

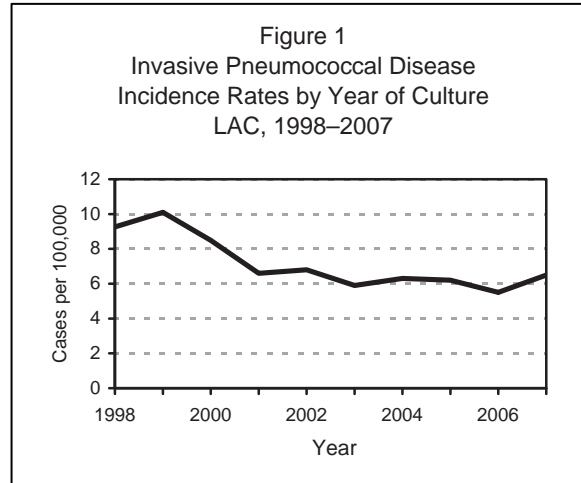


## PNEUMOCOCCAL DISEASE, INVASIVE

| 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

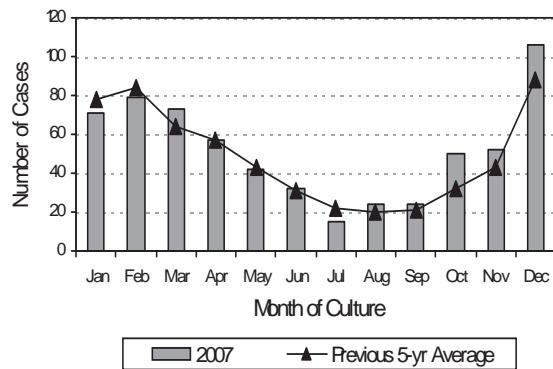


Figure 3  
Incidence Rates of IPD Cases by Age  
LAC, 2005-2007

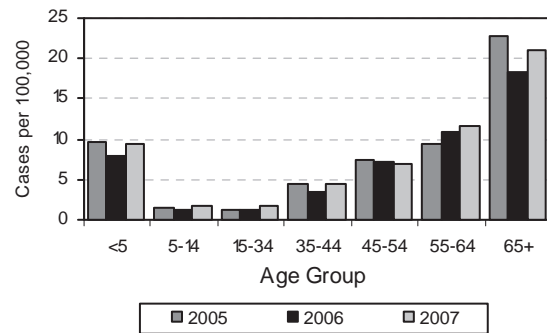
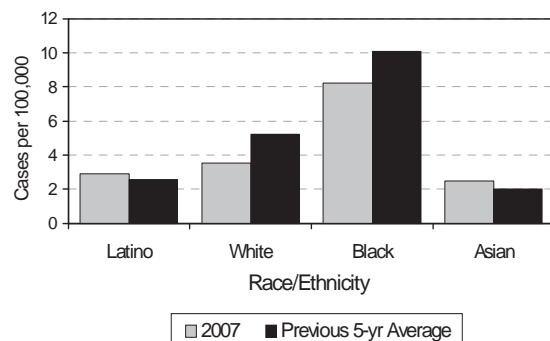


Figure 4  
Incidence Rates of IPD Cases by Race/Ethnicity  
LAC, 2007





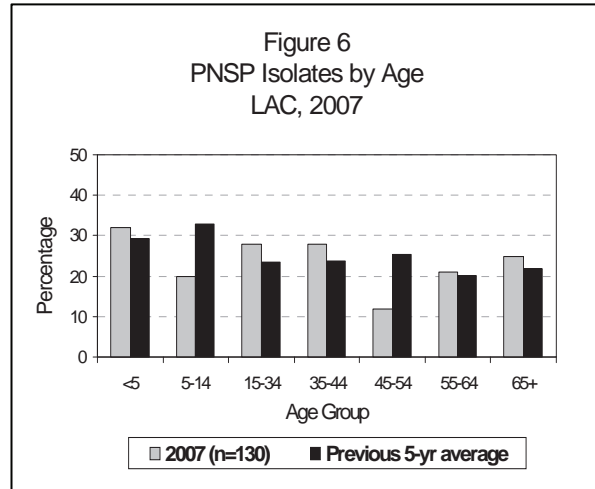
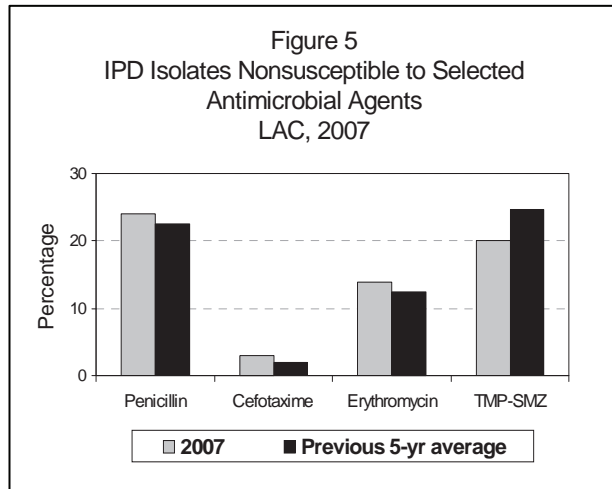
has increased for cases aged < 5 years, 15-34 years, and 35-44 years, as well as cases over 65 years of age. Cases aged 5-14 years and 45-54 experienced a decrease in PNSP (Figure 6). The percentage of PNSP isolates has remained about the same for adults 55-64 years old.

**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

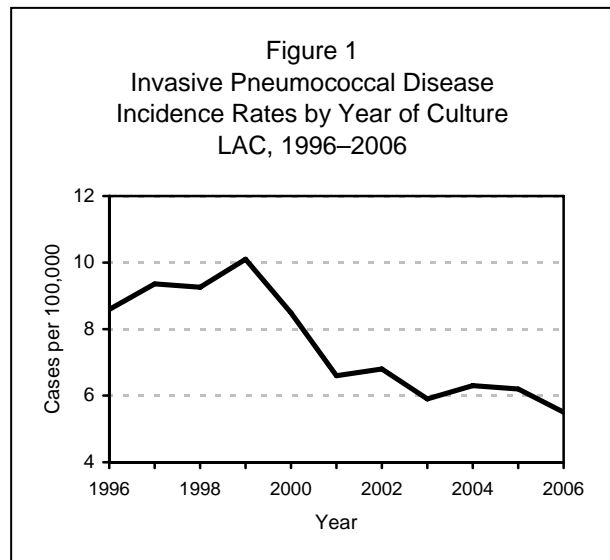
Flannery, B., Schrag, S., Bennett, N.M., Lynfield, R., Harrison, L.H., Reingold, A., et al. (2004). Impact of childhood vaccination on racial disparities in invasive *Streptococcus pneumoniae* infections. *Journal of the American Medical Association*, 291(18), 2197-2203.

## 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

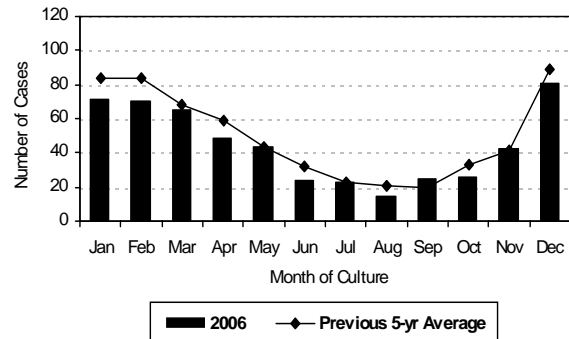


Figure 3  
Incidence Rates of IPD Cases by Age  
LAC, 2004-2006

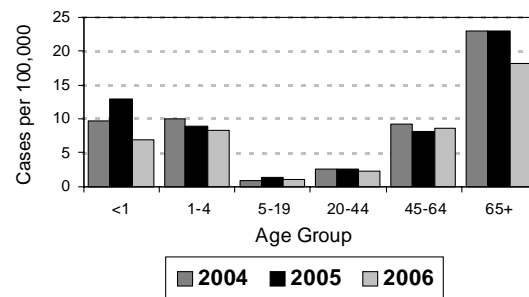
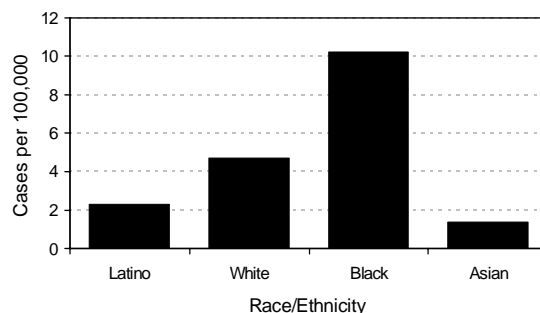


Figure 4  
Incidence Rates of IPD Cases by Race/Ethnicity  
LAC, 2006



## PREVENTION

Two effective vaccines are available for pneumococcal disease. Heptavalent pneumococcal conjugate vaccine (Prevnar<sup>®</sup>) 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<sup>®</sup>23 and Pneumovax<sup>®</sup>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

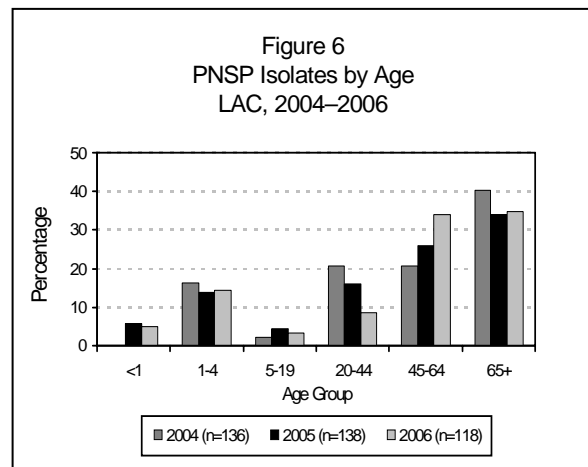
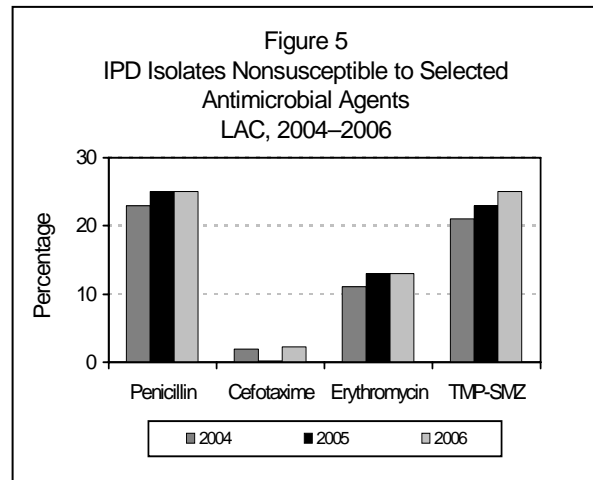
LAC experienced a decline of IPD in 2006, especially in those aged less than one year or older than 65 years. Though the overall proportion of PNSP isolates remained the same as 2005 (25%), a 30% increase of PNSP was observed in the 45 to 64 years age group, making it nearly equal to the proportion of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

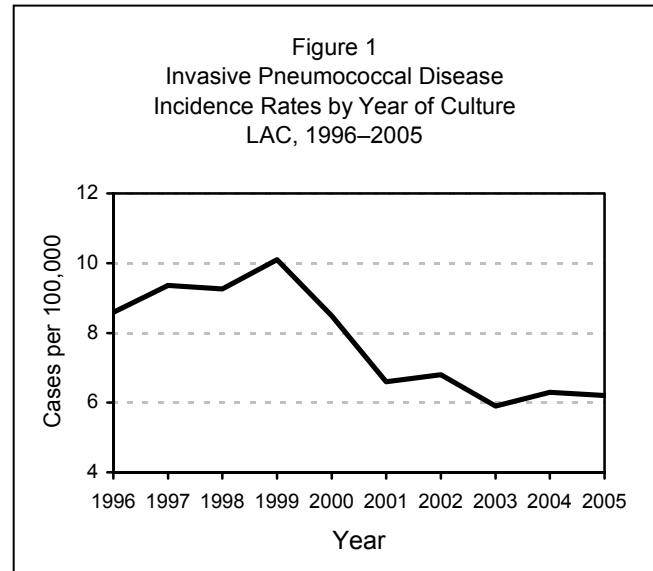
1. Active Bacterial Core Surveillance Reports from 1997 to 2005 from the CDC's Division of Bacterial and Mycotic Diseases. Report available at: [www.cdc.gov/ncidod/dbmd/abcs/survreports.htm](http://www.cdc.gov/ncidod/dbmd/abcs/survreports.htm)
2. CDC. Prevention of pneumococcal disease: recommendations 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.





## PNEUMOCOCCAL DISEASE, INVASIVE

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



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

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

<sup>c</sup> 50% of outcomes known.

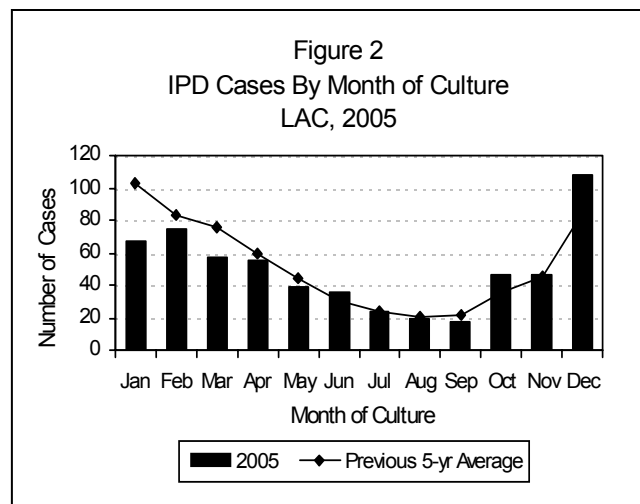
### DESCRIPTION

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

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

### DISEASE ABSTRACT

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





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

**STRATIFIED ANALYSIS**

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

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

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

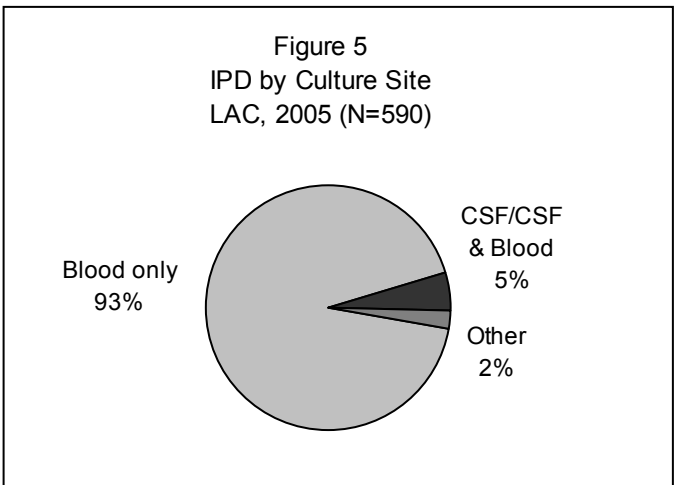
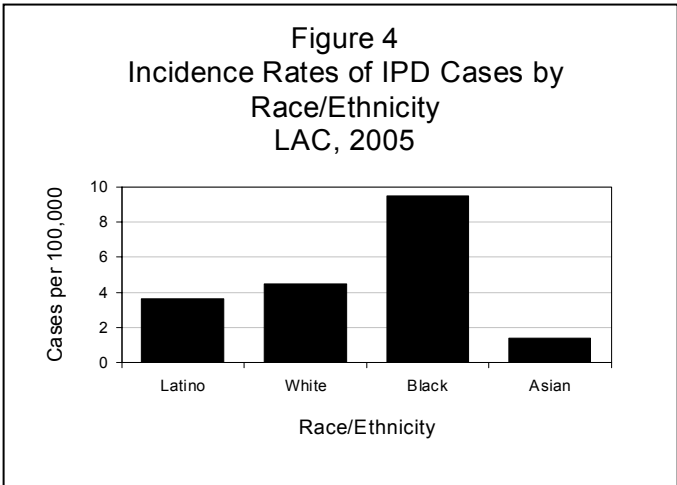
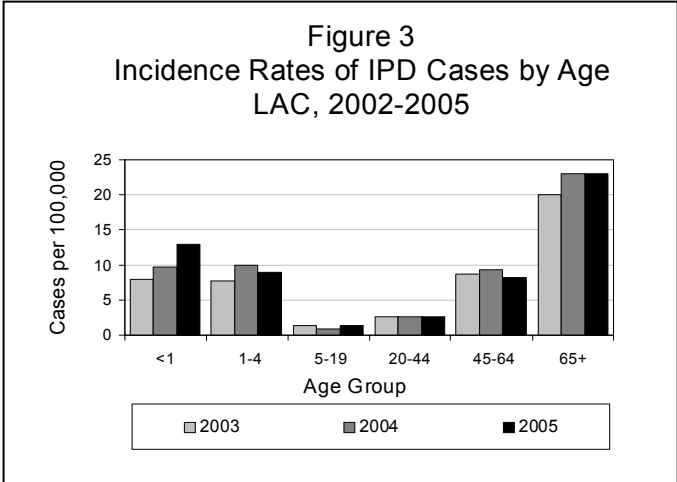
**Age:** The age of IPD cases ranged from birth to 101 years old with a mean of 52 years and median of 55 years (crude data). The distribution of incidence across age groups in 2005 remained similar compared to previous years. However, an increase is seen within the vaccine-preventable age group of 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

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

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

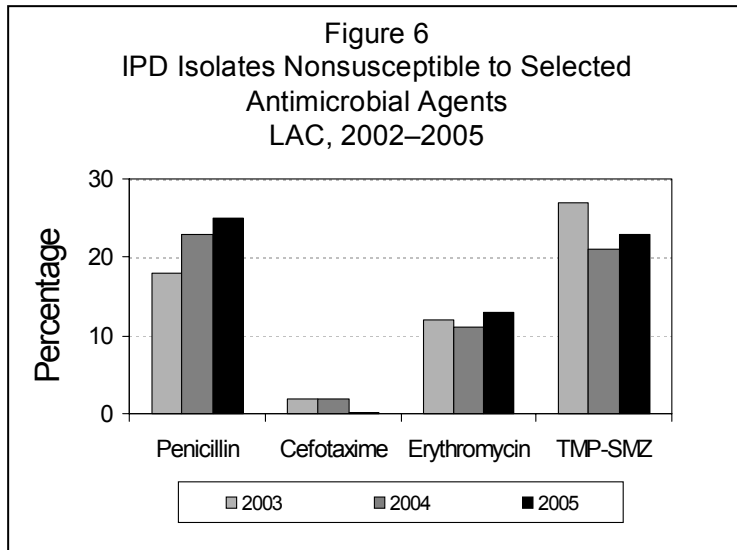
The proportion of culture sites remain the same as previous years, mainly from blood cultures only (Figure 5). Other sites reported include joint/synovial fluid, peritoneal fluid, ascites fluid, and thoracentesis fluid.

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



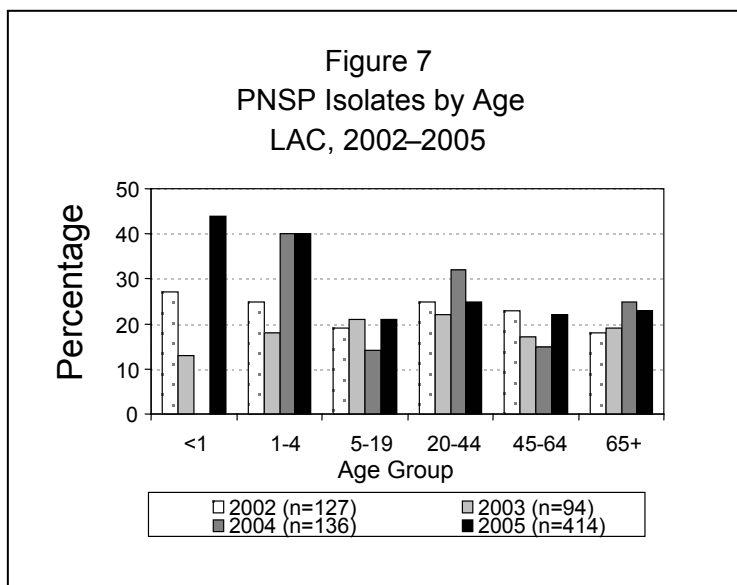


Changes in the proportion of cases with PNSP isolates occurred in almost all age groups. The most dramatic change was observed among those <1 years of age, rising from 0 to 44%. The proportion of PNSP isolates remained high (40%) in the 1–4 age group since 2004 (Figure 7).



## PREVENTION

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



## COMMENTS

Though there continues to be a decline in overall incidence in IPD, there has been an increase in incidence rates and proportions of PNSP isolates in the vaccine-preventable age group of children <1. For 2005, the incidence rates and prevalence of PNSP isolates for this age group are indeed too small to be reliable. The relatively small case

population produces unstable counts when stratified by multiple variables, such as age and penicillin nonsusceptibility.

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

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



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

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

## REFERENCES

1. Active Bacterial Core Surveillance Reports from 1997 to 2003 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at: [www.cdc.gov/ncidod/dbmd/abcs/survreports.htm](http://www.cdc.gov/ncidod/dbmd/abcs/survreports.htm). Accessed 5/10/2005.
2. CDC. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep. 1997; 46:1–24.
3. Flannery B, Schrag S, Bennett NM, Lynfield R, Harrison LH, Reingold A, Cieslak PR, Hadler J, Farley MM, Facklam RR, Zell ER, and Whitney CG. Impact of childhood vaccination on racial disparities in invasive *Streptococcus pneumoniae* infections. JAMA 2004; 291: 2197-2203.
4. CDC. Preventing pneumococcal disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep. 2000; 49:1–35.
5. CDC. Updated recommendations on the use of pneumococcal conjugate vaccine: suspension of recommendation for third and fourth dose. MMWR Morb Mortal Wkly Rep. 2004; 53:177–8.



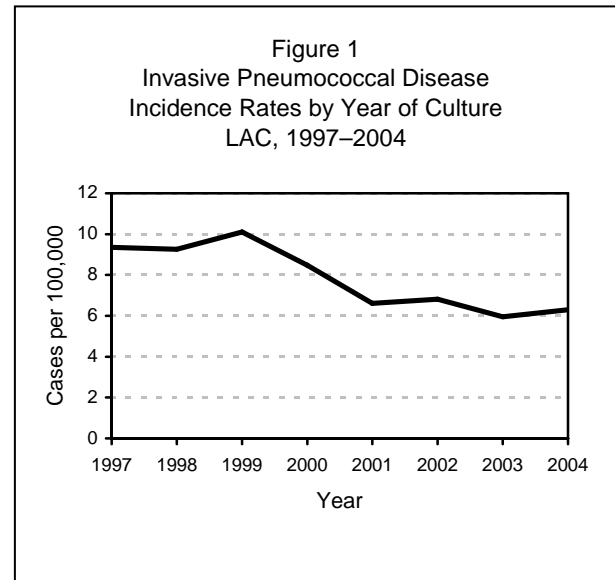
## PNEUMOCOCCAL DISEASE, INVASIVE

| CRUDE DATA                    |              |
|-------------------------------|--------------|
| Number of Cases               | 603          |
| Annual Incidence <sup>a</sup> |              |
| LA County                     | 6.3          |
| United States <sup>b</sup>    | 13.9         |
| Age at Diagnosis              |              |
| Mean                          | 53           |
| Median                        | 57           |
| Range                         | <1–102 years |
| Case Fatality                 |              |
| LA County <sup>c</sup>        | 11.8%        |
| United States <sup>b</sup>    | 13.5%        |

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

<sup>b</sup> National projection of IPD incidence from Active Bacterial Core Surveillance areas data, 2003 [1].

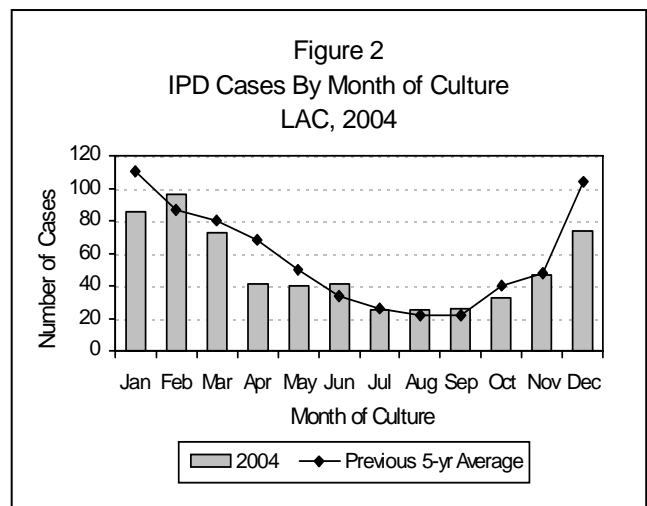
<sup>c</sup> 56% of outcomes known.



### DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by droplet or 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.

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



### DISEASE ABSTRACT

- There was an overall increase in the number of IPD cases reported but the seasonal trend for IPD was closely maintained.
- There was an increase in penicillin nonsusceptible infections, particularly among the 1–4 age group.



## STRATIFIED ANALYSIS

**Trends:** IPD occurred at an incidence rate of 6.3 per 100,000 in 2004 (n=603). This is a 7% increase over the incidence rate for 2003 (n=559) (Figure 1).

**Seasonality:** The seasonal trend in 2004 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 1.2:1.

**Age:** The age of IPD cases ranged from 1 month to 102 years old with a mean of 53 years and median of 57 years (crude data). The distribution of incidence by age groups in 2004 remained similar in comparison to 2003 (Figure 3). The highest rate of IPD was in the over 65 age group. An increase in cases in children less than 5 years was seen in early 2004 compared to 2003. However, the numbers dropped to baseline levels by the end of summer (Figure 4). It appears that this age group experienced an early seasonal peak.

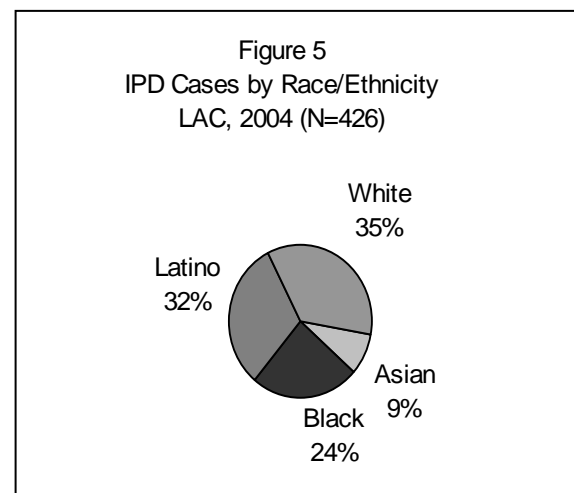
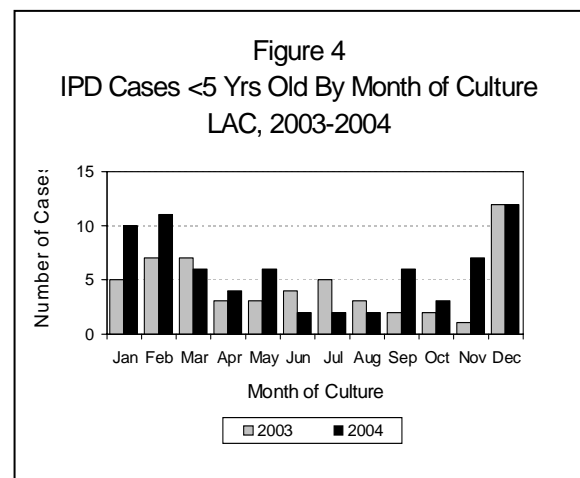
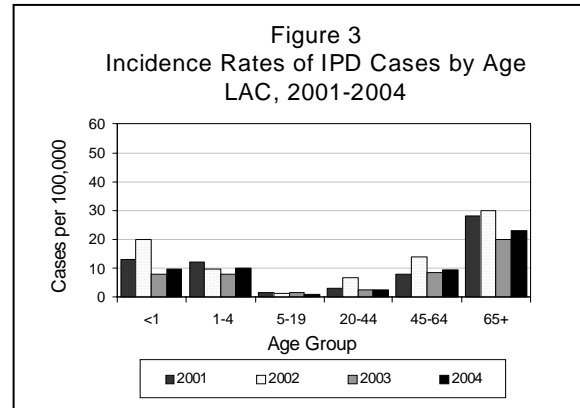
**Race/Ethnicity:** The highest percentage of cases occurred among Whites (35% [n=149]) and Latinos (32% [n=138]) (Figure 5). Latinos are underrepresented in comparison to the county population according to US Census 2000 data. However, the case population becomes comparable to LAC when adjusted for race and age (data not shown).

**Disease Severity:** During 2004, the hospitalization rate was 89% overall and higher for the over 65 age group (94%) than the less than 5 age group (68%). The case fatality rate was 11.8% (crude data). This rate is the lowest rate recorded since LAC began surveillance for IPD. The majority of deaths occurred among adults 65 years and over (60% [n=24]) and none occurred in children <18 years.

The proportion of culture sites remain the same as previous years, mainly from blood cultures only (Figure 6). Other sites reported include joint/synovial fluid, peritoneal fluid, ascites fluid, and thoracentesis fluid.

**Antibiotic Susceptibility:** For 2004, there was a rise in the proportion of penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates to 23% (n=136). This is a shift from a decreasing trend occurring since 2000. The percent of isolates nonsusceptible to erythromycin, cefotaxime, and trimethoprim-sulfamethoxazole (TMP-SMZ) has continued to decrease or remain the same (Figure 7). Almost all reported cases (99%) had antibiotic resistance information provided.

The greatest increase in the proportion of cases with PNSP isolates, from 18 to 40%, was observed among those 1–4 years of age. All isolates in children less than 1 year of age were susceptible to penicillin (Figure 8).





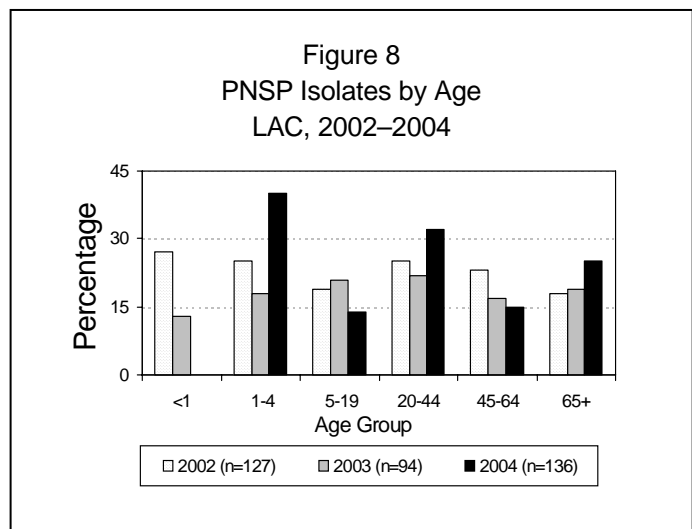
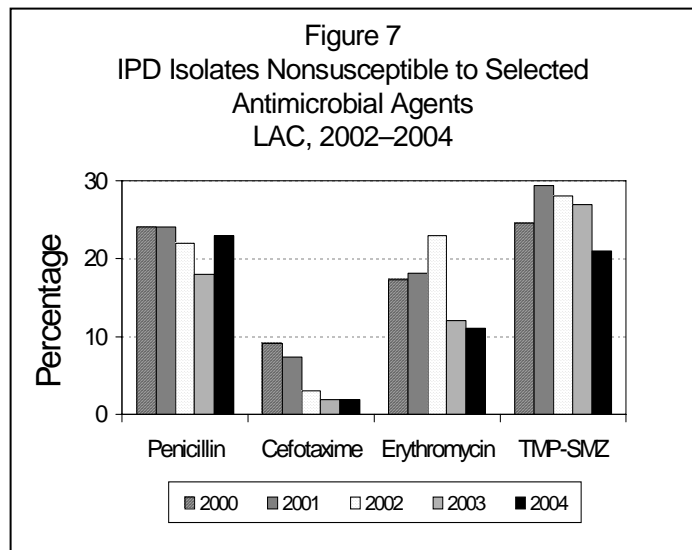
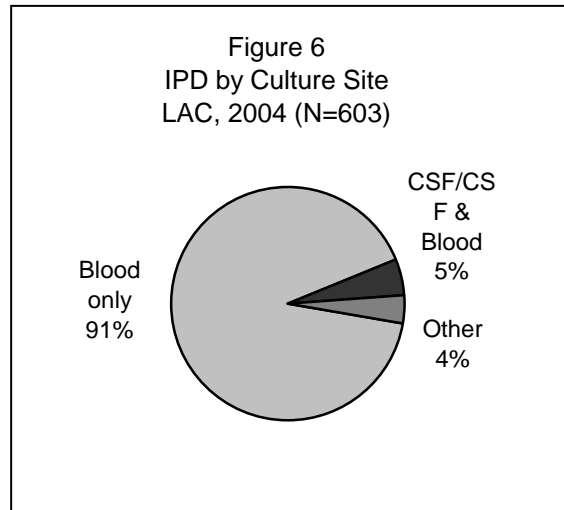
**PREVENTION**

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 less than age 2 years, and for children aged 24 through 59 months who are at high risk of invasive pneumococcal infections [2]. The 23-valent pneumococcal polysaccharide vaccine (Pneumovax<sup>®</sup>23) is recommended for all adults 65 years and those over age 2 years who are at high risk of invasive pneumococcal disease [2]. For children aged 24 through 59 months 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 [3].

**COMMENTS**

A shortage of the pneumococcal conjugate vaccine resulted in a suspension of the fourth dose beginning mid-February 2004 and also the third dose beginning March 2004 [4]. At the same time, LAC saw a rise in IPD cases in the vaccine-preventable age group of children less than two years old. A subsequent investigation found no strong association between the shortage and the increase in cases (see Special Studies Reports 2004). It was also found that the vaccination coverage for the group was very high. The PNSP rate was lower in this age group than for the overall case population and comprises only a small proportion of the high PNSP rate for the 1-4 age group.

Laboratories are the source for many of the IPD case reports to ACDC: 53% of cases were reported by laboratories only. Much of the limitations in the data are due to the minimal access that laboratories have to case information. Outcome status, for example, is known for only slightly over half of the cases. In addition, cases often are reported before the final outcome is known due to the requirement to report positive cultures within seven days. Thus, case fatality rates may be unreliable. Also, only 71% of case reports contained race/ethnicity data. However, the rate of race/ethnicity reporting is a sizeable improvement upon previous years' reporting





rates which ranged from 32–61%.

Another limitation is the relatively small case population, which produces unstable counts when stratified by multiple variables. The proportion of PNSP isolates stratified by age, for example, is not stable for certain age groups such as those <1 and 5-19 years of age. Also, the national annual incidence and case fatality rates estimated by the CDC Active Bacterial Core Surveillance system may not be accurate, as the surveillance system operates in only 10 sites across the country.

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

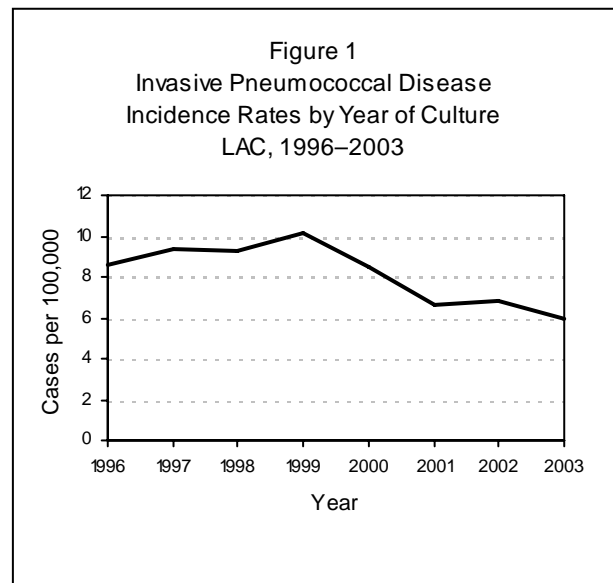
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2. CDC. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997; 46:1–24.
3. CDC. Preventing pneumococcal disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000; 49:1–35.
4. CDC. Updated recommendations on the use of pneumococcal conjugate vaccine: suspension of recommendation for third and fourth dose. MMWR 2004; 53:177–8.



## PNEUMOCOCCAL DISEASE, INVASIVE

| CRUDE DATA                    |              |
|-------------------------------|--------------|
| Number of Cases               | 559          |
| Annual Incidence <sup>a</sup> |              |
| LA County                     | 5.95         |
| United States <sup>b</sup>    | 14.20        |
| Age at Diagnosis              |              |
| Mean                          | 53           |
| Median                        | 56           |
| Range                         | <1–100 years |
| Case Fatality                 |              |
| LA County <sup>c</sup>        | 20.0%        |
| United States                 | N/A          |



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

<sup>b</sup> Estimation from provisional data from the Active Bacterial Core Surveillance Emerging Infections Program Network [3].

<sup>c</sup> Validity questionable since outcome status of 47% of 2003 cases were reported as "unknown".

### DESCRIPTION

*Streptococcus pneumoniae* is a leading cause of illness in young children and causes considerable illness and death in the elderly. This bacterium (pneumococcus) can attack different parts of the body causing pneumonia, bacteremia, and meningitis. Common symptoms are chills, fever, pleural pain, and a productive cough and transmission is via droplet spread, direct oral contact, or indirectly through articles freshly soiled with respiratory discharges [1]. The elderly, children under 2 years old, blacks, American Indians and Alaska Natives, children who attend group day care centers, and persons with underlying medical conditions including HIV infection and sickle-cell disease are at a higher risk of infection with *S. pneumoniae* [2].

LAC DHS has been following IPD as a special surveillance project since late 1995 but recently in October 2002 added IPD to its list of reportable diseases to enhance surveillance of this infection. The purpose of the surveillance is to measure the incidence of IPD in LAC, identify antibiotic resistance patterns, and monitor the effect of pneumococcal vaccines. Recently the importance of surveillance has been illustrated by the observation of the changing IPD epidemiology in LAC since the introduction of the pneumococcal conjugate vaccine for children less than 2 years old.

IPD cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site. Antimicrobial susceptibility is determined by disk diffusion or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on the National Committee for Clinical Laboratory Standards. For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antimicrobial agent if the results indicate intermediate or high-level resistance.

### DISEASE ABSTRACT

- The 2003 incidence rate for IPD continued to follow a downward trend from its peak in 1999.
- The elderly are at highest risk for acquiring IPD.
- The rate in children under 5 years was the lowest since 2000.



- Resistance to penicillin was not associated with increased mortality.

### STRATIFIED ANALYSIS

**Trends:** The IPD incidence rate for 2003 was 5.95 cases per 100,000 (n=559, Figure 1). A 41% decrease was observed in 2003 compared to the peak incidence observed in 1999.

**Seasonality:** The IPD cases from 2003 followed the typical seasonal pattern, peaking in the winter then gradually declining through spring. The pattern for most of the year was lower than the previous five-year average for most of the year (Figure 2).

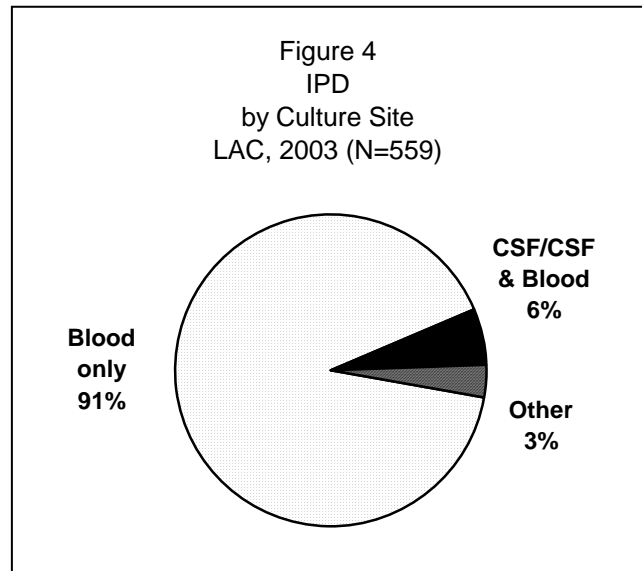
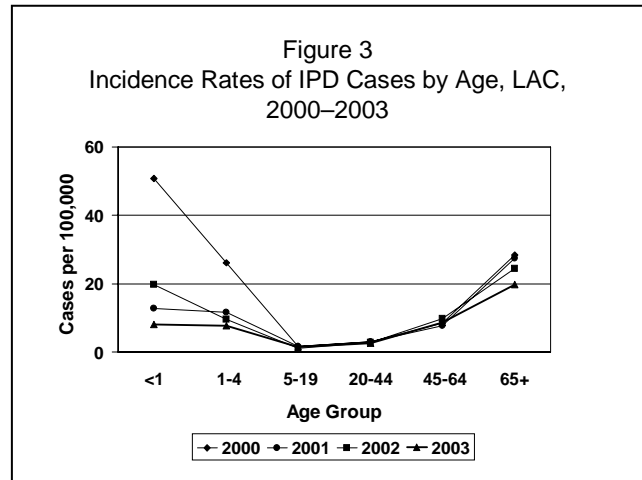
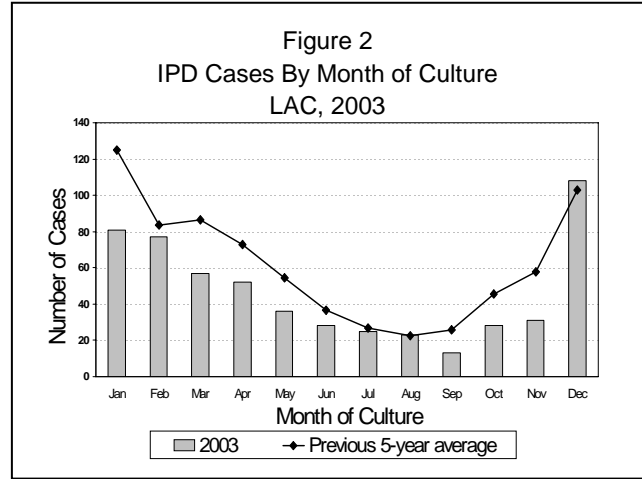
**Sex:** Male-to-female ratios indicated more males acquired IPD.

**Age:** The mean age for IPD cases was 53 years, median 56 years, ranging from 24 days to 100 years. For 2003, the highest age-specific incidence rates occurred among adults 65 years and over, which is common with IPD. Children less than 5 years of age continue to have a lower rate than previous years (Figure 3).

**Disease Severity:** In 2003, the case fatality rate was 20%, higher than previous years (range 13 to 16% from 2000 to 2002). The number of deaths did not differ greatly from last year (51 in 2002 and 58 in 2003) but the total number of cases has declined. Knowing only age and outcome status, 31 cases that died were in a vaccine-preventable age group (2 children under 2 years and 29 adults 65 years).

Reported culture site for 2003 did not vary greatly from previous years. Other sites reported included brain tissue, joint/synovial fluid, peritoneal fluid, pleural fluid, thoracentesis fluid, lower lung lobe abscess, lung tissue, and vitreous fluid (Figure 4).

**Antibiotic Susceptibility:** From 2000 to 2003, the proportion of penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates has decreased to a 4-year low (18%) in 2003 (Figure 5). Ninety-three percent of the cases had antimicrobial resistance information provided for at least one antibiotic. The percent of cases nonsusceptible to erythromycin, cefotaxime, and trimethoprim-sulfamethoxazole (TMP-SMZ) has also decreased from 2002 to 2003. Of the 252 cases reported in 2003 with testing results on levofloxacin, only two cases (0.8%) were nonsusceptible which is comparable to 0.5% seen in 2002 from a nationwide population-based surveillance system for IPD [4].

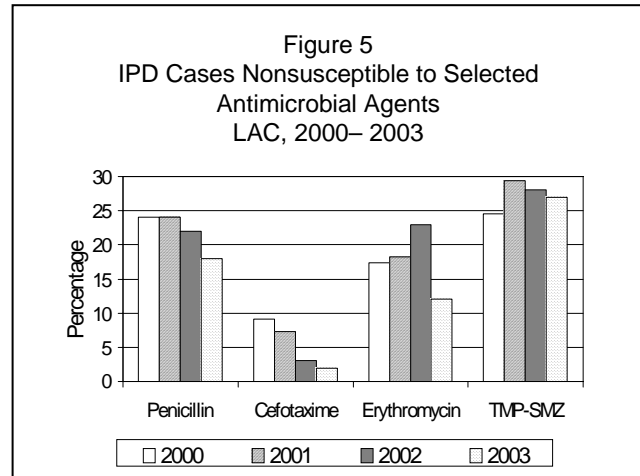




This proportion of PNSP cases changed from 2002 to 2003 for most of the age groups. The only increase of 11% (n=28) was observed among those 5 to 19 years of age and the largest decrease of 52% (n=8) was in children less than 1 year (Figure 6), although the results are unstable due to small numbers. Thirteen percent of the deaths were associated with PNSP (5/39).

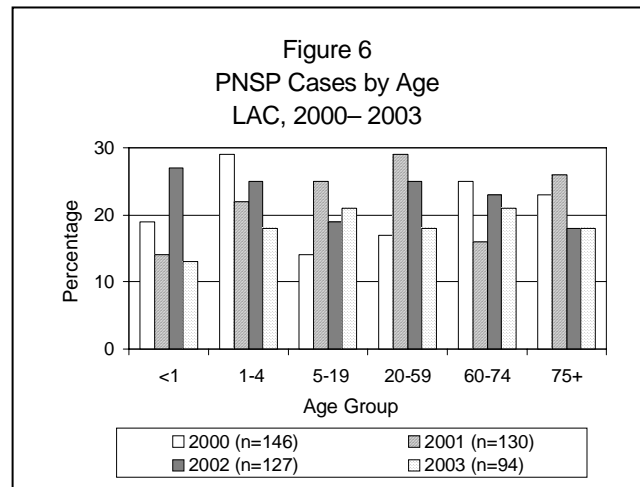
## PREVENTION

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 less than age 2 years, and for children up to age 5 years who are at high risk of invasive pneumococcal infections [3]. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are recommended for all adults  $\geq$  65 years and those over age 2 years who are at high risk of invasive pneumococcal disease [4]. For children aged 2 years 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 [4].



## COMMENTS

There were limitations to the data collected. For about half of the 2003 cases, outcome status was unknown, although it should be noted that the percent with unknown outcomes stayed constant for the past three years. Also, the case fatality rate may be underestimated since reporting of positive isolates is required within seven days and many times the final outcome of current infection has not been determined yet.



Current statistics underscore the importance of vaccination in preventing pneumococcal disease as demonstrated by the marked decrease of IPD cases in children from 2001 to 2003 after the introduction of pneumococcal conjugate vaccine (Prevnar<sup>®</sup>). The medical community should continue vaccinating children with Prevnar<sup>®</sup> but also focus their resources on promoting better vaccination rates in the elderly. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune<sup>®</sup>23 and Pneumovax<sup>®</sup>23) are especially important based on 2003 data indicating that the elderly continue to be at high risk of acquiring IPD and account for half of all IPD deaths.

## REFERENCES

1. Chin, J. Control of Communicable Diseases Manual. 17<sup>th</sup> Edition. 2000.
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3. From: [www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum\\_t.htm](http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum_t.htm). Accessed 8/9/2004.
4. CDC. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997; 46:1–24.
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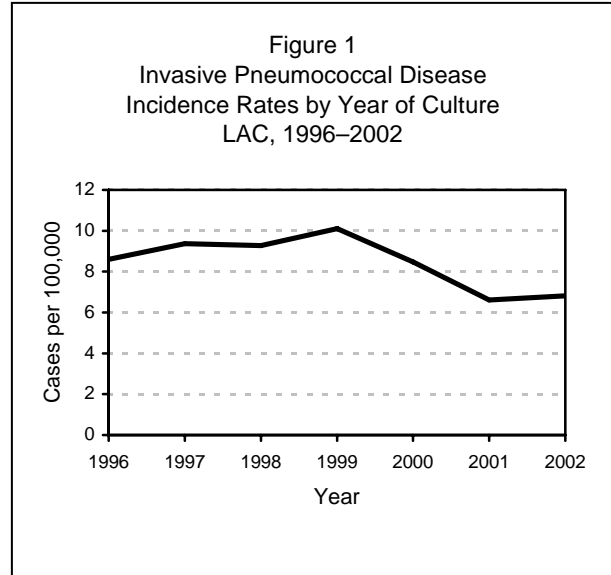


- Advisory Committee on Immunization Practices (ACIP). MMWR 2000; 49:1–35.
6. Active Bacterial Core Surveillance Reports from 1997 to 2002 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at: [www.cdc.gov/ncidod/dbmd/abcs/survreports.htm](http://www.cdc.gov/ncidod/dbmd/abcs/survreports.htm). Accessed 6/17/2004.



## PNEUMOCOCCAL DISEASE, INVASIVE

| CRUDE DATA                 |             |
|----------------------------|-------------|
| Number of Cases            | 630         |
| Annual Incidence           |             |
| LA County                  | 6.8         |
| United States <sup>b</sup> | 17.2        |
| Age at Diagnosis           |             |
| Mean                       | 52          |
| Median                     | 55          |
| Range                      | <1–99 years |
| Case Fatality              |             |
| LA County <sup>c</sup>     | 16.0%       |
| United States              | N/A         |



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

<sup>b</sup> Estimation from provisional data from the Active Bacterial Core Surveillance Emerging Infections Program Network [3].

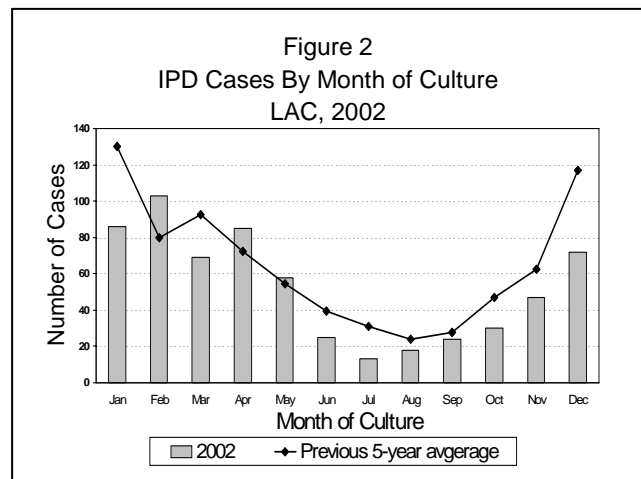
<sup>c</sup> Validity questionable since outcome status of 48% of 2002 cases were reported as "unknown".

### DESCRIPTION

*Streptococcus pneumoniae* is a leading cause of illness in young children and causes considerable illness and death in the elderly. This bacterium (pneumococcus) can attack different parts of the body causing pneumonia, bacteremia, and meningitis. Increasing antimicrobial resistance in the last decade poses a serious public health concern. A major development for pneumococcal disease in 2000 was the Food and Drug Administration's approval of a conjugate vaccine protecting children less than two years of age. Studies have indicated that the vaccine is safe and effective [1]. Previously, the only available vaccine, a polysaccharide vaccine, could not protect this high-risk age group.

In October 2002, LAC DHS added invasive pneumococcal disease (IPD) to its list of reportable diseases to enhance surveillance of this infection. Since 1995, the health department has followed LAC cases as a special surveillance project. The purpose of IPD surveillance is to measure the incidence of IPD in LAC, identify antibiotic resistance patterns, and monitor the effectiveness of the recently released pneumococcal conjugate vaccine.

IPD cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site. Antimicrobial susceptibility is determined by disk diffusion or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on the National Committee for Clinical Laboratory Standards. An isolate of *S. pneumoniae* is considered nonsusceptible to an antimicrobial agent if the results indicate intermediate or high-level resistance.





## DISEASE ABSTRACT

- The 2002 incidence rate for IPD increased slightly from 2001, although it was lower than previous years (1996–2000).
- The elderly are at highest risk for acquiring IPD.
- The rate in children under 5 years continued to decrease, a trend also found in 2001.
- Resistance to penicillin was not associated with increased mortality.

## STRATIFIED ANALYSIS

**Trends:** The IPD incidence rate for 2002 was 6.8 cases per 100,000 (n=630, Figure 1). A 33% decrease was observed in 2002 compared to the peak incidence observed in 1999.

**Seasonality:** The IPD cases from 2002 followed the typical seasonal pattern, peaking in late winter then gradually declining through spring. The pattern observed by month for 2002 was very similar to previous years although not as high at the end of the year (Figure 2).

**Sex:** Male-to-female ratios indicated more males acquired IPD (Table 1).

**Table 1. Characteristics of Invasive Pneumococcal Disease Cases— LAC, 1999–2002**

| Characteristic          | 1999<br>(N=894) | 2000<br>(N=760) | 2001<br>(N=603) | 2002<br>(N=630) |
|-------------------------|-----------------|-----------------|-----------------|-----------------|
| Male: Female rate ratio | 1.23:100        | 1.05:1.00       | 1.18:1.00       | 1.23:1.00       |
| Age (years)             |                 |                 |                 |                 |
| Mean                    | 47              | 43              | 51              | 52              |
| Median                  | 53              | 48              | 55              | 55              |
| Range                   | <1–100          | <1–101          | <1–103          | <1–99           |
| Case Fatality rate      | 17%<br>(55/328) | 13%<br>(42/320) | 15%<br>(39/252) | 16%<br>(51/327) |
| Culture Site            |                 |                 |                 |                 |
| Blood only              | 836 (94%)       | 703 (93%)       | 540 (90%)       | 567 (90%)       |
| CSF/CSF & blood         | 44 (5%)         | 33 (4%)         | 34 (6%)         | 41 (7%)         |
| Other                   | 14 (2%)         | 24 (3%)         | 29 (5%)         | 22 (3%)         |

**Age:** The mean age for IPD cases was 52 years, median 55 years, ranging from 4 days to 99 years (Table 1). For 2002, the highest age-specific incidence rates occurred among adults 65 years and over, which is common with IPD. Children less than 5 years of age continue to have a lower rate than found during 1999 to 2000, but not as low as 2001 (Figure 3).

**Disease Severity:** In 2002, the case fatality rate was 16%, similar to last year (Table 1). The validity of this data is questionable since outcome status for over half of the 2002 cases was unknown, although it should be noted that the percent with unknown outcomes stayed constant for the past three years. The case fatality rate may be underestimated since reporting of positive isolates is required within seven days and many times the final outcome of current infection has not been determined yet. In 2002, there was minimal fluctuation between the proportion of cases with cultures taken from the CSF versus other sites (e.g., ascites fluid, joint/synovial fluid, endotracheal fluid, pleural fluid, sinus, thoracentesis fluid, upper lobe fluid, and vitreous fluid). Of the meningitis cases with known outcome, only one case died.

**Antibiotic Susceptibility:** From 1998 to 2002, the proportion of penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates has decreased to 5-year low (24%) in 2002 (Figure 3). Ninety-five percent of the cases had antimicrobial resistance information provided. The percent of cases nonsusceptible to erythromycin, cefotaxime, and trimethoprim-sulfamethoxazole (TMP-SMZ) decreased from 2001 to 2002. Of the 281 cases reported in 2002 with testing results on levofloxacin, only one case (0.4%) was nonsusceptible



which is slightly lower than 0.7% seen in 2001 from a nationwide population-based surveillance system for IPD [3].

From 2001 to 2002, the proportion of PNSP cases fluctuated for most of the age groups. The largest increase of 93% (n=26) was observed among those less than 1-year of age, although the result is unstable due to small numbers. The largest decrease of 31% (n=146) was in adults 75 years and over (Figure 5). Only 14% (6 of 42 cases) of the cases that died had PNSP.

### 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 [1]. 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 [2]. For children aged 2 years 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 23-valent pneumococcal polysaccharide vaccine, in order to provide protection against a broader range of serotypes, although supporting data are limited [2].

### COMMENTS

For 2002, the resistance pattern toward selected antibiotics has decreased from the previous year. Once again the elderly were at a higher risk of acquiring IPD. Like 2001, there was a decrease in the 2002 incidence of IPD in children less than 5 years compared to previous years (1996–2000), which may be attributed to the use of the pneumococcal conjugate vaccine licensed in 2000. As in previous years, resistance toward penicillin was not associated with increased mortality.

### REFERENCES

1. CDC. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997; 46:1–24.

Figure 3  
Incidence Rates of IPD Cases by Age, LAC, 1999–2002

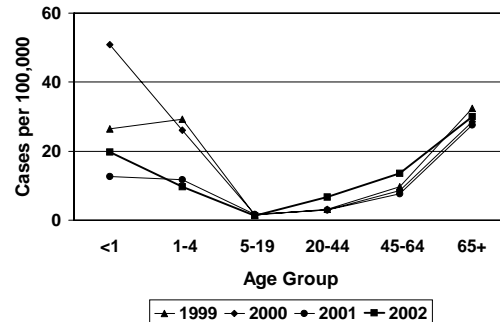


Figure 5  
PNSP Cases by Age  
LAC, 1998–2002

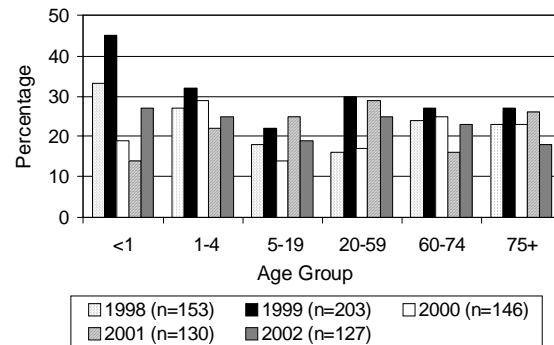
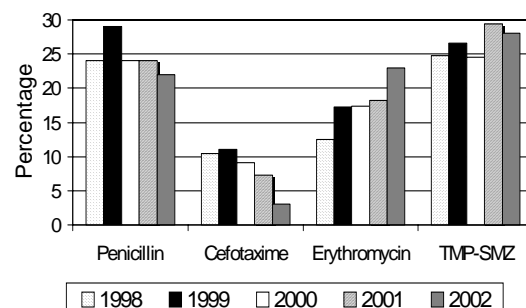


Figure 4  
IPD Cases Nonsusceptible to Selected  
Antimicrobial Agents  
LAC, 1998–2002





2. CDC. Preventing pneumococcal disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000; 49:1–35.
3. Active Bacterial Core Surveillance Reports from 1998 to 2001 (2001 provisional) from the Center of Disease Control and Prevention'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)