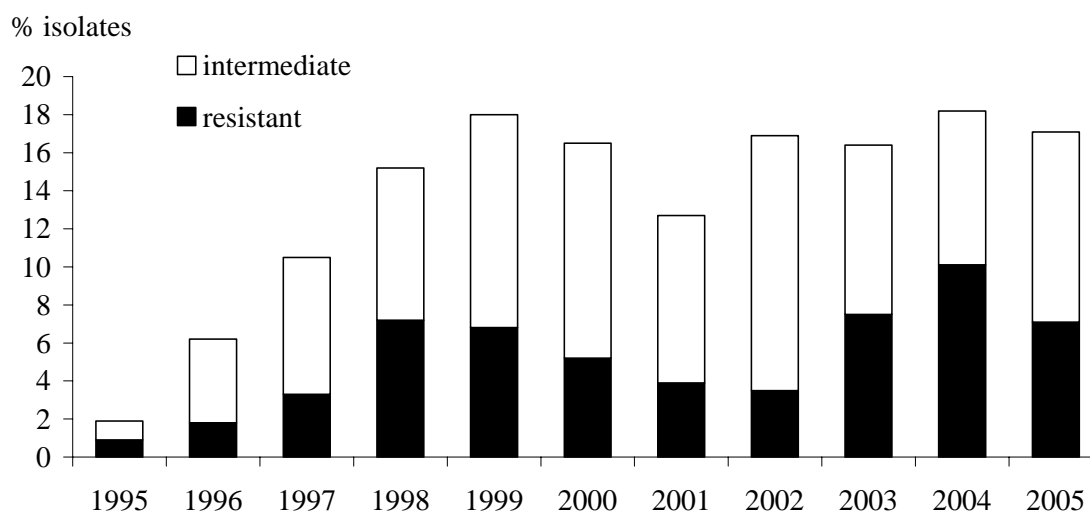


Antimicrobial susceptibility of invasive *Streptococcus pneumoniae*, 2005

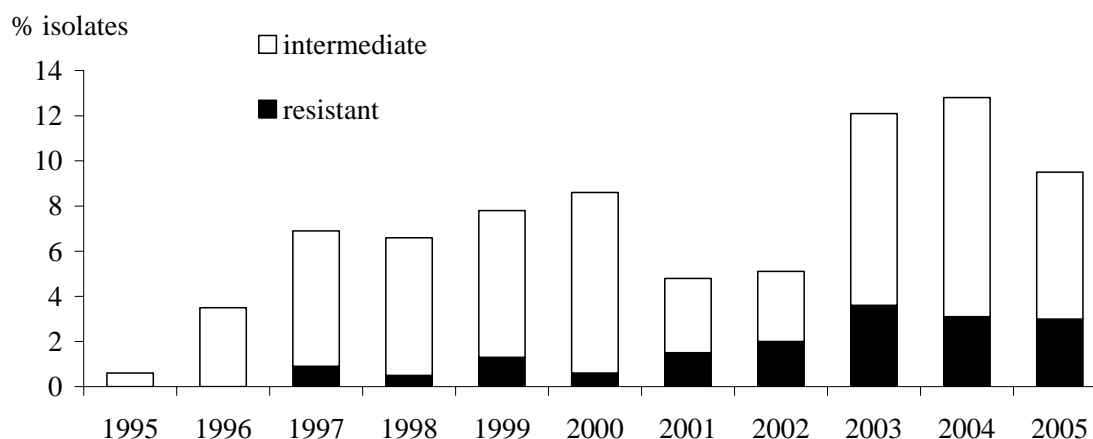
The antimicrobial susceptibility of all 492 viable invasive isolates of *S. pneumoniae* referred to ESR in 2005 was tested. 17.1% (84) were categorised as penicillin nonsusceptible (MIC ≥ 0.12 mg/L): 7.1% (35) as resistant (MIC ≥ 2 mg/L) and 10.0% (49) as intermediate (MIC 0.12-1 mg/L). Over the last decade there has been considerable variation in the prevalence of penicillin resistance, with a significant increase between 1995 and 1998-9, a decrease between 1999 and 2002 and then a further increase (Figure 1). Penicillin nonsusceptibility increased between 1995 and 1999, but there has been no significant change since then.

Figure 1. Penicillin resistance and nonsusceptibility among pneumococci from invasive disease, 1995-2005



Applying the CLSI meningitis interpretive standards, 9.6% (47) of the 492 invasive isolates were categorised as cefotaxime nonsusceptible (MIC ≥ 1 mg/L): 3.0% (15) as resistant (MIC ≥ 2 mg/L) and 6.5% (32) as intermediate (MIC 1 mg/L). Applying the non-meningitis interpretive standards, 3.0% (15) were categorised as cefotaxime nonsusceptible (MIC ≥ 2 mg/L): 1.4% (7) as resistant (MIC ≥ 4 mg/L) and 1.6% (8) as intermediate (MIC 2 mg/L). Trends in cefotaxime resistance and nonsusceptibility since 1995 are shown in Figure 2, and indicate a trend of increasing resistance to 3rd-generation cephalosporins, although there has been no increase in the last two years.

Figure 2. Cefotaxime resistance and nonsusceptibility (meningitis interpretations) among pneumococci from invasive disease, 1995-2005



The rates of resistance to other antibiotics among the 492 invasive isolates tested in 2005 included 3.3% chloramphenicol resistance, 32.1% co-trimoxazole resistance, 12.2% erythromycin resistance, and 8.5% tetracycline resistance. All isolates were susceptible to moxifloxacin and vancomycin.

Penicillin and cefotaxime resistance and nonsusceptibility in each district health board (DHB) is shown in Figures 3 and 4. These DHB data are influenced to some extent by the small numbers of invasive pneumococci isolated in some DHBs. There were less than 20 isolates from the Tairawhiti (5), Taranaki (10), Whanganui (0), MidCentral (12), Hutt (10), Wairarapa (4), Nelson-Marlborough (5), West Coast (0) and Southland (8) DHBs. For the analyses presented in Figures 3 and 4, the three DHBs in the greater Auckland area were combined, as were the Canterbury and South Canterbury DHBs.

Figure 3. Penicillin resistance and nonsusceptibility by district health board, 2005

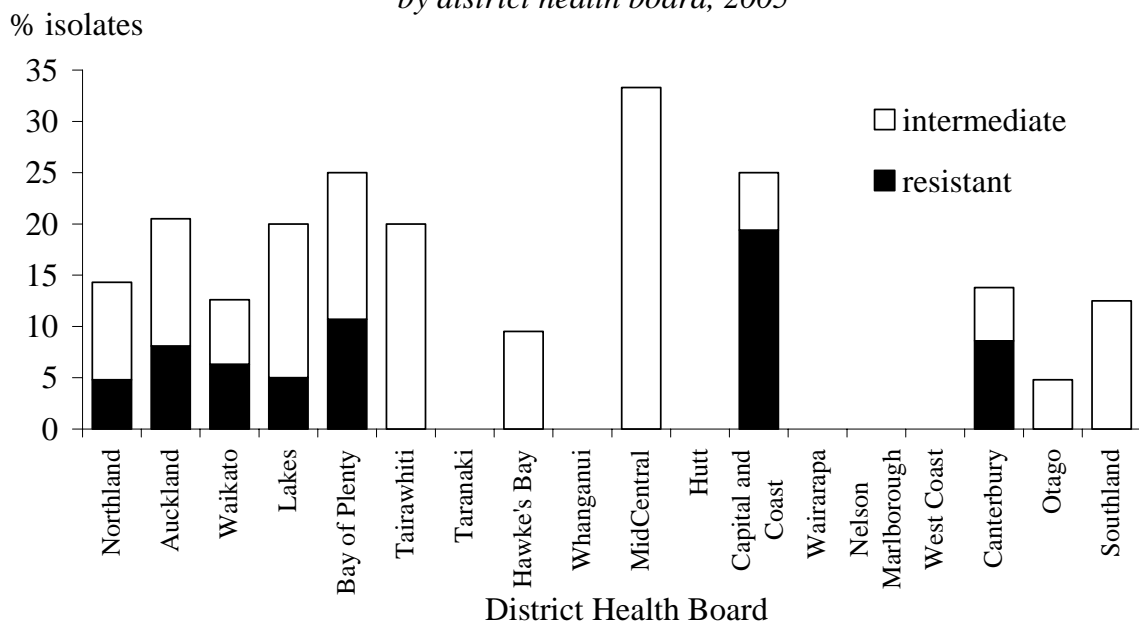
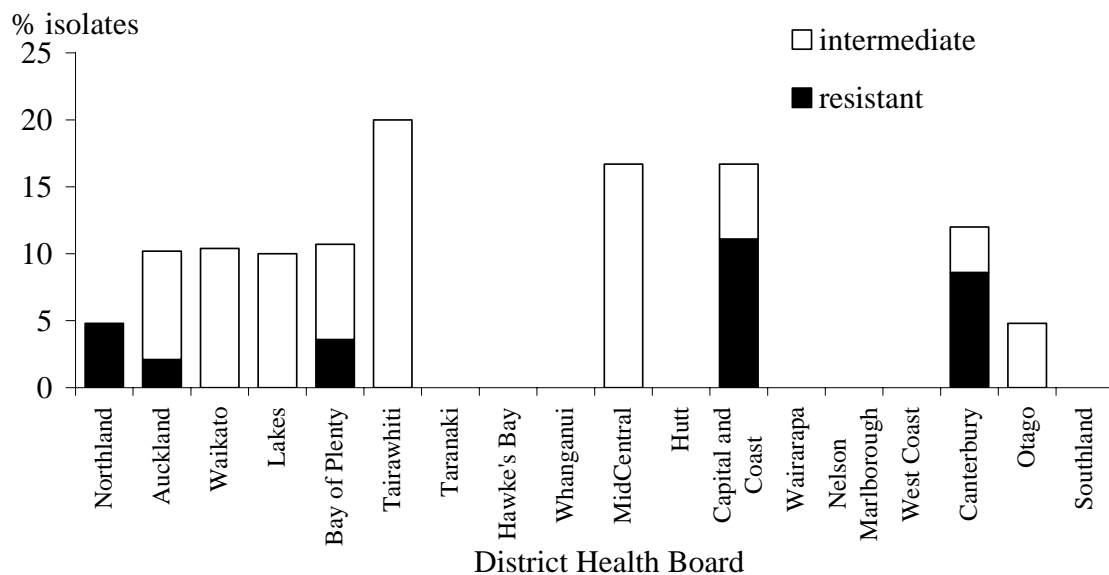


Figure 4. Cefotaxime resistance and nonsusceptibility (meningitis interpretations) by district health board, 2005



Penicillin and cefotaxime resistance and nonsusceptibility in the different age groups is shown in Table 1, and, for both antibiotics, was highest in pneumococci isolated from patients under 5 years of age.

Table 1. Penicillin and cefotaxime resistance and nonsusceptibility among invasive pneumococcal isolates by patient age, 2005

Age (years)	Percent			
	Penicillin		Cefotaxime	
	Nonsusceptible MIC \geq 0.12 mg/L	Resistant MIC \geq 2 mg/L	Nonsusceptible ¹ MIC \geq 1 mg/L	Resistant ¹ MIC \geq 2 mg/L
\leq 4 (n=152)	21.7	10.5	15.8	5.9
5-14 (n=21)	14.3	4.8	0	0
15-64 (n=156)	12.8	3.9	5.1	0.6
\geq 65 (n=163)	17.2	7.4	9.2	3.1
All ages (n=492)	17.1	7.1	9.6	3.0

¹ Based on meningitis interpretive standards

The majority of the penicillin-nonsusceptible isolates belonged to the capsular types usually associated with penicillin resistance (Table 2). Until 2000, serotype 9V was the prevalent penicillin-resistant serotype (Figure 5). Then between 2000 and 2003, serotype 19F was prevalent. Since 2003, no one serotype has been clearly predominant. Serotype 19F is the most common type among cefotaxime-resistant isolates. The majority of these cefotaxime-resistant serotype 19F isolates belong to a strain that is multiresistant to penicillin, cefotaxime, co-trimoxazole, erythromycin and tetracycline.

Table 2. Distribution of capsular types among penicillin and cefotaxime resistant and nonsusceptible invasive pneumococcal isolates, 2005

Capsular antigen type	Number (% ¹) isolates			
	Penicillin		Cefotaxime	
	Nonsusceptible MIC \geq 0.12 mg/L	Resistant MIC \geq 2 mg/L	Nonsusceptible ² MIC \geq 1 mg/L	Resistant ² MIC \geq 2 mg/L
19F	16 (19.1)	13 (37.1)	15 (31.9)	12 (80.0)
14	20 (23.8)	10 (28.6)	14 (29.8)	2 (13.3)
9V	21 (25.0)	6 (17.1)	9 (19.2)	0
6B	15 (17.9)	4 (11.4)	7 (14.9)	0
23F	7 (8.3)	2 (5.7)	2 (4.3)	1 (6.7)
19A	2 (2.4)	0	0	0
Others	3 ³	0	0	0
Total	84	35	47	15

¹ Percentage of the nonsusceptible or resistant isolates

² Based on meningitis interpretive standards

³ One serogroup 15, one serotype 18C and one non-typable

Figure 5. Capsular antigen type distribution among penicillin-resistant pneumococci from invasive disease, 1996-2005

