



# THE CITY OF NEW YORK

DEPARTMENT OF HEALTH AND MENTAL HYGIENE

Michael R. Bloomberg  
Mayor

Thomas R. Frieden, M.D., M.P.H.  
Commissioner

---

nyc.gov/health

May 25, 2006

Dear Colleagues,

We are pleased to provide a summary of surveillance data on invasive *Streptococcus pneumoniae* infections in New York City from 1996 through 2005. Invasive *S. pneumoniae* remains an important cause of morbidity and mortality in New York City residents, and a comprehensive surveillance system is needed to track citywide trends in both antimicrobial resistance and the number of infections – especially in the age groups recommended to receive vaccine.

The Health Department began tracking *S. pneumoniae* in the early 1990s, and antimicrobial resistant *S. pneumoniae* was added to the reportable disease list in the NYC Health Code (section 11.03) in 1996. From 1996 to 2000, laboratories submitted individual reports of drug resistant *S. pneumoniae* and the total number of invasive *S. pneumoniae* infections for the given time period. Since 2000, all individual reports of invasive *S. pneumoniae* infections (both antibiotic resistant and sensitive) have been reportable<sup>1,2</sup>.

This surveillance system would not be possible without the help of many laboratorians and health care providers citywide. These efforts have successfully documented the emergence of penicillin and cephalosporin resistant *S. pneumoniae* in New York City and allow us to watch carefully for the emergence of fluoroquinolone resistance.<sup>3,4</sup>

In this report, we have enclosed concise summaries which provide surveillance data on the city as a whole and each borough<sup>5</sup>.

Sincerely,

Carmen Roman, BS

Beth Nivin, MPH

Brooke Levinson, MPH

Michael Phillips, MD  
*Streptococcus pneumoniae* Surveillance Workgroup  
Bureau of Communicable Disease

<sup>1</sup>Patient address is not currently reported, therefore data in this report may include non-NYC residents and borough level data represents reports from facilities located within the borough

<sup>2</sup>Invasive infection is defined as an isolate where the source is a usually sterile site (e.g blood, cerebrospinal fluid, pleural fluid, peritoneal fluid, pericardial fluid, surgical aspirate, bone, joint fluid, or internal body site (e.g., lymph node, brain)). See table 3.

<sup>3</sup>Heffernan R, Henning K, Labowitz A, Hjelte A and Layton M. Laboratory survey of drug-resistant *Streptococcus pneumoniae* in New York City, 1993-1995. *Emerg Infect Dis* 1998;4:113-6

<sup>4</sup>Labowitz A, Young A, Heffernan R, Cato S, Layton M and Mojica B. Surveillance for penicillin non-susceptible *Streptococcus pneumoniae* -- New York City, 1995. *MMWR* 1997;46:1-3

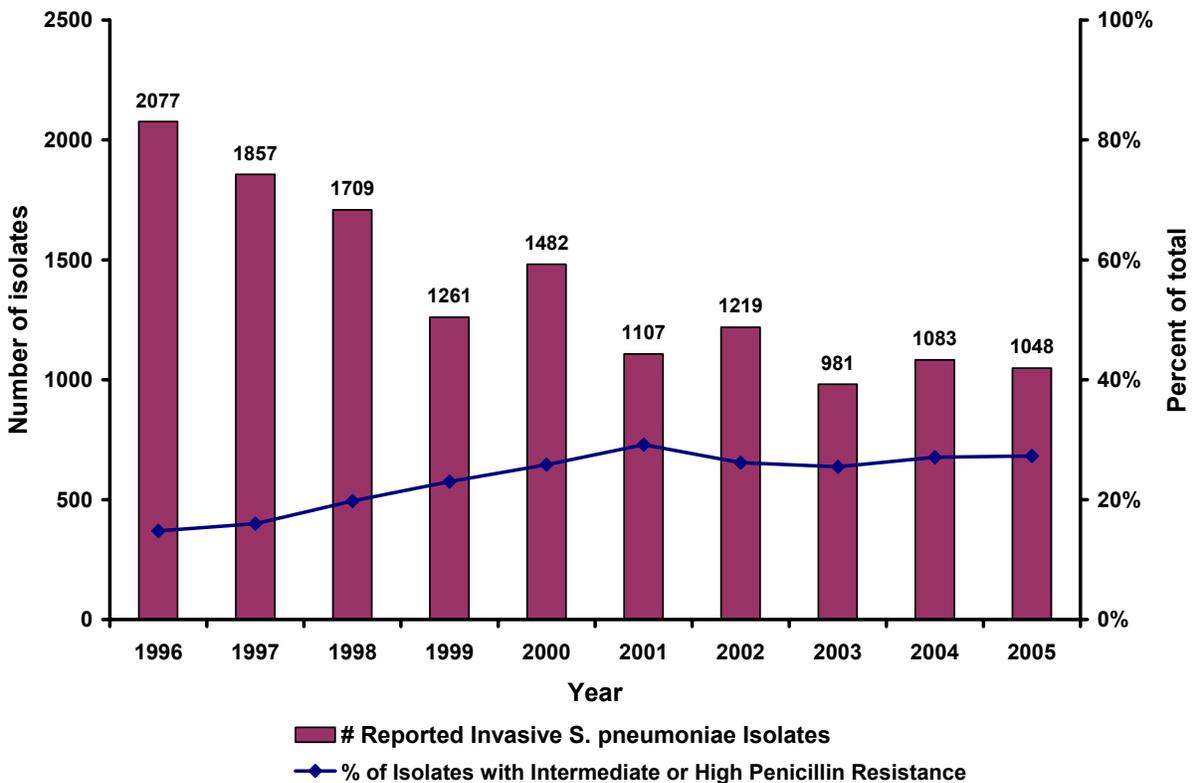
<sup>5</sup>Resistance data on fluoroquinolones and extended spectrum cephalosporins are only available from 2001 to 2005.

***Streptococcus pneumoniae* Surveillance Summary**  
**Bureau of Communicable Disease**  
 May 25, 2006

New York City Summary Data

Over the past decade, the number of *S. pneumoniae* isolates from invasive infections reported to the Health Department declined dramatically, from 2077 to 1048 isolates per year. This decrease occurred from 1996 to 2001, and the annual number of reported isolates has remained essentially stable since<sup>6</sup>. Although the total number of reported isolates declined, the portion of isolates with penicillin resistance doubled. In 1996, 14.8% of isolates exhibited either intermediate or high resistance to penicillin<sup>7</sup>. Penicillin resistance progressively increased until 2001, when 29.2% of isolates were resistant, and has remained at that level since.

**Graph 1: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, New York City, 1996-2005**

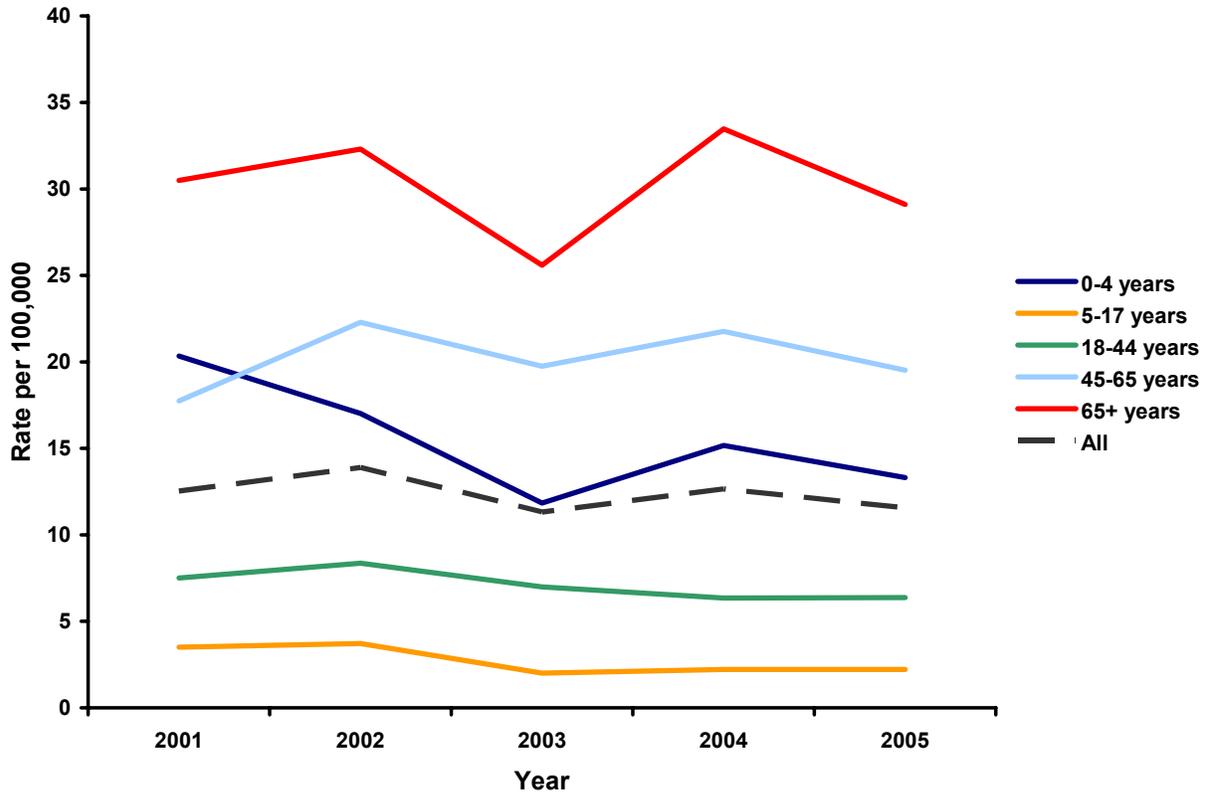


<sup>6</sup>Although the decline in reported invasive *S. pneumoniae* isolates from 1996 to 2001 likely represents a decrease in invasive infections, laboratories reported only an aggregate number of invasive infections (not individual reports) from 1996 to 2000, therefore we are unable to verify that duplicate reports or non-invasive isolates were excluded.

<sup>7</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See Table 2 footnotes

In 2005, the rate of reported invasive *S. pneumoniae* isolates in those 65 years and older was 29.1 per 100,000 population, significantly higher than all other age groups and essentially unchanged over the past 5 years. The importance of immunization in the elderly cannot be overemphasized. In contrast, the rate of reported invasive *S. pneumoniae* isolates in the 0-4 age group has declined from 2001 to 2005, from 20.3 to 13.3 per 100,000 population, presumably in part due to the introduction of conjugate vaccine in this age group<sup>8</sup>.

**Graph 2: Rate of Invasive *S. pneumoniae* Infection by Age Group, New York City, 2001-2005<sup>9</sup>**



**Table 1: Number and Rate of Reported Invasive *S. pneumoniae* Isolates by Age Group, New York City, 2005<sup>9</sup>**

Age Group	n	(%)	Rate
0-4	72	(7.8)	13.3
5-17	31	(3.3)	2.2
18-44	219	(23.7)	6.4
45-64	331	(35.7)	19.5
65+	273	(29.5)	29.1
<b>Total</b>	<b>926</b>	<b>(100)</b>	<b>11.6</b>

<sup>8</sup>Data on patient age has only been available since 2001; therefore we cannot determine the true baseline rate for the 0-4 age group prior to 2000 and the introduction of conjugate vaccine.

<sup>9</sup>Rate is per 100,000 population, calculated using 2000 Census data. The 122 reports without age are not included

As noted in graph 1, the number of isolates, and proportion with penicillin resistance has remained stable over the past five years. Although the numbers are small, there appears to be an increasing trend of extended spectrum cephalosporin resistance in penicillin resistant isolates over the past 2 years<sup>10</sup>. Fluoroquinolone resistance amongst penicillin resistant isolates remains rare<sup>11</sup>.

**Table 2: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, New York City, 2001 – 2005<sup>12</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	1107	(100.0)	1219	(100.0)	981	(100.0)	1083	(100.0)	1048	(100.0)
<b>Penicillin Resistance<sup>13</sup></b>										
Any resistance <sup>14</sup>	323	(29.2)	319	(26.2)	250	(25.5)	293	(27.1)	286	(27.3)
Intermediate resistance	224	(20.2)	228	(18.7)	192	(19.6)	202	(18.7)	228	(21.8)
High resistance	99	(8.9)	91	(7.5)	58	(5.9)	91	(8.4)	58	(5.5)
<b>Other Drug Resistance<sup>15</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>14</sup>	11	(3.4)	10	(3.1)	7	(2.8)	14	(4.8)	5	(1.7)
Intermediate resistance	6	(1.9)	2	(0.6)	2	(0.8)	1	(0.3)	2	(0.7)
High resistance	5	(1.5)	8	(2.5)	5	(2.0)	13	(4.4)	3	(1.0)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>14</sup>	22	(6.8)	17	(5.3)	14	(5.6)	26	(8.9)	25	(8.7)
Intermediate resistance	16	(5.0)	12	(3.8)	11	(4.4)	21	(7.2)	15	(5.2)
High resistance	6	(1.9)	5	(1.6)	3	(1.2)	5	(1.7)	10	(3.5)

<sup>10</sup>Increase from 6.8% in 2001 to 8.7% in 2005 does not reach statistical significance

<sup>11</sup>The increase in number of isolates with high fluoroquinolone resistance in 2004 is probably due to an isolated outbreak in an extended care facility. The Health Department increased surveillance activity around this event.

<sup>12</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>13</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>14</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>15</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. In all penicillin resistant isolates from 2001 to 2005, the extended spectrum cephalosporin sensitivity was unknown in 14.5% and fluoroquinolone sensitivity was unknown in 36%

The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

The source of reported invasive *S. pneumoniae* isolates is summarized in Table 3. The majority of isolates were from blood, but probably only a portion of these represent true primary bacteremia – more likely, the primary source of infection (e.g. cerebrospinal fluid (CSF) or lung) was not reported or cultured.

**Table 3: Source of Reported Invasive *S. pneumoniae* Isolates, New York City, 2005**

Source	n	(%)
Blood	966	(92.2)
CSF	17	(1.6)
Blood and CSF	14	(1.3)
Pleural fluid	7	(0.7)
Synovial fluid	1	(0.1)
Other	23	(2.2)
Unknown	20	(1.9)
<b>Total</b>	<b>1048</b>	<b>(100)</b>

Table 4 provides a borough level summary of number of reports, rate and % penicillin resistance. These data are not based on borough of patient residence, as a minimum of reports currently include home address. The borough level data represents reports from facilities located within the each borough, therefore referral patterns or location of health care (patients seeking care at a facility outside their home borough, or non-NYC residents) may alter results.

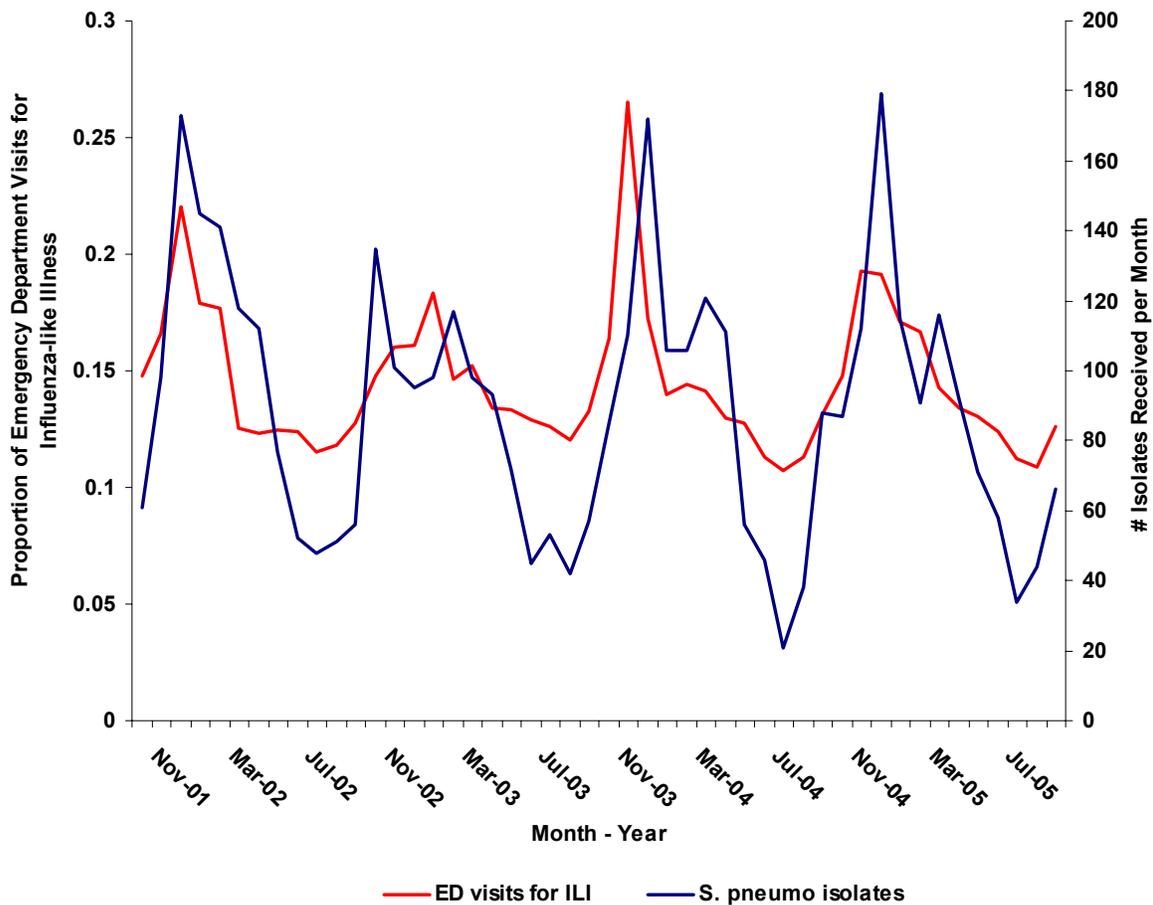
**Table 4: Reported Invasive *S. pneumoniae* Isolates and Penicillin resistance, by Borough of Reporting Facility, 2005<sup>16</sup>**

Borough	All Reported Isolates			Isolates with Penicillin Resistance		
	n	(%)	Rate	n	(%)	Rate
Bronx	188	(19.5)	14.1	62	(33.0)	4.7
Brooklyn	213	(22.1)	8.6	69	(32.4)	2.8
Manhattan	345	(35.8)	22.4	73	(21.2)	4.7
Queens	170	(17.7)	7.6	48	(28.2)	2.2
Staten Island	47	(4.9)	10.6	11	(23.4)	2.5
<b>Total</b>	<b>963</b>	<b>(100)</b>	<b>12.0</b>	<b>263</b>	<b>(27.2)</b>	<b>3.3</b>

<sup>16</sup>Rate is per 100,000 borough population, calculated using 2000 Census data. The 85 reports where borough is unknown or facility is outside NYC are not included. Penicillin resistance is defined as intermediate or high resistance to penicillin; see Table 2 footnotes.

To enhance the early detection of disease outbreaks, the Health Department established a syndromic surveillance system that monitors emergency department visits. Chief complaint information is collected and transmitted electronically to the health department daily, where it is analyzed for temporal and spatial aberrations. This syndromic surveillance system typically detects influenza-like illness activity in New York City about two weeks prior to increases in positive influenza culture reporting<sup>17</sup>. Graph 3 illustrates the close relationship between influenza activity and invasive *S. pneumoniae* disease, and highlights the critical importance of addressing both vaccine-preventable diseases through adherence to guidelines for influenza and pneumococcal vaccination of high risk groups<sup>18,19</sup>. The cause for the biphasic peaks seen below in the *S. pneumoniae* isolate curves during the three winter-spring seasons from 2002 to 2005 is unknown; this possibly represents the separate arrival of influenza A in the Fall, followed by influenza B or other respiratory viruses in the Spring.

**Graph 3: Emergency Department Visits for Influenza-like Illness and Invasive *S. pneumoniae* Isolates, New York City, Nov 2001 to Nov 2005**



<sup>17</sup>Heffernan R, Mostashari F, Das D, Karpata A, Kulldorff M, Weiss D, Syndromic Surveillance in Public Health Practice, New York City, EID, 2004, 10, 858-864

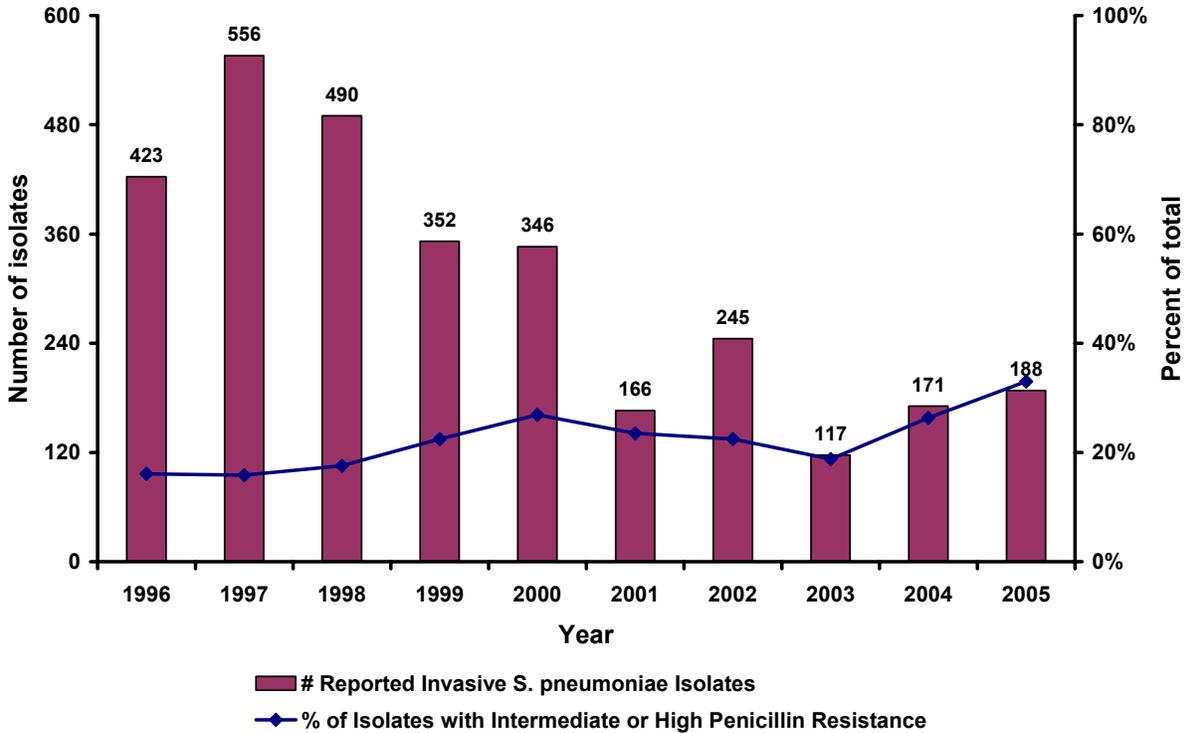
<sup>18</sup>Harper S, Fukuda K, Uyeki T, Cox N and Bridges C, Prevention and Control of Influenza, MMWR, 2005, 54(RR08);1-40

<sup>19</sup>CDC, Prevention of Pneumococcal Disease: Recommendations of the ACIP. MMWR, 1997, 45(RR08); 1-24; and CDC Preventing Pneumococcal Disease Among Infants and Young Children: Recommendations of the ACIP. MMWR 2000, 49(RR09); 1-35.

Bronx Summary Data

The data contained in graph 4a and table 5a are derived from reports received from hospitals based in the Bronx.

**Graph 4a: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, The Bronx, 1996-2005<sup>20</sup>**



<sup>20</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See table 2 footnotes

As seen in the citywide data, the rate of penicillin resistance remains stable. Small numbers limit the ability to note a significant change in resistance to fluoroquinolone and extended spectrum cephalosporins.

**Table 5a: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, The Bronx, 2001 – 2005<sup>21</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	166	(100.0)	245	(100.0)	117	(100.0)	171	(100.0)	188	(100.0)
<b>Penicillin Resistance<sup>22</sup></b>										
Any resistance <sup>23</sup>	39	(23.5)	55	(22.4)	22	(18.8)	45	(26.3)	62	(33.0)
Intermediate resistance	30	(18.1)	48	(19.6)	18	(15.4)	34	(19.9)	57	(30.3)
High resistance	9	(5.4)	7	(2.9)	4	(3.4)	11	(6.4)	5	(2.7)
<b>Other Drug Resistance<sup>24</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>23</sup>	0	(0.0)	0	(0.0)	1	(4.5)	2	(4.4)	0	(0.0)
Intermediate resistance	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
High resistance	0	(0.0)	0	(0.0)	1	(4.5)	2	(4.4)	0	(0.0)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>23</sup>	4	(10.3)	1	(1.8)	1	(4.5)	5	(11.1)	2	(3.2)
Intermediate resistance	4	(10.3)	1	(1.8)	1	(4.5)	4	(8.9)	2	(3.2)
High resistance	0	(0.0)	0	(0.0)	0	(0.0)	1	(2.2)	0	(0.0)

<sup>21</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>22</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>23</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>24</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

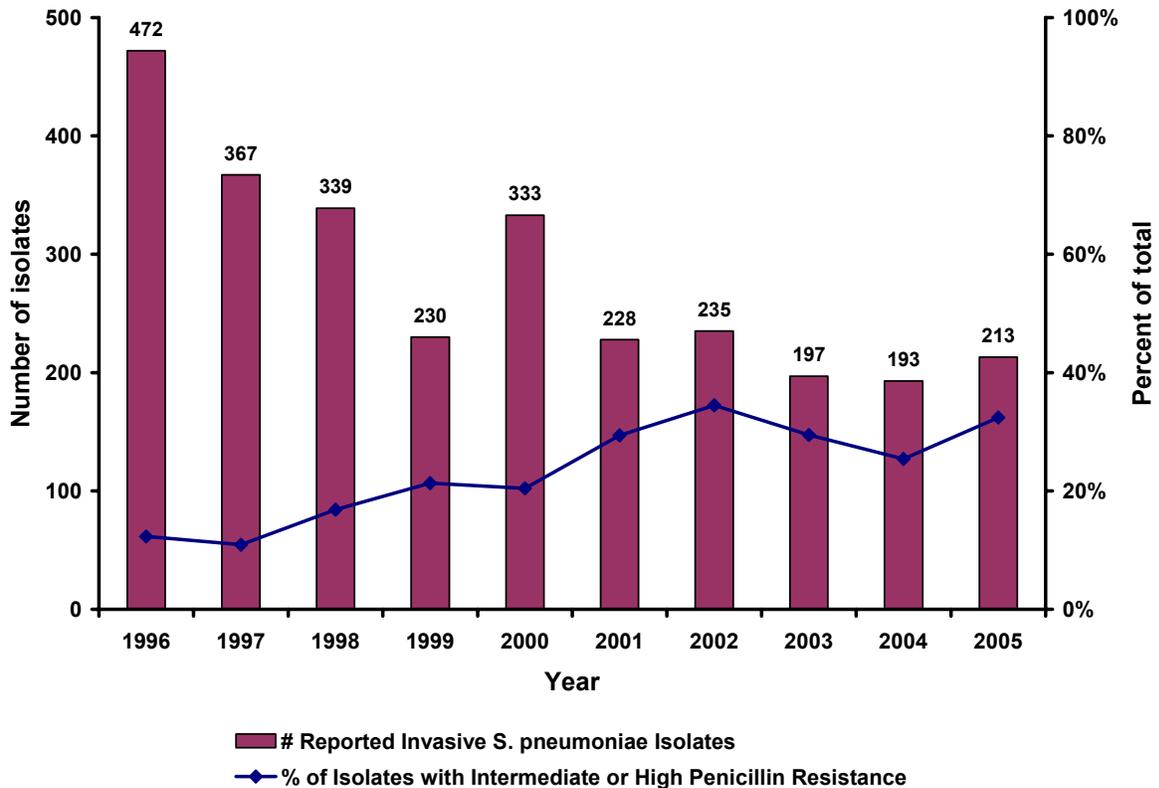
cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

Brooklyn Summary Data

The data contained in graph 4b and table 5b are derived from reports received from hospitals based in Brooklyn.

**Graph 4b: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, Brooklyn, 1996-2005<sup>20</sup>**



<sup>20</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See table 2 footnotes

As seen in the citywide data, the rate of penicillin resistance remains stable. Small numbers limit the ability to note a significant change in resistance to fluoroquinolone and extended spectrum cephalosporins.

**Table 5b: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, Brooklyn, 2001 – 2005<sup>21</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	228	(100.0)	235	(100.0)	197	(100.0)	193	(100.0)	213	(100.0)
<b>Penicillin Resistance<sup>22</sup></b>										
Any resistance <sup>23</sup>	67	(29.4)	81	(34.5)	58	(29.4)	49	(25.4)	69	(32.4)
Intermediate resistance	42	(18.4)	57	(24.3)	42	(21.3)	37	(19.2)	57	(26.8)
High resistance	25	(11.0)	24	(10.2)	16	(8.1)	12	(6.2)	12	(5.6)
<b>Other Drug Resistance<sup>24</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>23</sup>	2	(3.0)	1	(1.2)	1	(1.7)	1	(2.0)	1	(1.4)
Intermediate resistance	2	(3.0)	1	(1.2)	1	(1.7)	0	(0.0)	1	(1.4)
High resistance	0	(0.0)	0	(0.0)	0	(0.0)	1	(2.0)	0	(0.0)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>23</sup>	5	(7.5)	7	(8.6)	7	(12.1)	5	(10.2)	4	(5.8)
Intermediate resistance	4	(6.0)	4	(4.9)	5	(8.6)	4	(8.2)	4	(5.8)
High resistance	1	(1.5)	3	(3.7)	2	(3.4)	1	(2.0)	0	(0.0)

<sup>21</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>22</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>23</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>24</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

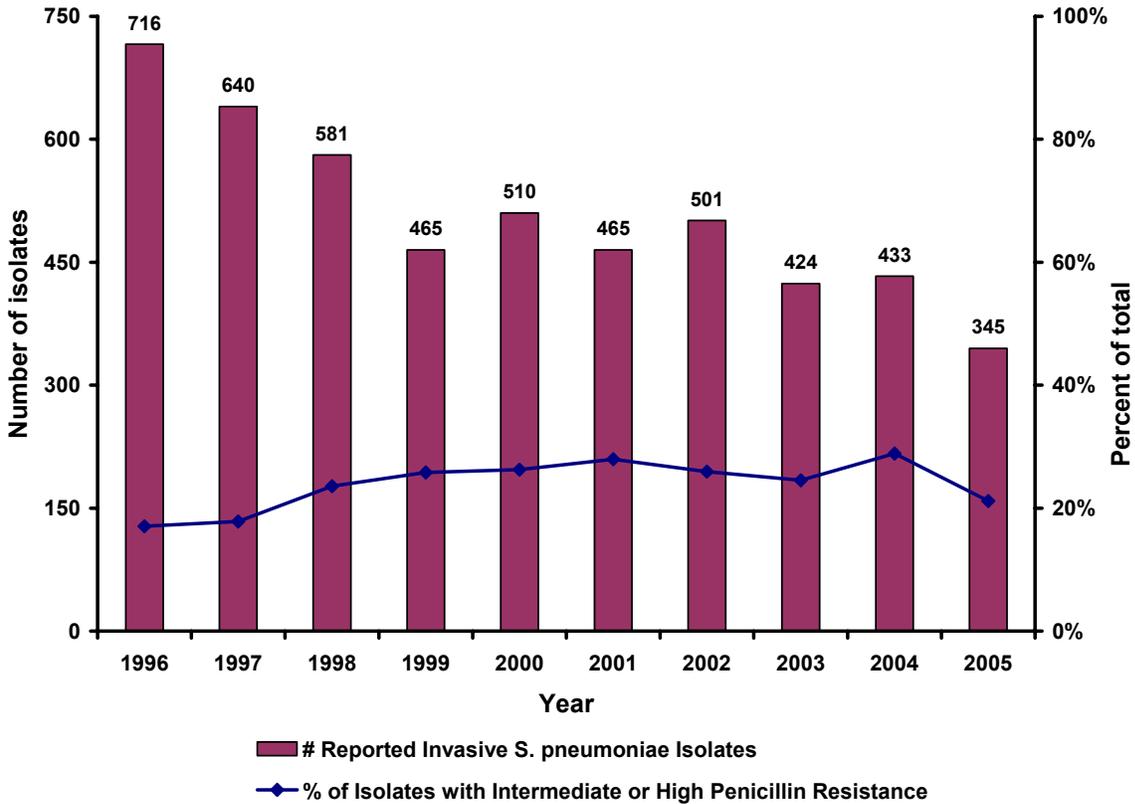
cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

Manhattan Summary Data

The data contained in graph 4c and table 5c are derived from reports received from hospitals based in Manhattan.

**Graph 4c: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, Manhattan, 1996-2005<sup>20</sup>**



<sup>20</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See table 2 footnotes

As seen in the citywide data, the rate of penicillin resistance remains stable. Small numbers limit the ability to note a significant change in resistance to fluoroquinolone and extended spectrum cephalosporins.

**Table 5c: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, Manhattan, 2001 – 2005<sup>21</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	465	(100.0)	501	(100.0)	424	(100.0)	433	(100.0)	345	(100.0)
<b>Penicillin Resistance<sup>22</sup></b>										
Any resistance <sup>23</sup>	130	(28.0)	130	(25.9)	104	(24.5)	125	(28.9)	73	(21.2)
Intermediate resistance	88	(18.9)	87	(17.4)	81	(19.1)	82	(18.9)	57	(16.5)
High resistance	42	(9.0)	43	(8.6)	23	(5.4)	43	(9.9)	16	(4.6)
<b>Other Drug Resistance<sup>24</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>23</sup>	7	(5.4)	8	(6.2)	4	(3.8)	11	(8.8)	4	(5.5)
Intermediate resistance	3	(2.3)	1	(0.8)	0	(0.0)	1	(0.8)	1	(1.4)
High resistance	4	(3.1)	7	(5.4)	4	(3.8)	10	(8.0)	3	(4.1)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>23</sup>	11	(8.5)	3	(2.3)	3	(2.9)	11	(8.8)	6	(8.2)
Intermediate resistance	6	(4.6)	2	(1.5)	3	(2.9)	10	(8.0)	3	(4.1)
High resistance	5	(3.8)	1	(0.8)	0	(0.0)	1	(0.8)	3	(4.1)

<sup>21</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>22</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>23</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>24</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

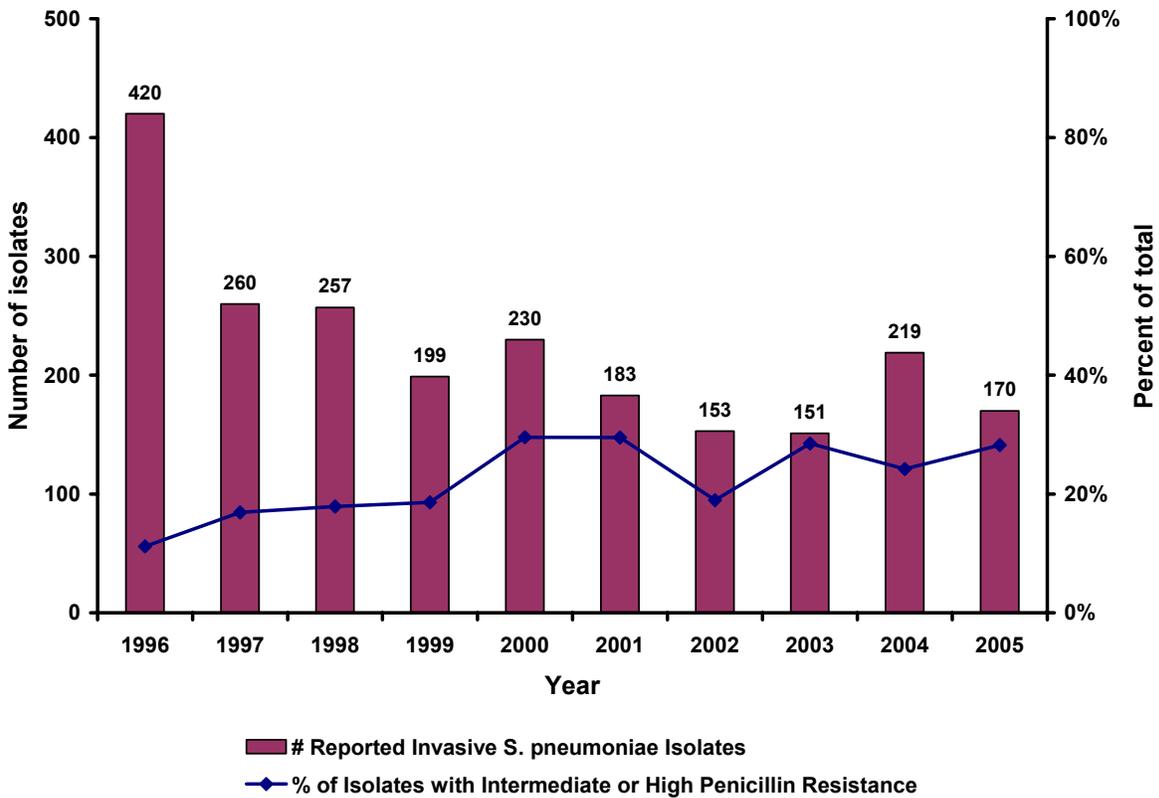
cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

Queens Summary Data

The data contained in graph 4d and table 5d are derived from reports received from hospitals based in Queens.

**Graph 4d: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, Queens, 1996-2005<sup>20</sup>**



<sup>20</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See table 2 footnotes

As seen in the citywide data, the rate of penicillin resistance remains stable. Small numbers limit the ability to note a significant change in resistance to fluoroquinolone and extended spectrum cephalosporins.

**Table 5d: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, Queens, 2001 – 2005<sup>21</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	183	(100.0)	153	(100.0)	151	(100.0)	219	(100.0)	170	(100.0)
<b>Penicillin Resistance<sup>22</sup></b>										
Any resistance <sup>23</sup>	54	(29.5)	29	(19.0)	43	(28.5)	53	(24.2)	48	(28.2)
Intermediate resistance	37	(20.2)	20	(13.1)	32	(21.2)	35	(16.0)	33	(19.4)
High resistance	17	(9.3)	9	(5.9)	11	(7.3)	18	(8.2)	15	(8.8)
<b>Other Drug Resistance<sup>24</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>23</sup>	1	(1.9)	1	(3.4)	1	(2.3)	0	(0.0)	0	(0.0)
Intermediate resistance	0	(0.0)	0	(0.0)	1	(2.3)	0	(0.0)	0	(0.0)
High resistance	1	(1.9)	1	(3.4)	0	(0.0)	0	(0.0)	0	(0.0)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>23</sup>	2	(3.7)	4	(13.8)	1	(2.3)	1	(1.9)	9	(18.8)
Intermediate resistance	2	(3.7)	3	(10.3)	0	(0.0)	0	(0.0)	5	(10.4)
High resistance	0	(0.0)	1	(3.4)	1	(2.3)	1	(1.9)	4	(8.3)

<sup>21</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>22</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>23</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>24</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

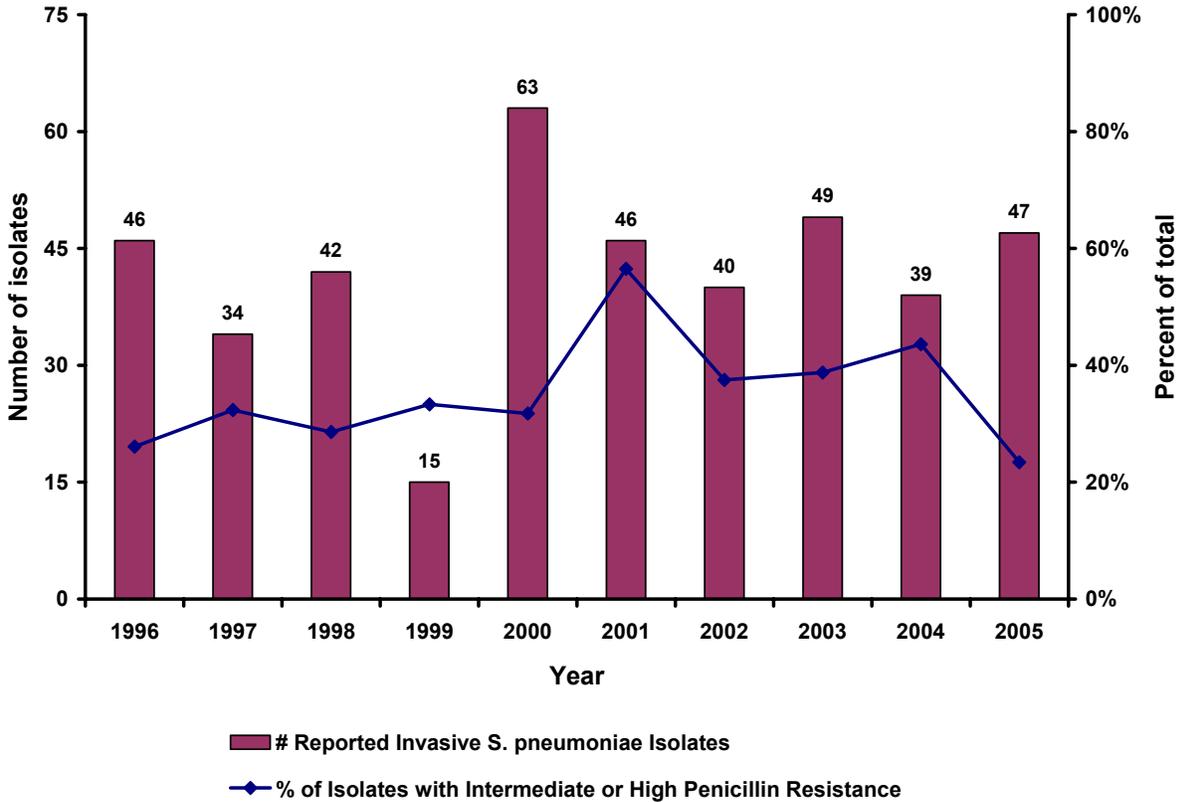
cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

Staten Island Summary Data

The data contained in graph 4e and table 5e are derived from reports received from hospitals based in Staten Island.

**Graph 4e: Number of Reported Invasive *S. pneumoniae* Isolates and Percent Penicillin Resistance, Staten Island, 1996-2005<sup>20</sup>**



<sup>20</sup>Penicillin resistance is defined as a Kirby Bauer interpretation of intermediate or high resistance, or a MIC value of 0.12 or higher. See table 2 footnotes

As seen in the citywide data, the rate of penicillin resistance remains stable. Small numbers limit the ability to note a significant change in resistance to fluoroquinolone and extended spectrum cephalosporins.

**Table 5e: Source and Antibiotic Resistance of Reported Invasive *S. pneumoniae* Isolates, Staten Island, 2001 – 2005<sup>21</sup>**

	2001		2002		2003		2004		2005	
	n	(%)								
Total number of <i>S. pneumoniae</i> isolates	46	(100.0)	40	(100.0)	49	(100.0)	39	(100.0)	47	(100.0)
<b>Penicillin Resistance<sup>22</sup></b>										
Any resistance <sup>23</sup>	26	(56.5)	15	(37.5)	19	(38.8)	17	(43.6)	11	(23.4)
Intermediate resistance	21	(45.7)	10	(25.0)	16	(32.7)	12	(30.8)	5	(10.6)
High resistance	5	(10.9)	5	(12.5)	3	(6.1)	5	(12.8)	6	(12.8)
<b>Other Drug Resistance<sup>24</sup></b>										
<u>Fluoroquinolones</u>										
Any resistance <sup>23</sup>	1	(3.8)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Intermediate resistance	1	(3.8)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
High resistance	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
<u>Extended Spectrum Cephalosporins</u>										
Any resistance <sup>23</sup>	0	(0.0)	2	(13.3)	2	(10.5)	4	(23.5)	4	(36.4)
Intermediate resistance	0	(0.0)	2	(13.3)	2	(10.5)	3	(17.6)	1	(9.1)
High resistance	0	(0.0)	0	(0.0)	0	(0.0)	1	(5.9)	1	(9.1)

<sup>21</sup>Antibiotic resistance was reported by MIC value, Kirby-Bauer interpretation or both. If the MIC and Kirby-Bauer were discordant, the MIC value was used.

<sup>22</sup>Penicillin resistance amongst all isolates reported. The following MIC breakpoints were used: Sensitive:  $\leq 0.06$ , Intermediate: 0.12-1, High:  $\geq 2$

<sup>23</sup>Any resistance is the sum of intermediate and high resistant isolates

<sup>24</sup>Fluoroquinolone and extended spectrum cephalosporin resistance **in penicillin resistant isolates**. The following MIC breakpoints were used:

levofloxacin: Sensitive:  $\leq 2$ , Intermediate: 4, High:  $\geq 8$

moxifloxacin and gatifloxacin: Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

cefotaxime and ceftriaxone (where source is CSF or blood/CSF): Sensitive:  $\leq 0.5$ , Intermediate: 1, High:  $\geq 2$

cefotaxime and ceftriaxone (where source is not CSF or blood/CSF): Sensitive:  $\leq 1$ , Intermediate: 2, High:  $\geq 4$

Special thanks to Emily Lumeng MPH, Don Olson MPH and Annie Fine MD for assistance in the surveillance system and preparing this report