

**Antibiotic Susceptibility Testing by Broth Microdilution: Invasive *Streptococcus pneumoniae* Isolates
Minneapolis-St. Paul and Seven County Metropolitan Area: 1996-2001**

Drug class:	penicillins/carbapenems		second generation cephalosporin		third generation cephalosporin		lincosamide		macrolide		tetracycline		folic acid antagonist-sulfonamide		quinolone					
	Penicillin		Amoxicillin		Meropenem		Cefuroxime		Cefotaxime ¹		Clindamycin		Erythromycin		Tetracycline		Trimeth-Sulfameth.		Levofloxacin	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
2001																				
Susceptible	235	77.3%	285	93.8%	256	84.2%	250	82.2%	254	83.6%	294	96.7%	244	80.3%	275	90.5%	216	71.1%	303	99.7%
Intermediate	21	6.9%	3	1.0%	28	9.2%	1	0.3%	34	11.2%	0	0.0%	2	0.7%	1	0.3%	19	6.3%	0	0.0%
Resistant	48	15.8%	16	5.3%	20	6.6%	53	17.4%	16	5.3%	10	3.3%	58	19.1%	28	9.2%	69	22.7%	1	0.3%
Total	304		304		304		304		304		304		304		304		304		304	
2000																				
Susceptible	301	73.4%	367	89.5%	327	79.8%	315	76.8%	341	83.2%	397	96.8%	306	74.6%	376	91.7%	273	66.6%	408	99.5%
Intermediate	41	10.0%	12	2.9%	41	10.0%	9	2.2%	41	10.0%	0	0.0%	0	0.0%	0	0.0%	22	5.4%	0	0.0%
Resistant	68	16.6%	31	7.6%	42	10.2%	86	21.0%	28	6.8%	13	3.2%	104	25.4%	34	8.3%	115	28.0%	2	0.5%
Total	410		410		410		410		410		410		410		410		410		410	
1999																				
Susceptible	423	75.8%	516	92.5%	461	82.6%	453	81.2%	465	83.3%	545	97.7%	434	77.8%	509	91.2%	371	66.5%	558	100.0%
Intermediate	43	7.7%	5	0.9%	34	6.1%	4	0.7%	71	12.7%	0	0.0%	0	0.0%	0	0.0%	37	6.6%	0	0.0%
Resistant	92	16.5%	37	6.6%	63	11.3%	101	18.1%	22	3.9%	13	2.3%	124	22.2%	49	8.8%	150	26.9%	0	0.0%
Total	558		558		558		558		558		558		558		558		558		558	
1998																				
Susceptible	374	79.7%	449	95.7%	405	86.4%	400	85.7%	407	86.8%	457	97.4%	392	83.6%	428	91.3%	337	71.9%	466	99.8%
Intermediate	34	7.2%	2	0.4%	23	4.9%	4	0.9%	42	9.0%	0	0.0%	0	0.0%	1	0.2%	30	6.4%	0	0.0%
Resistant	61	13.0%	18	3.8%	41	8.7%	63	13.5%	20	4.3%	12	2.6%	77	16.4%	40	8.5%	102	21.7%	1	0.2%
Total	469		469		469		467		469		469		469		469		469		467	
1997																				
Susceptible	340	78.2%	416	95.6%	375	86.2%	-	-	375	86.2%	425	97.7%	380	87.4%	403	92.6%	302	69.4%	420	96.6%
Intermediate	42	9.7%	11	2.5%	30	6.9%	-	-	33	7.6%	2	0.5%	1	0.2%	0	0.0%	25	5.7%	13	3.0%
Resistant	53	12.2%	8	1.8%	30	6.9%	-	-	27	6.2%	8	1.8%	54	12.4%	32	7.4%	108	24.8%	2	0.5%
Total	435		435		435		-	-	435		435		435		435		435		435	
1996																				
Susceptible	365	85.9%	416	97.9%	393	92.5%	-	-	394	92.7%	418	98.4%	385	90.6%	399	93.9%	327	76.9%	412	96.9%
Intermediate	27	6.4%	4	0.9%	16	3.8%	-	-	20	4.7%	0	0.0%	2	0.5%	1	0.2%	19	4.5%	13	3.1%
Resistant	33	7.8%	5	1.2%	16	3.8%	-	-	11	2.6%	7	1.6%	38	8.9%	25	5.9%	79	18.6%	0	0.0%
Total	425		425		425		-	-	425		425		425		425		425		425	

Methods: Isolates from 1996 represent 85% of cases (425/501), 1997: 93% of cases (435/467), 1998: 93% of cases (469/503), 1999: 96% (558/583), 2000: 94% (410/438), and 2001: 90% (304/339). MICs were determined by broth microdilution. NCCLS 2002 MIC interpretive standards for *S. pneumoniae* were used.

Also Tested: For susceptibility to **chloramphenicol**: 2-3% of isolates were resistant each year from 1999-2001; between 4-5% were resistant each year from 1996-98. All isolates were screened for resistance to **vancomycin**: all isolates were susceptible. Different screening MICs have been utilized for **rifampin**; through 1999 all isolates were susceptible (MICs < 1 µg/mL); in 2000 all MICs were < 4 µg/mL (undefined susceptibility) and in 2001, all were < 2 µg/mL (intermediate or susceptible). From 1996-1999, all isolates were susceptible to **quinupristin/dalfopristin**; in 2000 < 1% (2/410), and in 2001 1% (2/304) were resistant.

Note: ¹In 2002 NCCLS cefotaxime and ceftriaxone breakpoints are changing for nonmeningitis pneumococcal isolates. Reported above are the proportions of isolates in each susceptibility category by the **meningitis breakpoints** (S: ≤ 0.5µg/mL, I: 1µg/mL, R: ≥ 2µg/mL). **Nonmeningitis breakpoints** are S: ≤ 1µg/mL, I: 2µg/mL, R: ≥ 4µg/mL, so adding isolates included in the susceptible and intermediate categories above gives the number susceptible to cefotaxime by nonmeningitis breakpoints.

**Penicillin Susceptibility by Age Group and Year and Multiple-Drug Resistance by Year: Invasive *Streptococcus pneumoniae* Isolates
Minneapolis-St. Paul and Seven County Metropolitan Area: 1996-2001**

	Penicillin Susceptibility											Resistant to One or More Drug Classes ¹			
	0-4 years		5-17 years		18-39 years		40-64 years		65 years and over		Total		All Ages		
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	
2001															
Susceptible	51	71.8%	18	85.7%	26	78.8%	69	87.3%	71	71.0%	235	77.3%	1 Drug Class	32	10.5%
Intermediate	8	11.3%	1	4.8%	0	0.0%	3	3.8%	9	9.0%	21	6.9%	2-3 Drug Classes	36	11.8%
Resistant	12	16.9%	2	9.5%	7	21.2%	7	8.9%	20	20.0%	48	15.8%	4-6 Drug Classes	23	7.6%
Total	71		21		33		79		100		304		Total	304	
2000															
Susceptible	87	65.4%	15	83.3%	30	71.4%	79	83.2%	90	73.8%	301	73.4%	1 Drug Class	47	11.5%
Intermediate	13	9.8%	1	5.6%	5	11.9%	8	8.4%	14	11.5%	41	10.0%	2-3 Drug Classes	71	17.3%
Resistant	33	24.8%	2	11.1%	7	16.7%	8	8.4%	18	14.8%	68	16.6%	4-6 Drug Classes	26	6.3%
Total	133		18		42		95		122		410		Total	410	
1999															
Susceptible	134	67.0%	20	87.0%	60	84.5%	100	80.0%	109	78.4%	423	75.8%	1 Drug Class	56	10.0%
Intermediate	19	9.5%	0	0.0%	5	7.0%	5	4.0%	14	10.1%	43	7.7%	2-3 Drug Classes	85	15.2%
Resistant	47	23.5%	3	13.0%	6	8.5%	20	16.0%	16	11.5%	92	16.5%	4-6 Drug Classes	39	7.0%
Total	200		23		71		125		139		558		Total	558	
1998															
Susceptible	140	71.1%	25	96.2%	44	89.8%	73	93.6%	92	77.3%	374	79.7%	1 Drug Class	52	11.1%
Intermediate	22	11.2%	0	0.0%	0	0.0%	1	1.3%	11	9.2%	34	7.2%	2-3 Drug Classes	46	9.8%
Resistant	35	17.8%	1	3.8%	5	10.2%	4	5.1%	16	13.4%	61	13.0%	4-6 Drug Classes	32	6.8%
Total	197		26		49		78		119		469		Total	469	
1997															
Susceptible	127	75.1%	17	81.0%	38	74.5%	65	84.4%	93	79.5%	340	78.2%	1 Drug Class	58	13.3%
Intermediate	18	10.7%	2	9.5%	6	11.8%	7	9.1%	9	7.7%	42	9.7%	2-3 Drug Classes	41	9.4%
Resistant	24	14.2%	2	9.5%	7	13.7%	5	6.5%	15	12.8%	53	12.2%	4-6 Drug Classes	26	6.0%
Total	169		21		51		77		117		435		Total	435	
1996															
Susceptible	138	85.2%	22	78.6%	46	93.9%	72	87.8%	87	83.7%	365	85.9%	1 Drug Class	45	10.6%
Intermediate	8	4.9%	3	10.7%	2	4.1%	5	6.1%	9	8.7%	27	6.4%	2-3 Drug Classes	33	7.8%
Resistant	16	9.9%	3	10.7%	1	2.0%	5	6.1%	8	7.7%	33	7.8%	4-6 Drug Classes	18	4.2%
Total	162		28		49		82		104		425		Total	425	

Note: ¹To assess multiple-drug susceptibility, the following beta-lactam/cephalosporin agents were considered one drug class: penicillin, amoxicillin, meropenem, cefuroxime, and cefotaxime, and the following fluoroquinolones were considered one drug class: levofloxacin and ofloxacin. Five additional antibiotics each representing a single *drug class* were assessed: clindamycin (*lincosamide*), erythromycin (*macrolide*), tetracycline (*tetracycline*), trimethoprim-sulfamethoxazole (*folic acid antagonist-sulfonamide*), and chloramphenicol (*phenicol*). In total, seven drug classes were assessed.