INVASIVE PNEUMOCOCCAL DISEASE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERNS FOR STREPTOCOCCUS PNEUMONIAE IN LOS ANGELES COUNTY, 2000

BACKGROUND

Streptococcus pneumoniae infection is the leading cause of pneumonia, bacteremia, and meningitis in the United States. Since 1995, the Los Angeles County (LAC) Department of Health Services (DHS) has operated a laboratory- and hospital-infection-control-based surveillance system for invasive pneumococcal disease (IPD). IPD was selected for surveillance to measure the incidence in LAC, track antibiotic resistance patterns, potentially monitor immunization efficacy, and target vaccine usage.

Table 1: MIC Breakpoints for Selected Agents Used to Treat *Streptococcus pneumoniae* Infection

Antimicrobial	MIC (μg/mL) Susceptible	Intermediate	Resistant
Penicillin	≤0.06	0.12-1.0	≥2.0
3rd generation Cephalosporin (cefotaxime,ceftriaxone,cefuroxime)	≤0.5	1.0	≥2.0
Erythromycin	≤0.25	0.5	≥1.0
Trimethoprim-sulfamethoxazole (TMP-S)	≤0.5/9.5	1/19-2/38	≥4/76

A major development for IPD in 2000 was the Food and Drug Administration's approval of a conjugate vaccine protecting children less than two years of age. Previously, the only available vaccine, polysaccharide vaccine, could not protect this high-risk age group. Studies have indicated that the vaccine is safe and effective (1).

Table 2: Characteristics of IPD Cases Los Angeles County, 1997-2000

Characteristics*	1997 (N=818)	1998 (N=814)	1999 (N=894)	2000 (N=760)
Male:Female Ratio	1.10:1.00	1.06:1.00	1.03:1.00	1.01:1.00
Age (years)				
Mean	44	44	47	43
Median	49	50	53	48
Range	1 mo.-106	<1 day–102	1 day–100	<1 day –101
Case fatality rate	15% (59/383)	15% (53/346)	17% (55/328)	13% (42/320)
Culture site				
Blood only	771 (95%)	776 (96%)	836 (94%)	703 (93%)
CSF/CSF&Blood	30 (4%)	28 (3%)	44 (5%)	33 (4%)
Other	13 (2%)	10 (1%)	14 (2%)	24 (3%)

*Data not available on race/ethnicity and characteristic information not available for all cases.

Increasing antimicrobial resistance continues to be a problem with pneumococcal disease. In a report by the Centers for Disease Control and Prevention Working Group on *S. pneumoniae*, their nationwide population-based surveillance system observed a percent increase of penicillin nonsusceptible *S. pneumoniae* isolates from 14% in 1993-1994 to 27% in 1999 (2,3). Other classes of antimicrobials such as the macrolides, cephalosporins, and fluoroquinolones also have developed resistance.

The following is a description of the 2000 incidence of reported IPD and *S. pneumoniae* antimicrobial susceptibility patterns in individuals residing in LAC (excluding the cities of Long Beach and Pasadena).

METHODS

Cases were defined as LAC residents with a positive isolate for *S. pneumoniae* from a normally sterile site collected in 2000. To calculate incidence rates, population data were derived from the 1990 census using sophisticated estimation techniques developed by the LAC Urban Research Section. Antimicrobial susceptibility was determined by disk diffusion or dilution diffusion. It was assumed that minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories were based on the National Committee for Clinical Laboratory Standards. The breakpoints for selected antimicrobial agents are illustrated in Table 1. An isolate of *S. pneumoniae* was considered nonsusceptible to an antimicrobial agent if the results indicated intermediate or high-level resistance. Data were entered in Microsoft Access 97 and analyzed using Epi-Info 6.04 and SAS Version 6.12.

DATA ANALYSIS

The annual incidence of reported IPD decreased 16% from 9.8 cases per 100,000 (n=894) in 1999 to 8.2 cases in 2000 (n=760). As indicated by Table 2, the male-to-female rate ratios indicated that there were slightly more males who acquired IPD. In 2000, the mean age for IPD cases was 43 years (median 48 years, range <1 day to 101 years), which was comparable to the previous three years.

In 2000, the case-fatality rate was 13%, which was the lowest rate in four years (Table 2). The validity of this data is questionable since outcome status of 58% of the cases for 2000 were reported as "unknown," although it should be noted that the percent "unknown" stayed constant for the previous three years. The case-fatality rate may be underestimated since reporting of positive isolates is required within 24 hours and many times the final outcome of current infection has not yet been determined. The distribution of cases by culture site varied little from 1997 to 2000. As in previous years, mortality in 2000 was not significantly associated with having

Figure 1: Incidence Rates of IPD Cases by Age, Los Angeles County, 1997-2000

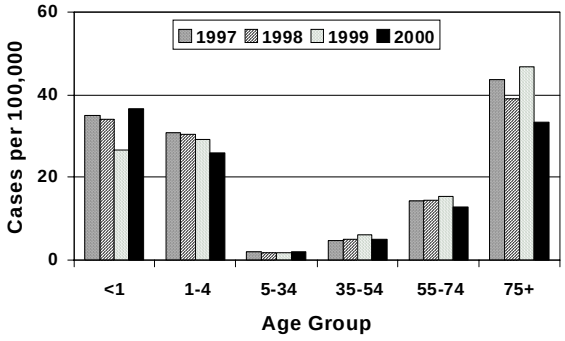
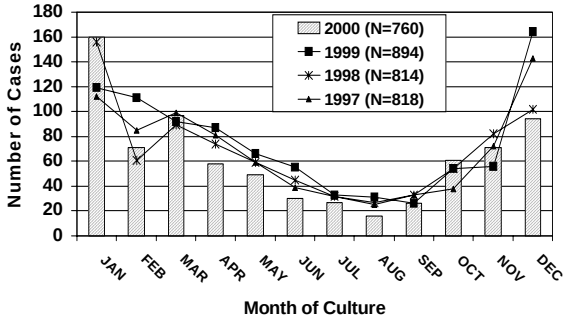


Figure 2: IPD Cases By Month of Culture Los Angeles County, 1997-2000



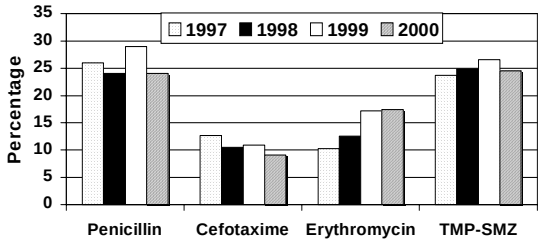
meningitis (odds ratio [OR]: 1.11; 95% confidence interval: 0.19 to 4.38, p=0.55).

For 2000, the highest age-specific incidence rates occurred in children under five years and adults 75 years and over, which is common with IPD (Figure 1). Comparing 2000 to 1999, the age-specific incidence rates decreased in all age groups except in infants less-than-one-year (+38%).

The IPD cases for 1997-2000 followed the typical seasonal pattern, peaking in late winter, then gradually declining through spring. The pattern observed by month for 2000 was very similar to what was seen in 1997 (Figure 2).

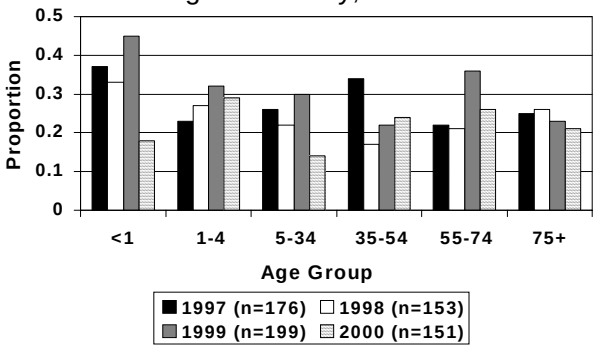
In 2000, Inglewood District had the highest crude rate of IPD at 13.1 per 100,000 population (54 cases) followed by Glendale with a rate of 11.5 (39) and West Valley with 10.8 (79). The West Valley District had the highest number of cases. Inglewood District continued to have the highest rate (13.4 cases per 100,000) even after adjusting for age (using the age groups in Figure 1). From 1998-2000, Southwest District was among the top three districts with the highest age-adjusted rates.

Figure 3: IPD Cases Nonsusceptible to Selected Antimicrobial Agents
Los Angeles County, 1997-2000



From 1997 to 2000, the proportion of penicillin nonsusceptible *Streptococcus pneumoniae* (PNSP) isolates has fluctuated from a low of 24% in 1998 and 2000 to a high of 29% in 1999 (Figure 3). The fluctuation of PNSP by year was not significant (χ^2=7.12, p-value=0.07). The percent of cases nonsusceptible to erythromycin increased from 1997 to 2000 and cefotaxime decreased while trimethoprim-sulfamethoxazole (TMP-SMZ) remained about the same.

Figure 4: PNSP Cases by Age
Los Angeles County, 1997-2000



In 2000, the proportion of PNSP cases was lower than the previous year among all age groups except adults 35-54 years. The largest decrease (-60%) of penicillin resistance from 1999 to 2000 was in infants less than one year (Figure 4). In 2000, there was not a significant difference between age groups

and penicillin nonsusceptibility (χ^2=7.28, p-value=0.20). Also mortality was not significantly associated with penicillin nonsusceptibility.

DISCUSSION

The DHS observed a decrease in incidence and antibiotic nonsusceptibility for cases of IPD in 2000. The very young and the elderly had a higher risk of acquiring IPD. Resistance was not associated with increased mortality. For more information regarding antimicrobial resistance and IPD in LAC, see the other 2000 special studies report on "Factors Associated with Acquiring Penicillin Nonsusceptible Invasive Pneumococcal Disease in Los Angeles County."

REFERENCES

1. Centers for Disease Control and Prevention: Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1997;46:1-24.

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3. Active Bacterial Core Surveillance reports for 1998 and 1999 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at http://www.cdc.gov/ncidod/dbmd/abcs/survreports.htm.