	14.2	8.3
5	36	5.8	5.6	48	7.3	7.4	54	6.9	8.3	44	7.6	6.9	49	7.5	7.7
6	92	14.7	8.8	107	16.2	10.1	111	14.1	10.6	79	13.7	7.9	90	13.7	8.9
7	79	12.7	5.7	73	11.0	5.3	102	13.0	7.4	69	12.0	5.3	81	12.3	6.3
8	98	15.7	8.8	78	11.8	6.9	89	11.3	7.9	77	13.4	7.3	90	13.7	8.5
Unknown	25	4.0		40	6.0		30	3.8		14			25	3.8	

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



Figure 1. Annual Incidence Rates of Invasive Pneumococcal Disease, LAC and US, 2000-2011

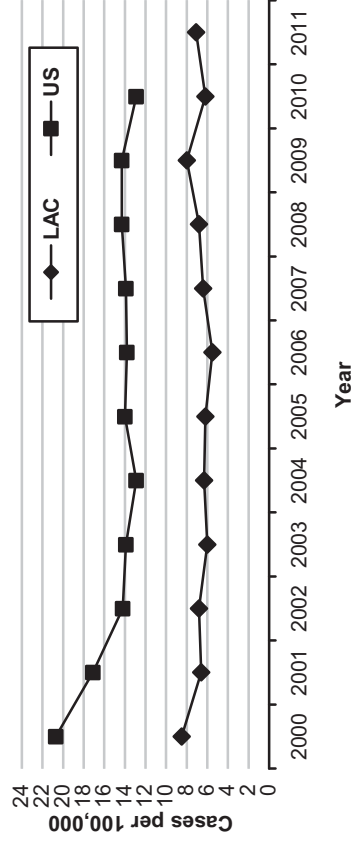


Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease 2006-2011

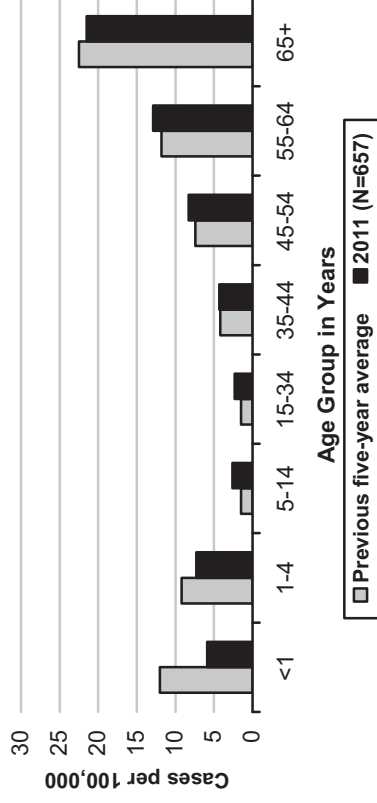


Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2006-2011

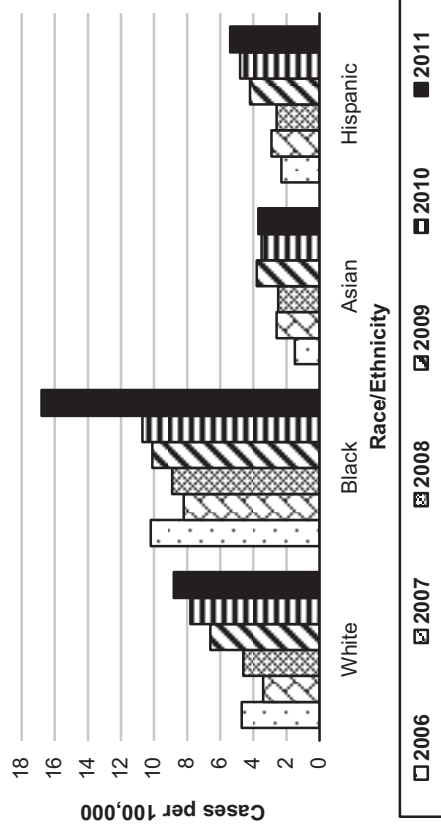
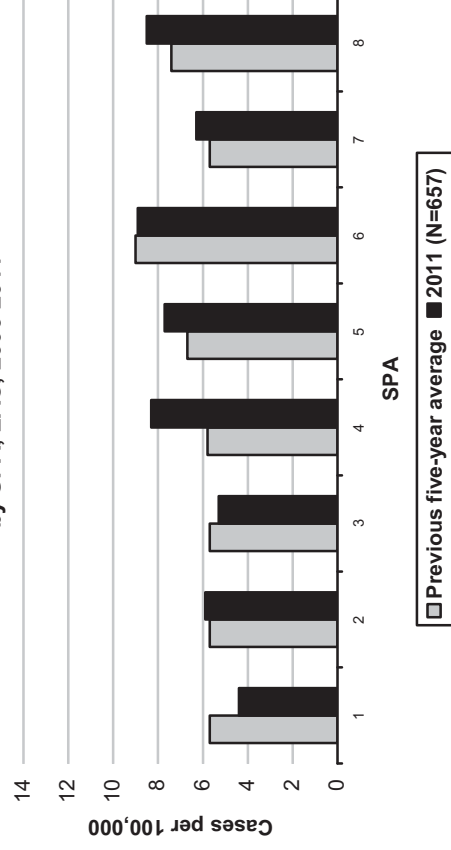


Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2006-2011



\* For 2006, 2007, 2008, 2009, 2010, and 2011, total numbers of cases (and percent with race-ethnicity missing) were 533 (35%), 624 (46%), 662 (45%), 785(32%), 576 (5%) and 657 (0%), respectively.



Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2006-2011

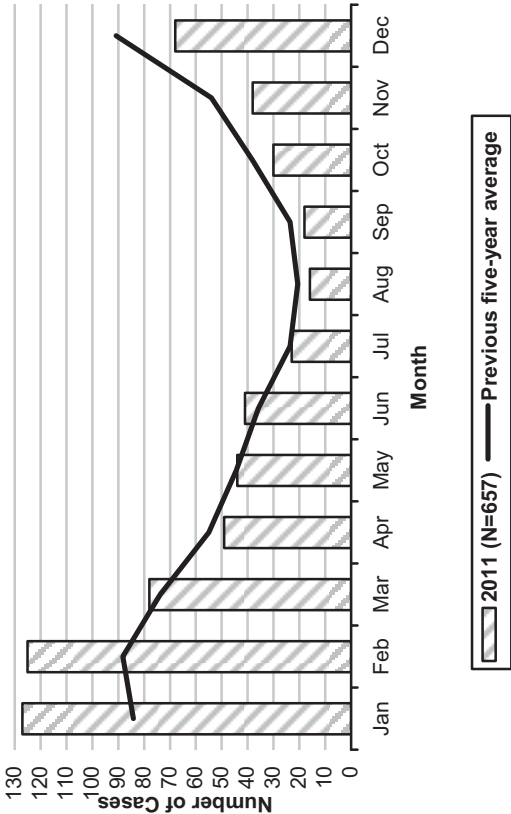
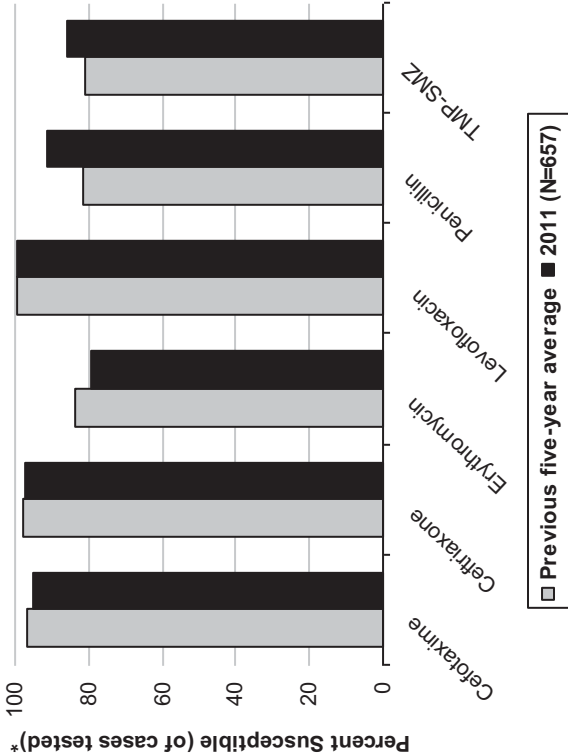


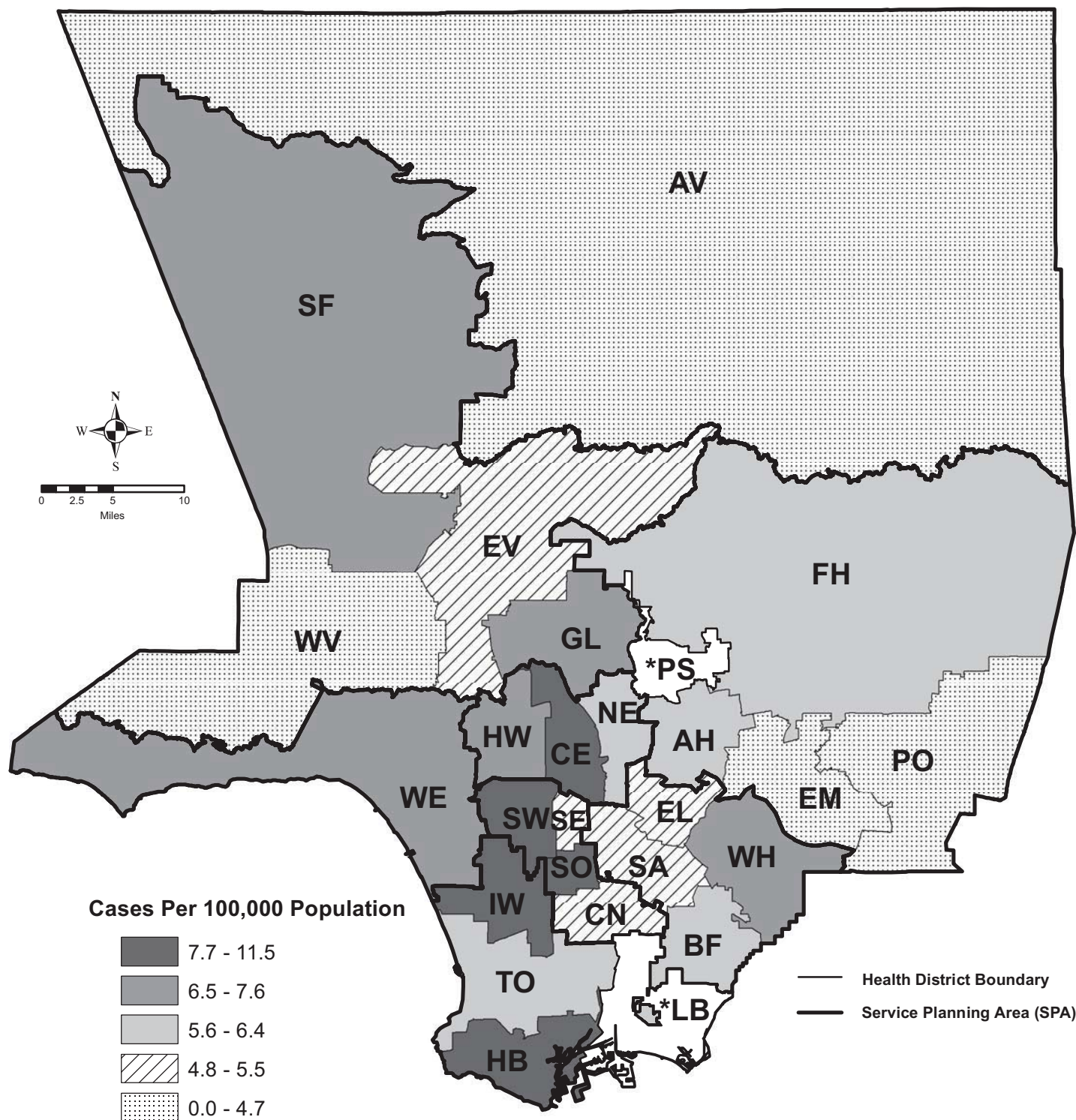
Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2006-2011



\*Range of number of isolates tested 2006-2011: Cefotaxime (297-389), Ceftriaxone (279-485), Erythromycin (268-455), Levofloxacin (261-394), Penicillin (486-667), and TMP-SMZ (149-330).



# **Map 12. Pneumococcal Disease, Invasive Rates by Health District, Los Angeles County, 2011\***



\*Excludes Long Beach and Pasadena Data.

Catalina Island (HB)



## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	576
Annual Incidence <sup>a</sup>	
LA County	5.87
California <sup>b</sup>	N/A
United States <sup>b</sup>	N/A
Age at Diagnosis	
Mean	53
Median	58
Range	1 mos – 102 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory discharge and can cause pneumonia, bacteremia, meningitis, and death. While *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (inner ear infections), these non-invasive forms of infection are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC conducted a special antibiotic resistance surveillance project since late 1995 and IPD became reportable in LAC in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid).

Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Three vaccines may prevent pneumococcal disease. Two brands of 23-valent polysaccharide vaccine, Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23 have been available for several years. A 13-valent conjugate vaccine Prevnar13<sup>®</sup> was introduced in February 2010.

### 2010 TRENDS AND HIGHLIGHTS

- Between 2006 and 2009, the rate of IPD increased in LAC. In 2010, IPD incidence decreased.
- IPD incidence rate has been stable over the past five years and 2010 rate was among the lowest in the last 10 years, except in 2006 (5.5 cases per 100,000 people), and also 26% lower than previous year's rate (8.0 cases per 100,000, N=785); and 11% lower than the previous five-year average annual incidence rate (6.6 per 100,000).
- Mortality was 15.6% (n=88 deaths). Validating and interpreting a mortality trend is difficult because disease outcome data were missing for 36-63% of the cases in 2005-2009 while in 2010 only 5% (n=30) of cases were missing disease outcome. Unadjusted mortality in the previous five years ranged from 7-14% (n=51-88).
- In 2010, 90% (n=519) of cases were reported hospitalized (2% missing). In 2005-2009, 73% of cases were hospitalized (20% missing).
- Median length of hospital stay was 6 days (n=502; mean=10, range=0-130 days). Length of stay was missing for 3% (n=17) of hospitalized cases. Length of hospital stay was not recorded for most of 2009 and all of 2004-2008.
- Incidence rates decreased or remained stable amongst all age groups compared to the previous 5-year average (Figure 2). Amongst cases <1 year old, the incidence rate was 32% lower than the previous 5-year average (from 12.6 to 8.6 cases per 100,000). Rate decreases were also seen among age groups 1-4 (11%), 15-34 (12%), 35-44 (27%), and 45-54 (18%). Rate changes for the other age groups remained within 10% of their previous 5-year averages.
- Cases aged 65 years and older and 55 to 64 years had the highest incidence rates (20.6 and 11.2 per 100,000, respectively) (Table,



Figure 2). In 2009, cases <1 year old had the second highest incidence rate among all age groups.

- Similar to previous years, the incidence rate in blacks was the highest compared to other race/ethnic groups (Table, Figure 3). Compared to the 2009, the 2010 incidence rate decreased slightly. However, valid comparisons cannot be made across years as race information was missing for 32% to 46% of cases in previous years. Race/ethnicity information was missing for 5% of cases in 2010.
- As in previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (7.4 cases per 100,000; Table, Figure 4).
- IPD peaked in January in 2010, unlike the December peaks seen in the previous five years (Figure 5). Compared to the average monthly incidence of the previous five years, the numbers of incident IPD cases in 2010 were substantially lower during October (52%) and April (39%).
- The percentage of isolates susceptible to penicillin increased 10% compared to the previous five years. Susceptibility to erythromycin (78% of isolates) was slightly lower than the previous 5 years (85%, Figure 6).
- Improvements in data quality have been made in 2010; outcome, hospitalization, and/or race-ethnicity were missing for ≤5% of cases compared to up to 63% missing in the previous five years.



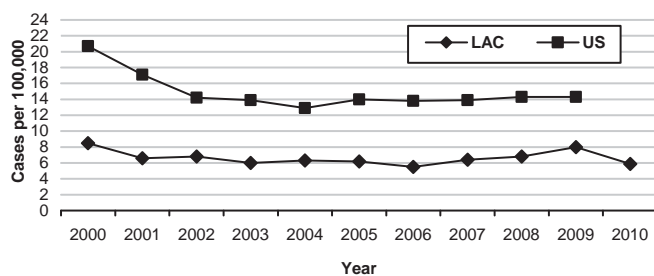
**Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA  
Los Angeles County, 2006-2010**

	2006 (N=533)			2007 (N=624)			2008 (N=662)			2009 (N=785)			2010 (N=576)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Age Group</b>															
<1	12	2.3	8.3	23	3.7	15.6	19	2.4	11.5	20	2.5	14.6	12	2.1	8.6
1-4	47	8.8	8.1	48	7.7	8.3	57	8.6	10.1	56	7.1	10.0	47	8.2	8.1
5-14	16	3.0	1.1	23	3.7	1.6	11	1.8	0.9	33	4.2	2.4	21	3.6	1.6
15-34	34	6.4	1.2	47	7.5	1.7	30	4.4	1.0	64	8.1	2.3	39	6.8	1.3
35-44	53	9.9	3.5	67	10.7	4.5	67	10.6	4.6	75	9.5	5.0	46	8.0	3.2
45-54	92	17.3	7.1	90	14.4	6.8	98	14.2	7.0	136	17.3	9.9	84	14.6	6.2
55-64	95	17.8	10.9	106	17.0	11.9	114	17.4	12.6	123	15.6	12.9	108	18.8	11.2
65+	178	33.4	18.2	214	34.3	21.2	264	40.2	26.1	278	34.4	26.2	218	37.8	20.6
Unknown	6	1.1		6	1.0		2	0.3		1	0.1		1	0.2	--
<b>Race/Ethnicity</b>															
Asian	19	3.6	1.5	33	5.3	2.6	32	4.8	2.5	50	6.4	3.8	46	8.0	3.4
Black	86	16.1	10.2	70	11.2	8.2	76	11.5	8.9	86	10.9	10.1	82	14.2	9.6
Hispanic	107	20.1	2.3	135	21.6	2.9	124	18.7	2.6	197	25.1	4.2	208	36.1	4.2
White	136	25.5	4.7	102	16.3	3.5	135	20.4	4.6	192	24.4	6.6	206	35.8	7.0
Other	1	0.2	3.5	0	0.0	0.0	0	0.0	0.0	9	1.1	35.4	8	1.4	31.0
Unknown	184	34.5		284	45.5		295	44.6		252	32.1		26	4.5	--
<b>SPA</b>															
1	23	4.3	6.6	24	3.8	6.7	18	2.7	4.9	25	3.2	6.8	13	2.3	3.5
2	95	17.8	4.4	100	16.0	4.6	137	20.7	6.3	156	19.8	7.0	130	22.6	5.9
3	90	16.9	5.2	104	16.7	6.0	99	15.0	5.7	116	14.8	6.7	80	13.9	4.6
4	52	9.8	4.1	66	10.6	5.2	62	9.4	4.9	103	13.1	8.3	70	12.2	5.6
5	35	6.6	5.5	36	5.8	5.6	48	7.3	7.4	54	6.9	8.3	44	7.6	6.7
6	81	15.2	7.8	92	14.7	8.8	107	16.2	10.1	111	14.1	10.6	79	13.7	7.4
7	66	12.4	4.8	79	12.7	5.7	73	11.0	5.3	102	13.0	7.4	69	12.0	5.0
8	68	12.8	6.1	98	15.7	8.8	78	11.8	6.9	89	11.3	7.9	77	13.4	6.9
Unknown	12	4.3		25	4.0		40	6.0		30	3.8		14	2.4	--

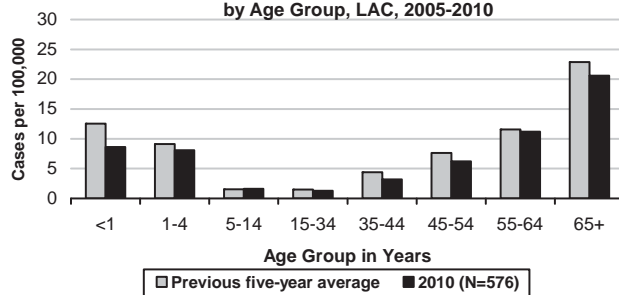
\*Rates calculated based on less than 19 cases or events are considered unreliable.



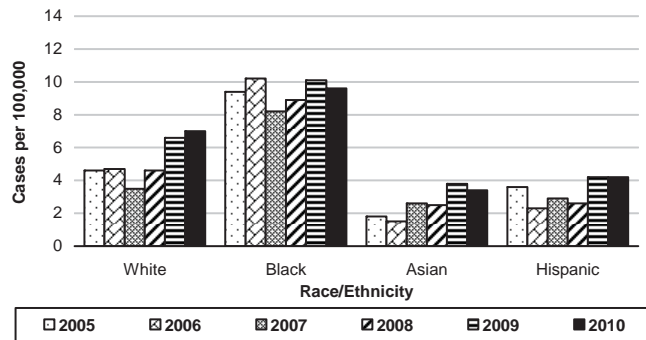
**Figure 1. Annual Incidence Rates of Invasive Pneumococcal Disease, LAC and US, 2000-2010**



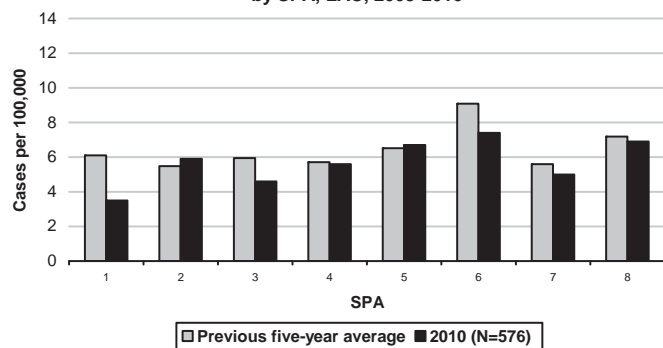
**Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease by Age Group, LAC, 2005-2010**



**Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2005-2010**



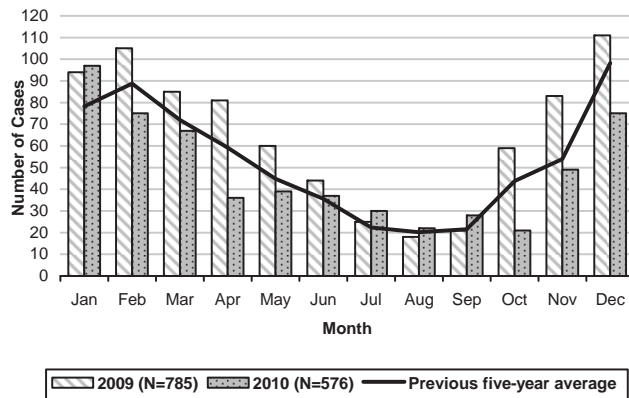
**Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2005-2010**



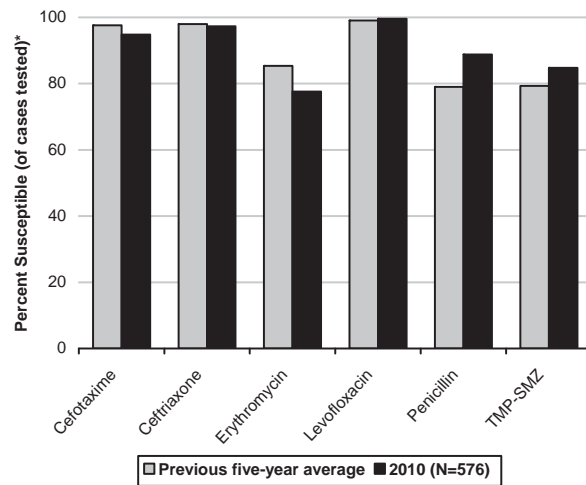
\* For 2005, 2006, 2007, 2008, 2009, and 2010, total numbers of cases (and percent with race-ethnicity missing) were 590 (32%), 533 (35%), 624 (46%), 662 (45%), 785(32%), and 576 (5%), respectively.



**Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2005-2010**



**Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2005-2010**



\*Range of number of isolates tested 2005-2010: Cefotaxime (301-389), Ceftriaxone (280-485), Erythromycin (271-455), Levofloxacin (262-394), Penicillin (490-667), and TMP-SMZ (150-330).





## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	786
Annual Incidence <sup>a</sup>	
LA County	8.0
California <sup>b</sup>	N/A
United States	--
Age at Diagnosis	
Mean	52
Median	55
Range	0 mos – 102 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable.

### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory discharge and can cause pneumonia, bacteremia, meningitis, and death. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in LA County (LAC) surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

ACDC has followed IPD as a special antibiotic resistance surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid).

Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Two effective vaccines are available for pneumococcal disease. Heptavalent pneumococcal conjugate vaccine (Prevnar<sup>®</sup>) is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children under two years, and for children up to five years at high risk of invasive pneumococcal infections.<sup>1</sup> The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults ≥65 years and those over two years at high risk of IPD. For children aged two to five years at high risk of invasive pneumococcal infections, ACIP recommends the use of pneumococcal conjugate vaccine followed at least two months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited. While the current vaccines are still effective, the incidence rate for IPD has increased since 2006.

### 2009 TRENDS AND HIGHLIGHTS

- The incidence rate of IPD has been fairly stable with a range of 5.5 to 8.5 cases per 100,000 people since 2000 (Figure 1). This year's incidence rate, 8.0 cases (N=786) per 100,000 people, continued an upward trend since 2006, and was 29% higher than the average annual incidence rate of the previous five years (6.2 per 100,000).
- Mortality in 2009 was 10.7% (N=84). Average annual mortality for the previous five years was 6.8%. However, disease outcome data were missing for 44-63% of the cases in 2004-2008, and 36% of cases (N=282) in 2009.
- Incidence rates among all age groups were the highest they have been since 2004 (Figure 2). The greatest increases were in 5 to 14 year olds (100%) and 15 to 34 year olds (69%).
- Cases aged 65 years and older have the highest incidence rate (26.2 per 100,000) of all age groups followed by those aged less than one year (Figure 2).
- All race/ethnic groups had higher annual incidence rates in 2009 when compared to the

<sup>1</sup> In February 2010, a 13-valent pneumococcal conjugate vaccine (Prevnar 13<sup>®</sup>) was licensed and replaces the heptavalent vaccine. The 13-valent vaccine prevents invasive infection caused by the serotypes contained in the heptavalent vaccine and six additional serotypes of *S. pneumoniae*.





previous four years (Figure 3). Asians had the greatest increase (87%) in 2009. However, the validity of comparisons across years is questionable as race data were missing for 29% to 46% of cases during 2004 to 2008. In 2009, race-ethnicity was missing for 252 cases (32%).

- Similar to previous years, the incidence rate in blacks was two to three times higher than the rate in other race/ethnic groups (Figure 3).
- As in previous years, Service Planning Area (SPA) 6 had the highest incidence rate of IPD (10.6 cases per 100,000; Figure 4).
- In contrast to previous years, SPA 4 had the second highest incidence rate in 2009. In 2004-2008, SPA 4 had the lowest average annual rate of IPD. In 2009, SPA 4 had a 68% increase in incidence rate compared to the previous five years.
- IPD peaked in December in 2009, similar to the previous five years (Figure 5).
- Compared to the average monthly incidence of the previous five years and the 2008 monthly incidence, the numbers of incident IPD cases in 2009 were substantially higher in November (77%), April (58%), October (54%), and May (46%) (Figure 5). These months correlated with increased H1N1 influenza incidence in LAC, specifically the emergence of the pandemic in April and May, and the sharp rise in H1N1 incidence during October and November.
- The percentage of isolates susceptible to penicillin increased compared to the previous five years (Figure 6). Susceptibility to cefotaxime, trimethoprim-sulfamethoxazole (TMP-SMZ), erythromycin, ceftriaxone, and the fluoroquinolones stayed the same or changed only slightly.
- In 2009, 78% (N=616) of cases were reported hospitalized (14% missing). In 2004-2008, 72% of cases were hospitalized (21% missing).
- Median length of hospital stay was 5 days (N=226; mean=8.4 and range=0 to 74 days). ACDC only started recording length of hospital stay after July 2009. Length of hospital stay was still missing for 71% (N=560) of hospitalized cases.



## Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA Los Angeles County, 2005-2009

Age Group	2005 (N=590)			2006 (N=533)			2007 (N=624)			2008 (N=662)			2009 (N=786)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<b>Race/Ethnicity</b>															
Asian	22	3.7	1.8	19	3.6	1.5	33	5.3	2.6	32	4.8	2.5	50	6.4	3.8
Black	81	13.7	9.4	86	16.1	10.2	70	11.2	8.2	76	11.5	8.9	86	10.9	10.1
Hispanic	164	27.8	3.6	107	20.1	2.3	135	21.6	2.9	124	18.7	2.6	197	25.1	4.2
White	132	22.4	4.6	136	25.5	4.7	102	16.3	3.5	135	20.4	4.6	192	24.4	6.6
Other	1	0.2	3.5	1	0.2	3.5	0		0.0	0		0.0	9	1.1	35.4
Unknown	190	32.2		184	34.5		284	45.5		295	44.6		252	32.1	
<b>SPA</b>															
1	19	3.2	5.5	23	4.3	6.6	24	3.8	6.7	18	2.7	4.9	25	3.2	6.8
2	108	18.3	5.1	95	17.8	4.4	100	16.0	4.6	137	20.7	6.3	156	19.8	7.0
3	104	17.6	6.1	90	16.9	5.2	104	16.7	6.0	99	15.0	5.7	116	14.8	6.7
4	76	12.9	6.1	52	9.8	4.1	66	10.6	5.2	62	9.4	4.9	103	13.1	8.3
5	38	6.4	5.8	35	6.6	5.5	36	5.8	5.6	48	7.3	7.4	54	6.9	8.3
6	84	14.2	8.1	81	15.2	7.8	92	14.7	8.8	107	16.2	10.1	111	14.1	10.6
7	66	11.2	4.8	66	12.4	4.8	79	12.7	5.7	73	11.0	5.3	102	13.0	7.4
8	69	11.7	6.2	68	12.8	6.1	98	15.7	8.8	78	11.8	6.9	89	11.3	7.9
Unknown	26	4.4		12	4.3		25	4.0		40	6.0		30	3.8	

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



Figure 1. Annual Incidence Rates of Invasive Pneumococcal Disease, LAC and US, 2000-2009

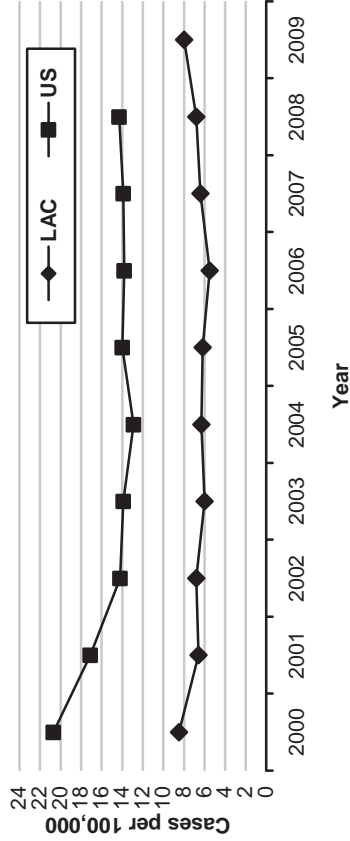


Figure 2. Annual Incidence Rates of Invasive Pneumococcal Disease by Age Group, LAC, 2004-2009

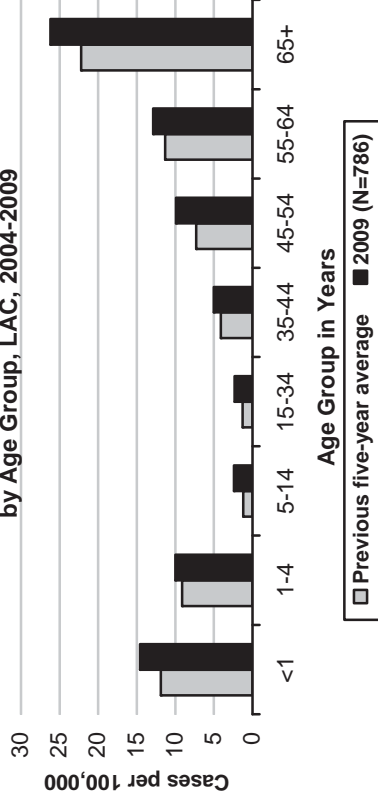


Figure 3. Annual Incidence Rates of Invasive Pneumococcal Disease by Race/Ethnicity, LAC, 2005-2009

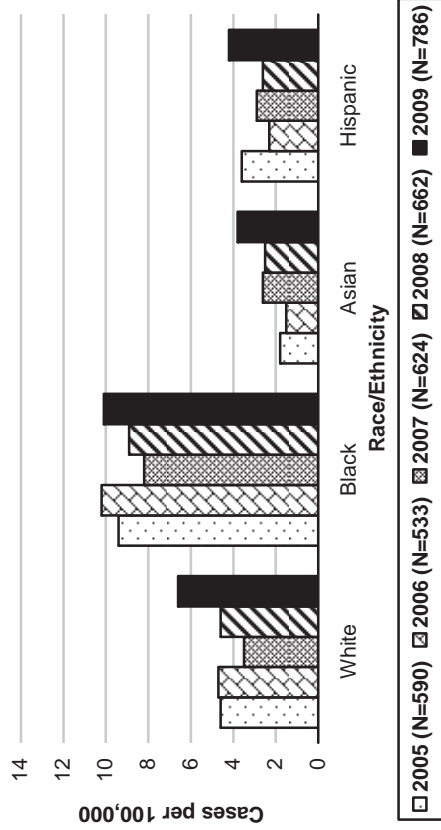
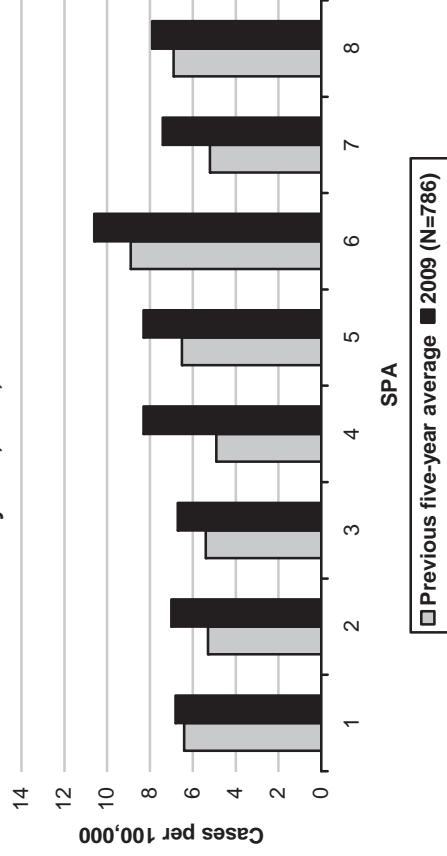


Figure 4. Annual Incidence Rates of Invasive Pneumococcal Disease by SPA, LAC, 2004-2009



\*Race-ethnicity was missing for 32%, 35%, 46%, 45%, and 32% of cases for 2005, 2006, 2007, 2008, and 2009, respectively.



Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2004-2009

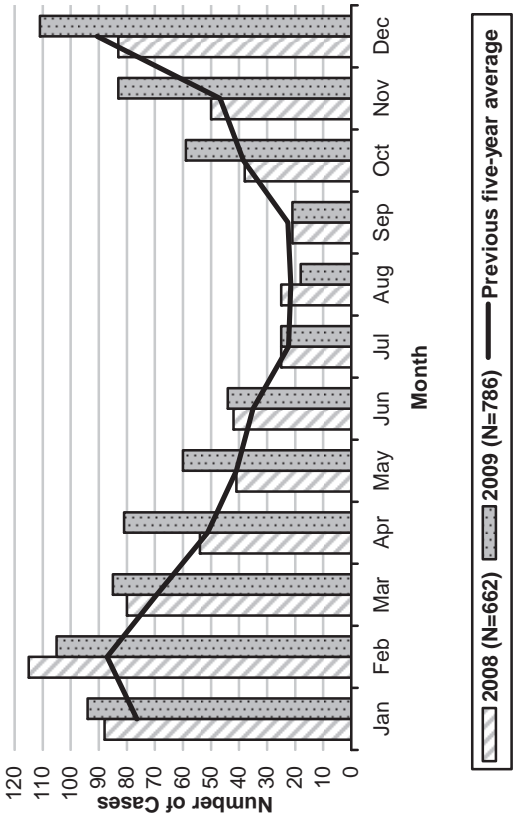
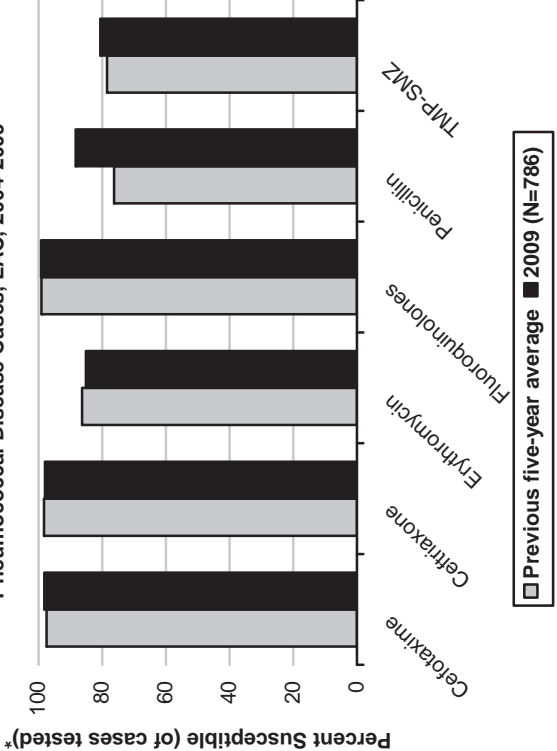


Figure 6. Reported Antibiotic Susceptibility of Invasive Pneumococcal Disease Cases, LAC, 2004-2009



\*Range of number of isolates tested 2004-2009: Cefotaxime (301-389), Ceftriaxone (280-485), Erythromycin (271-456), Fluoroquinolones (262-394), Penicillin (490-668), and TMP-SMZ (150-330).



## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	661
Annual Incidence <sup>a</sup>	
LA County	6.8
California <sup>b</sup>	N/A
United States	14.3
Age at Diagnosis	
Mean	55
Median	59
Range	3 mos – 102 yrs

<sup>a</sup>Cases per 100,000 population.

<sup>b</sup>Not notifiable.

### DESCRIPTION

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

ACDC has followed IPD as a special surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid). Antibiotic susceptibility is determined by disk or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance. *S. pneumoniae* is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in LAC surveillance. Therefore, the data presented in this report underestimate all disease caused by *S. pneumoniae* in LAC.

Two effective vaccines are available for pneumococcal disease. Heptavalent pneumococcal conjugate vaccine (Prevnar<sup>®</sup>) is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children under 2 years, and for children up to 5 years at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults ≥65 years and those >2 years at high risk of IPD. For children aged 2 to 5 years at high risk of invasive pneumococcal infections, ACIP recommends the use of pneumococcal conjugate vaccine followed at least 2 months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited. While the current vaccines are still effective, the incidence rate for IPD has increased since 2006 due to serotype replacement. A new vaccine is scheduled to be released in late 2009 or 2010 that will cover the more prevalent of these replacement serotypes.

### 2008 TRENDS AND HIGHLIGHTS

- The incidence rate has continued to increase slightly from a low in 2006 (Figure 1).
- Cases aged 65 years and older have the highest incidence rate (26.1 per 100,000) of all age groups followed by those aged 55 to 64 years. In 2008, the rate among those aged 65 and older was the highest it has been in the past five years (Figure 2).
- The rates of IPD in all races were within historical norms. Similar to previous years, the rate in blacks was 2 to 4 times higher than the rate in other race/ethnic groups (Figure 3).
- Similar to previous years, Service Planning Area (SPA) 6 had the highest rate of IPD (10.9 cases per 100,000) followed by SPA 8 with 7.0 cases per 100,000 (Figure 4).
- IPD peaked in February in 2008 in contrast to previous years when it peaked in December (Figure 5).
- The percentage of isolates susceptible to penicillin increased just slightly compared to the previous five years. The same is true of isolates susceptible to trimethoprim-sulfamethoxazole (TMP-SMZ) and to the fluoroquinolones. In contrast, the percentage of isolates susceptible to cefotaxime, ceftriaxone, and erythromycin decreased relative to the past five years (Figure 6).



## Reported Invasive Pneumococcal Disease Cases and Rates\* per 100,000 by Age Group, Race/Ethnicity, and SPA Los Angeles County, 2004-2008

Age Group	2004 (N=603)			2005 (N=590)			2006 (N=533)			2007 (N=624)			2008 (N=661)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
<1	14	2.3	9.8	18	3.1	12.8	10	1.9	6.9	23	3.7	15.6	16	2.4	11.5
1-4	58	9.6	10.1	52	8.8	9.0	48	9.0	8.3	46	7.4	8.0	57	8.6	10.1
5-14	15	2.5	1.0	23	3.9	1.6	17	3.2	1.2	24	3.8	1.7	12	1.8	0.9
15-34	42	7.0	1.5	35	5.9	1.2	34	6.4	1.2	48	7.7	1.7	29	4.4	1.0
35-44	56	9.3	3.7	66	11.2	4.4	52	9.8	3.5	68	10.9	4.5	70	10.6	4.6
45-54	98	16.3	7.9	94	15.9	7.4	92	17.3	7.1	92	14.7	7.0	94	14.2	7.0
55-64	95	15.8	11.9	79	13.4	9.5	95	17.8	10.9	105	16.8	11.8	115	17.4	12.6
65+	224	37.1	23.7	219	37.1	22.7	179	33.6	18.3	212	34.0	21.0	266	40.2	26.1
Unknown	1	0.2		4	0.7		6	1.1		6	1.0		2	0.3	
<b>Race/Ethnicity</b>															
Asian	37	6.1	3.0	18	3.1	1.4	18	3.4	1.4	32	5.1	2.5	28	4.2	2.1
Black	101	16.7	11.8	82	13.9	9.7	86	16.1	10.2	70	11.2	8.2	75	11.3	8.8
Hispanic	138	22.9	3.1	164	27.8	3.6	107	20.1	2.3	135	21.6	2.9	124	18.8	2.6
White	149	24.7	5.1	130	22.0	4.5	136	25.5	4.7	102	16.3	3.5	131	19.8	4.5
Other	1	0.2	3.6	1	0.2	3.5	1	0.2	3.5	0	0.0	0.0	0	0.0	0.0
Unknown	177	29.4		195	33.1		185	34.7		285	45.7		303	45.8	
<b>SPA</b>															
1	26	4.3	7.8	17	2.9	5.0	20	3.8	5.8	23	3.7	6.4	18	2.7	4.9
2	124	20.6	5.9	105	17.8	4.9	91	17.1	4.2	98	15.7	4.5	136	20.6	6.2
3	70	11.6	4.1	103	17.5	6.0	88	16.5	5.1	100	16.0	5.8	98	14.8	5.6
4	54	9.0	4.4	74	12.5	5.9	52	9.8	4.1	66	10.6	5.2	62	9.4	4.9
5	47	7.8	7.4	28	4.7	4.4	27	5.1	4.2	27	4.3	4.2	40	6.1	6.2
6	104	17.2	10.2	93	15.8	9.0	89	16.7	8.5	100	16.0	9.6	115	17.4	10.9
7	75	12.4	5.5	65	11.0	4.7	66	12.4	4.8	77	12.3	5.6	73	11.0	5.3
8	71	11.8	6.4	68	11.5	6.1	66	12.4	5.9	97	15.5	8.7	79	12.0	7.0
Unknown	32	5.3		37	6.3		34	6.4		36	5.8		40	6.1	

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





Figure 1. Incidence Rates of Invasive Pneumococcal Disease  
LAC and US, 1999-2008

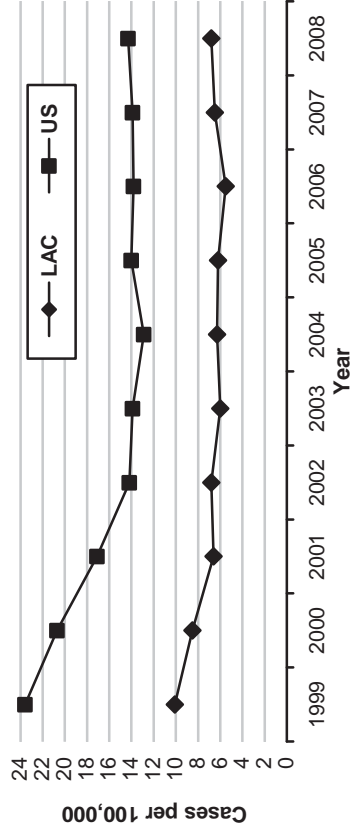


Figure 2. Incidence Rate of Invasive Pneumococcal Disease  
by Age Group, LAC, 2008

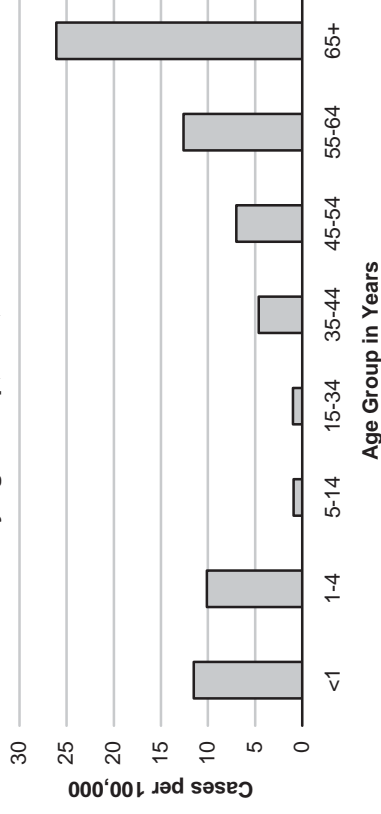


Figure 3. Invasive Pneumococcal Disease Incidence  
by Race/Ethnicity, LAC, 2004-2008

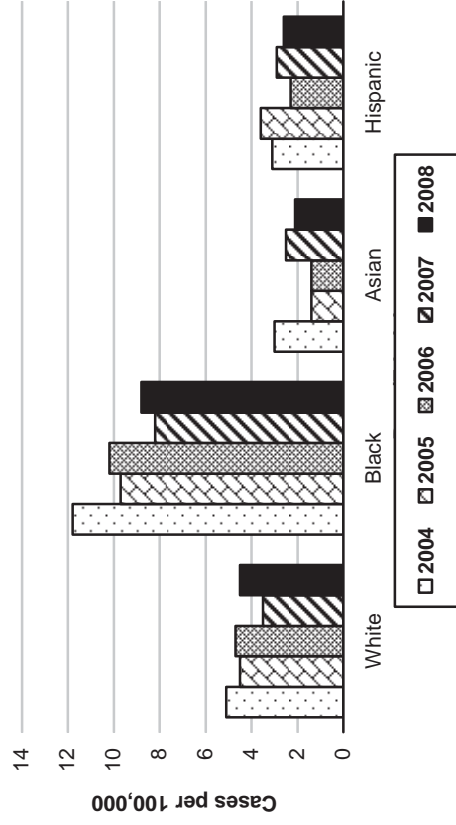
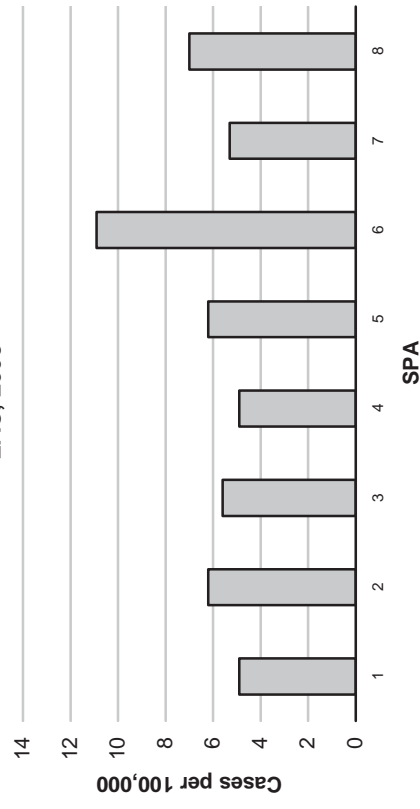


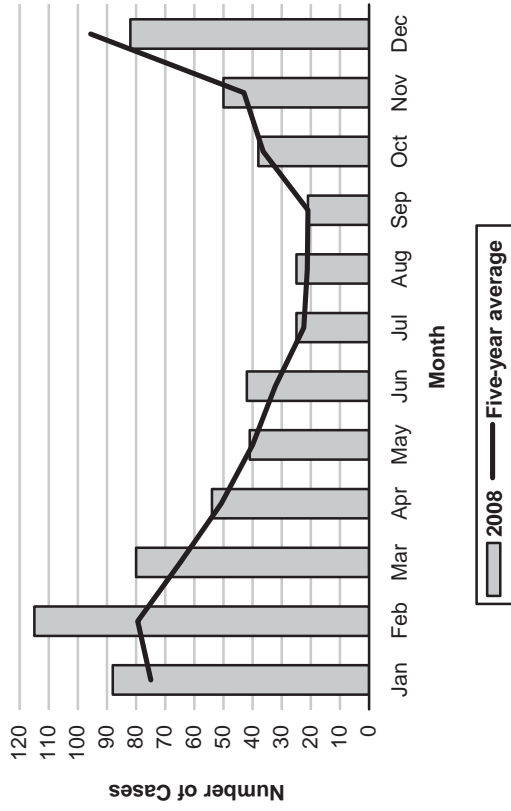
Figure 4. Rates of Invasive Pneumococcal Disease by SPA  
LAC, 2008



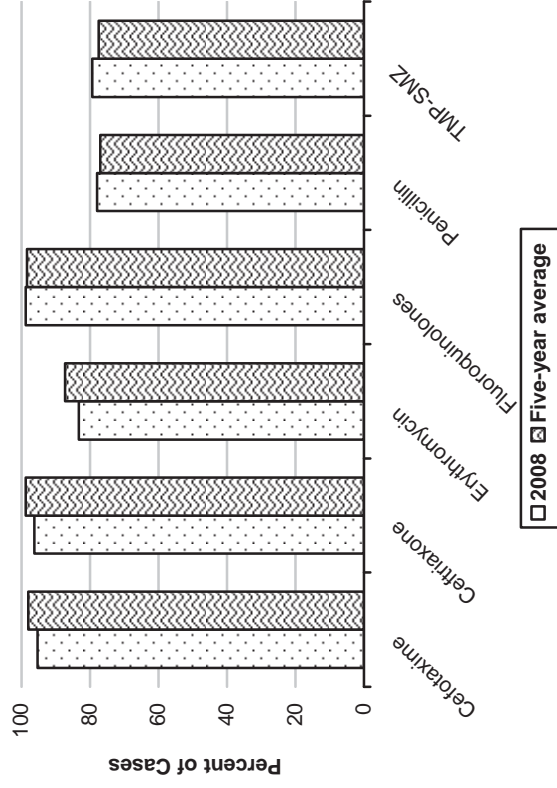
\*Race/Ethnicity information was missing for up to 47% of cases in a given year. Thus, rates are underestimates.



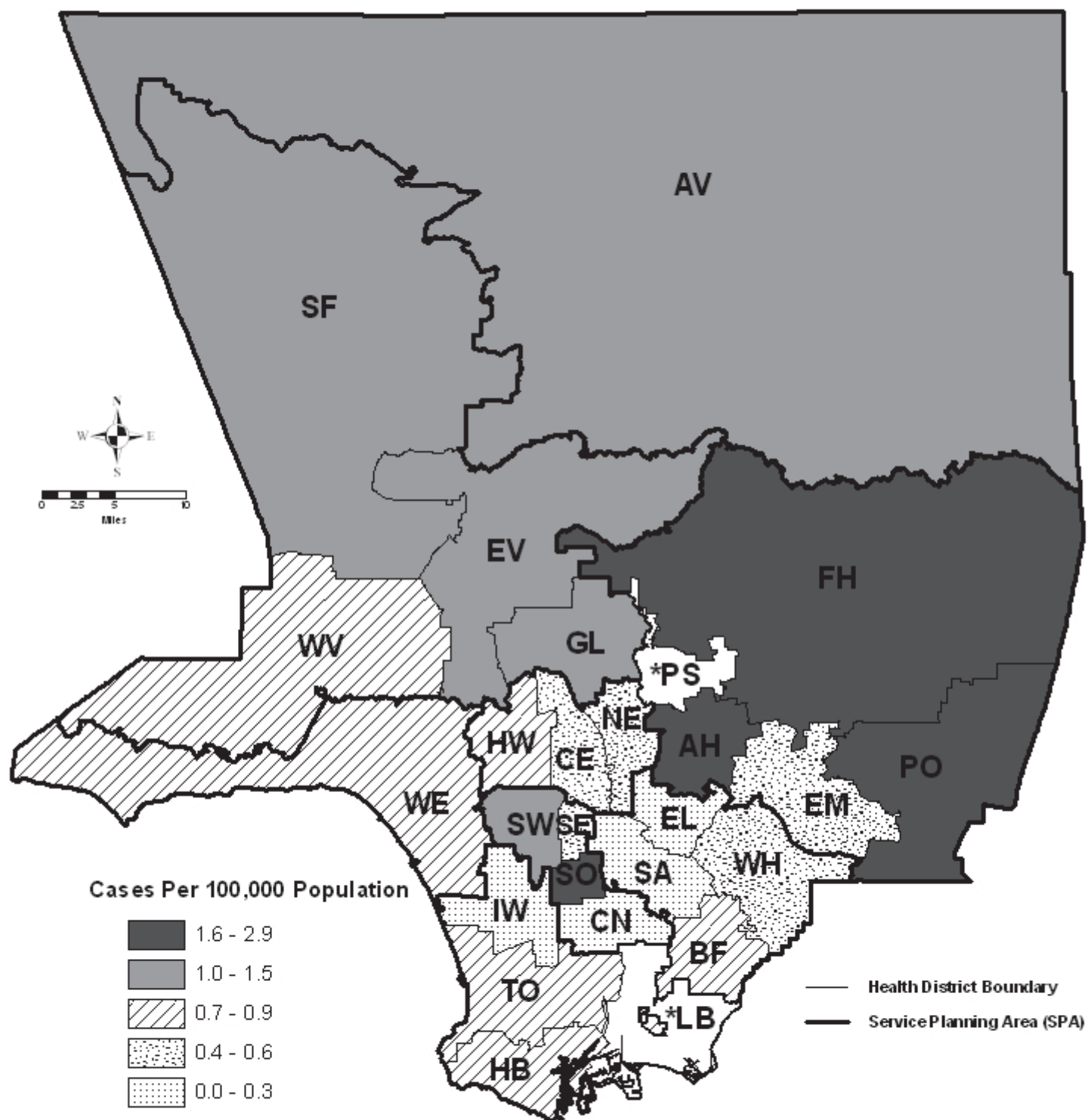
**Figure 5. Invasive Pneumococcal Disease Cases by Month of Onset LAC, 2008**



**Figure 6. Invasive Pneumococcal Disease Antibiotic Susceptibility LAC, 2008**



**Map 12. Pneumococcal Disease, Invasive  
Rates by Health District, Los Angeles County, 2008\***



\*Excludes Long Beach and Pasadena Data.



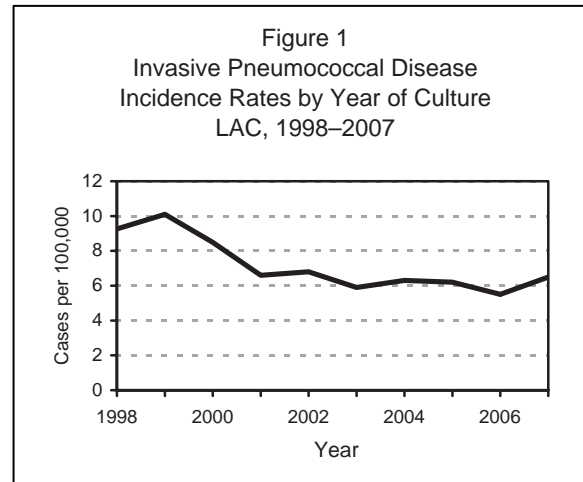


## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	625
Annual Incidence <sup>a</sup>	
LA County	6.5
United States	14.0 <sup>b</sup>
Age at Diagnosis	
Mean	51
Median	56
Range	0 days -100 years

<sup>a</sup> Cases per 100,000 population.

<sup>b</sup> National projection of IPD incidence from Active Bacterial Core Surveillance areas data, 2007 (CDC, 2007).



### DESCRIPTION

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

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

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

### DISEASE ABSTRACT

- The incidence rate increased slightly in LAC in 2007.
- The overall percentage of penicillin nonsusceptible infections has increased slightly. The percentage of penicillin nonsusceptible isolates increased or remained the same for all age groups except for cases aged 5-14 years and 45-54 years.
- The highest incidence of IPD continued to be among blacks.



## STRATIFIED DATA

**Trends:** IPD occurred at an incidence rate of 6.5 per 100,000 in 2007 (N=625), an increase from the previous year (5.5 per 100,000, N=533) (Figure 1).

**Seasonality:** The seasonal trend in 2007 followed the typical peak for IPD in winter months, dropping in the spring and summer months (Figure 2).

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

**Age:** The age of IPD cases ranged from birth to 100 years old with a mean of 51 years and median of 56 years. The incidence rate increased or stayed the same from 2006 in all age groups. The incidence rate has increased consistently since 2005 in persons aged 55-64 years. As expected, the highest rate (21 cases per 100,000) occurred in cases aged 65 years and older (Figure 3).

**Race/Ethnicity:** The incidence decreased among whites and blacks and increased among Latinos and Asians. The highest incidence of IPD occurred among blacks (8.2 cases per 100,000). This rate was more than twice as high as that of whites and approximately three times as high as that of Latinos and Asians (Figure 4).

**Disease Severity:** Hospitalization status was known for 71% of cases. Of these cases, 94% were hospitalized. Hospitalization was more frequent in cases 65 years and older (99%) and occurred less in children under 5 years (80%). The overall case fatality was 14%, similar to 2006 and higher than the national case fatality of 10.3% (CDC, 2007). Adults aged 35-44 years had the highest case fatality (34%) of all age groups followed by cases aged 55-64 years (18%) and cases older than 65 years (14%).

**Antibiotic Susceptibility:** Antibiotic resistance information was provided for 93% of cases. The percentage of isolates nonsusceptible to penicillin has increased slightly compared to the previous 5 years. The same is true of isolates nonsusceptible to erythromycin and cefotaxime. The percentage of isolates nonsusceptible to trimethoprim-sulfamethoxazole (TMP-SMZ) decreased to 20% in 2007.

The percentage of cases with penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates

Figure 2  
IPD Cases By Month of Culture  
LAC, 2007

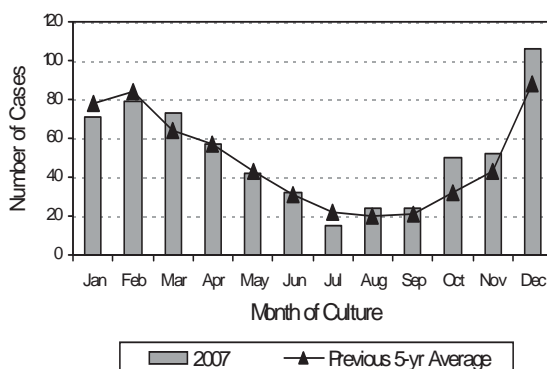


Figure 3  
Incidence Rates of IPD Cases by Age  
LAC, 2005-2007

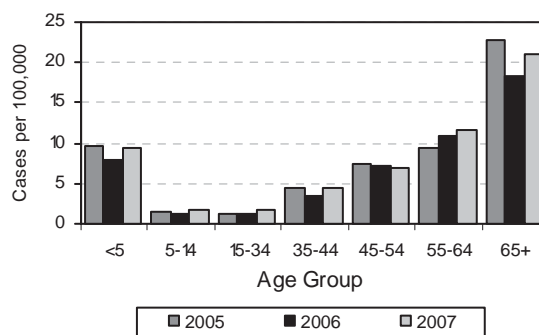
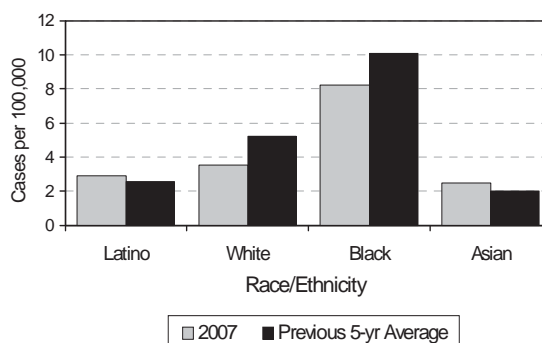


Figure 4  
Incidence Rates of IPD Cases by Race/Ethnicity  
LAC, 2007





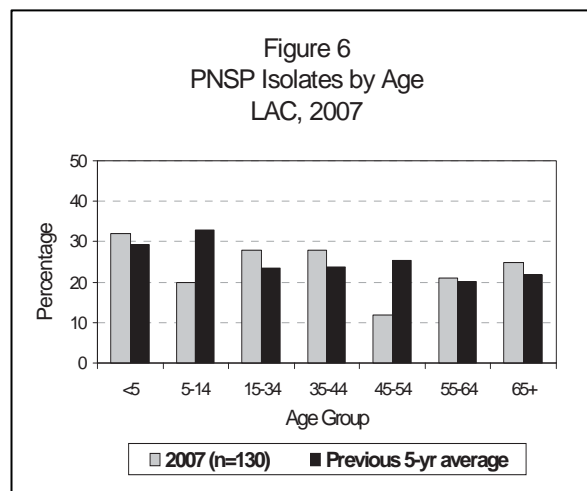
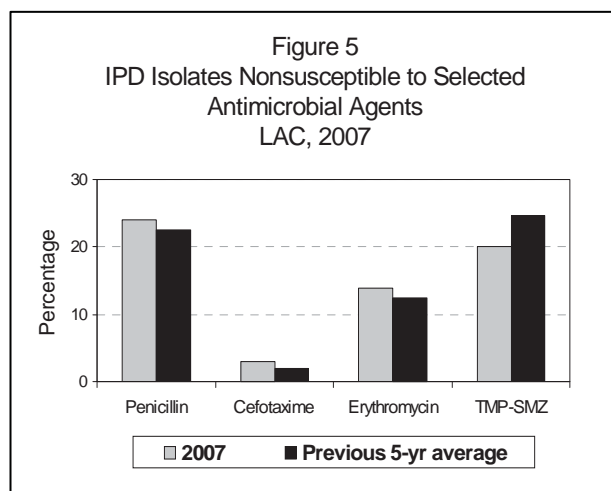
has increased for cases aged < 5 years, 15-34 years, and 35-44 years, as well as cases over 65 years of age. Cases aged 5-14 years and 45-54 experienced a decrease in PNSP (Figure 6). The percentage of PNSP isolates has remained about the same for adults 55-64 years old.

## COMMENTS

In 2007 IPD increased in all age groups except for adults aged 45-54 years. Surprisingly, adults aged 35-44 years had the highest case fatality (34%) of all age groups. Cases <5 years showed the highest percentage of PNSP isolates. The percentage of PNSP isolates increased or remained the same for all age groups with the exception of cases aged 5-14 years and 45-54 years which experienced a considerable decrease in the percentage of PNSP.

In LAC, incidence of IPD in blacks (8.2 cases per 100,000) is over two times that of whites and about 3 times that of Latinos and Asians. The black-to-white rate ratio is similar to the ratio found nationally; however, the incidence rates in Los Angeles County for both whites and blacks are lower than the national incidence rates (national rates: 12 and 24 cases per 100,000 respectively) (CDC, 2007).

Laboratories are the source for many of the IPD case reports to ACDC: 58% of cases were reported by laboratories only. Many of the limitations in the data are due to the limited access laboratories have to patient information. Race/ethnicity data and outcome status, in particular, are often missing from laboratory reported cases. Only 54% of reports contained race/ethnicity data and 37% contained outcome status. The unavailability of outcome status is further exacerbated by the requirements of laboratory reporting procedures. Cases often are reported before the final outcome is known due to the requirement to report positive cultures within seven days. Therefore, case fatality rates may be unreliable.



## PREVENTION

Two effective vaccines are available for pneumococcal disease. Heptavalent pneumococcal conjugate vaccine (Prevnar<sup>®</sup>) is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children under 2 years, and for children up to 5 years at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults ≥65 years and those >2 years at high risk of IPD. For children aged 2 to 5 years at high risk of invasive pneumococcal infections, ACIP recommends the use of pneumococcal conjugate vaccine followed at least 2 months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited (CDC, 1997).





## REFERENCES

Centers for Disease Control and Prevention (1997). Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report*, 46(RR08), 1–24.

Centers for Disease Control and Prevention (2007). Active Bacterial Core Surveillance Reports, Emerging Infections Program Network, *Streptococcus Pneumoniae 2007*. Available at: [http://www.cdc.gov/ncidod/dbmd/abcs/survreports/SPNEUMO\\_2007\\_provisional.pdf](http://www.cdc.gov/ncidod/dbmd/abcs/survreports/SPNEUMO_2007_provisional.pdf)

## ADDITIONAL RESOURCE

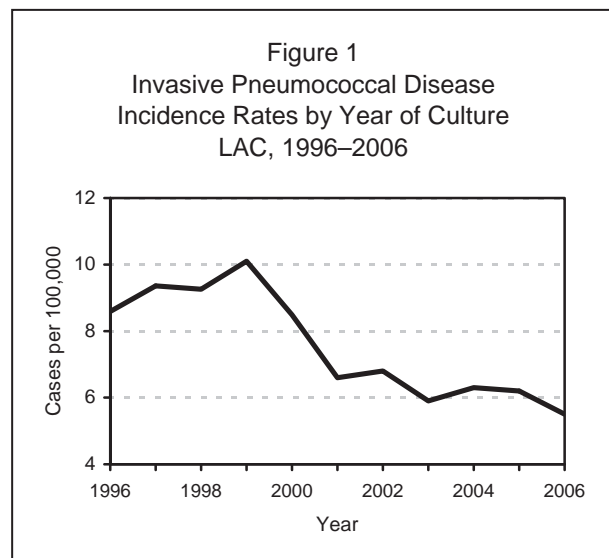
Flannery, B., Schrag, S., Bennett, N.M., Lynfield, R., Harrison, L.H., Reingold, A., et al. (2004). Impact of childhood vaccination on racial disparities in invasive *Streptococcus pneumoniae* infections. *Journal of the American Medical Association*, 291(18), 2197-2203.

## PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	533
Annual Incidence <sup>a</sup>	
LA County	5.5
United States	14.0 <sup>b</sup>
Age at Diagnosis	
Mean	52
Median	56
Range	0–101 years

<sup>a</sup> Cases per 100,000 population.

<sup>b</sup> National projection of IPD incidence from Active Bacterial Core Surveillance areas data, 2005 [1].



### DESCRIPTION

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

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

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

### DISEASE ABSTRACT

- The incidence rate decreased in LAC in 2006.
- There was no change in the overall percentage of penicillin nonsusceptible infections. However, an increase was observed in the 45–64 years age group while all other age groups remained approximately equal or decreased from 2005 (Figure 3).
- The highest incidence of IPD continued to be among blacks—the incidence rate of this group was at least twice as high as that of whites or Latinos (Figure 4).

## STRATIFIED DATA

**Trends:** IPD occurred at an incidence rate of 5.5 per 100,000 in 2006 (N=533), a decrease from the previous year (6.2 per 100,000, N=590) (Figure 1).

**Seasonality:** The seasonal trend in 2006 followed the typical peak for IPD in the winter months, dropping in the spring and summer months (Figure 2).

**Sex:** The male-to-female rate ratio was 1.1:1. Males had a slightly higher incidence than females (6 vs. 5 cases per 100,000).

**Age:** The age of IPD cases ranged from birth to 101 years old with a mean of 52 years and median of 56 years. Compared to previous years, the incidence greatly decreased in children <1 year and in persons older than 65 years. A slight decrease was also observed in the 1-4 year age group. The distribution of incidence across the remaining age groups in 2006 remained similar to previous years (Figure 3).

**Race/Ethnicity:** The highest incidence of IPD occurred among blacks. With an incidence of 10.2 per 100,000, this rate was at least twice as high as that of whites or Latinos (Figure 4).

**Disease Severity:** During 2006, hospitalization status was known for 80% of the cases. Of these, 94% were hospitalized. Hospitalization was more frequent in cases older than 65 years (98%) and occurred less in children aged less than 5 years (78%). The overall case fatality was 14%, slightly higher than the national case fatality (11%) [1]. Most deaths occurred among adults 65 years and older (43% [n=16]); however, the 45–64 age group followed closely at 32% (n=12).

**Antibiotic Susceptibility:** Since 2004, there has been an increasing proportion of isolates nonsusceptible to trimethoprim-sulfamethoxazole (TMP-SMZ), increasing to 25% in 2006 (n=37). The percent of isolates nonsusceptible to penicillin and erythromycin remained the same as 2005, while cefotaxime increased (Figure 5). Almost all reported cases had antibiotic resistance information provided (95%).

The proportion of cases with penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates decreased or remained the same in almost all age groups except in cases aged 45 to 64 years. In this age group there has been an increasing trend of greater nonsusceptibility to penicillin since 2004.

Figure 2  
IPD Cases By Month of Culture  
LAC, 2006

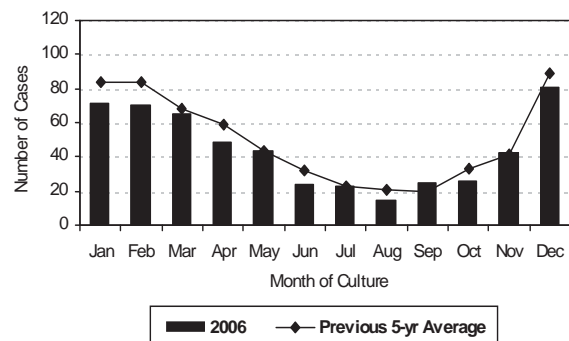


Figure 3  
Incidence Rates of IPD Cases by Age  
LAC, 2004-2006

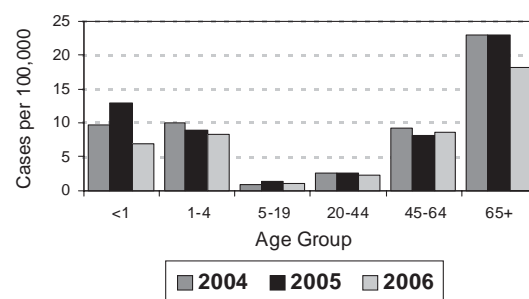
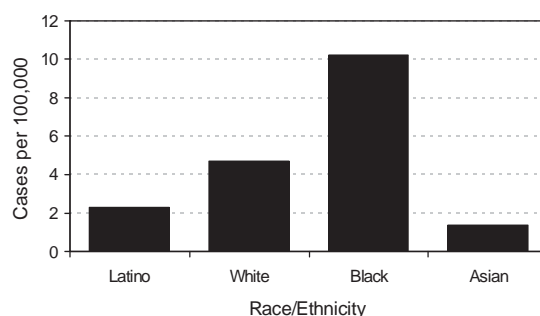


Figure 4  
Incidence Rates of IPD Cases by Race/Ethnicity  
LAC, 2006



## PREVENTION

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

## COMMENTS

LAC experienced a decline of IPD in 2006, especially in those aged less than one year or older than 65 years. Though the overall proportion of PNSP isolates remained the same as 2005 (25%), a 30% increase of PNSP was observed in the 45 to 64 years age group, making it nearly equal to the proportion of PNSP isolates in the 65 years and older age group.

Incidence of IPD in blacks is over two times the incidence in whites or Latinos in LAC. The ratio of black-white incidence is similar to that found nationally; however, the incidence is much lower for both whites and blacks, which are 12 and 25 per 100,000 in the national population, respectively [1]. Interestingly, black IPD cases were more likely to be female (52%) and aged between 45 and 64 years (53%) when compared to non-blacks (45% female and 32% aged 45-64 years). Studies have indicated that the difference in incidence among blacks is associated with rates of breastfeeding, attendance in daycare, and underlying infections such as HIV [3].

Laboratories are the source for many of the IPD case reports to ACDC: 58% of cases were reported by laboratories only. Much of the limitations in the data are due to the minimal access that laboratories have to patient information. Race/ethnicity data and outcome status, in particular, are often missing from laboratory reported cases. Only 65% of case reports contained race/ethnicity data and 49% contained outcome status. The unavailability of outcome status is further exacerbated by the requirements of laboratory reporting procedures. Cases often are reported before the final outcome is known due to the requirement to report positive cultures within seven days. Therefore, case fatality rates may be unreliable.

## REFERENCES

1. Active Bacterial Core Surveillance Reports from 1997 to 2005 from the CDC's Division of Bacterial and Mycotic Diseases. Report available at: [www.cdc.gov/ncidod/dbmd/abcs/survreports.htm](http://www.cdc.gov/ncidod/dbmd/abcs/survreports.htm)
2. CDC. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997; 46(RR08):1-24.
3. Flannery B, Schrag S, Bennett NM, et al. Impact of childhood vaccination on racial disparities in invasive *Streptococcus pneumoniae* infections. JAMA 2004; 291(18):2197-2203.

