

**ENHANCED SURVEILLANCE OF BACTERIAL
MENINGITIS (INCLUDING MENINGOCOCCAL
SEPTICAEMIA), IN THE EASTERN REGION
1998-2003**

Department of Public Health,
Dr. Steevens' Hospital



EASTERN REGIONAL HEALTH AUTHORITY
Údarás Sláinte Réigiúnach An Oirthir

Piarras O'Lorcain , Emer Feely & Miriam Owens

Report Produced: October 2004

Summary

Between 1998 and 2003, 990 cases of bacterial meningitis / septicaemia were notified in the Eastern Region (Counties Dublin, Wicklow and Kildare). This included 859 cases of invasive meningococcal disease (IMD), 48 pneumococcal meningitis cases and twelve *Haemophilus influenzae type b* (Hib) meningitis cases. Over this period of time there were 41 deaths due to bacterial meningitis / septicaemia and two imported cases of IMD.

More recently, in 2003 there were one hundred and seven cases of bacterial meningitis, compared to 108 cases in 2002. The breakdown by causative agent was as follows for 2003: *Neisseria meningitides* (n=74), *Streptococcus pneumoniae* (n=10), Hib (n=4), Group B streptococci (n=1), *Listeria monocytogenes* (n=2), *Mycobacterium tuberculosis* (n=3), *Escherichia coli* (n=2), *Enterobacter* species (n=1) and organism unspecified (n=10). The numbers for 2003 represent a continuation of an overall decline since 1999. Serogroup C meningococcal disease notifications declined by as much as 96% when compared with 1999 reflecting the significant positive impact that the meningococcal serogroup C conjugate vaccine had had. There were five deaths from bacterial meningitis and no imported cases of IMD in 2003.

Introduction

A significant cause of childhood morbidity and mortality in the Eastern Region is bacterial meningitis / septicaemia, the majority of which cases are the result of IMD, a serious and sometimes fatal illness caused by *Neisseria meningitidis*. The enhanced surveillance system for Bacterial Meningitis (including meningococcal septicaemia) commenced in Ireland in 1997. Details on how this system operates and the case definitions used have been outlined previously¹. In brief, the Community Care Areas (CCAs) simultaneously notify the Department of Public Health (DeptPH) and the national Disease Surveillance Center (NDSC) of each suspected case of bacterial meningitis. Follow-up information on each case notified is collected by the DeptPH/CCA and forwarded to the NDSC. In the DeptPH the data is entered on to a MS Access database. The Irish Meningococcal and Meningitis Reference Laboratory (IMMRL) based at the Children's Hospital in Temple Street, Dublin, perform active surveillance on laboratory confirmed cases of IMD. The DeptPH database is reconciled monthly with the IMMRL database and both quarterly and yearly with the NDSC database.

Data on bacterial meningitis notifications for 1998 to 2003 are presented in this report. For surveillance purposes the diagnosis of IMD is classified as Definite, Presumed and Possible as outlined in the Department of Health and Children's Working Group report². Descriptions of these different types of meningococcal disease are to be found in Appendix 1. All figures presented throughout the report are based on date of notification of the case and consequently, may differ slightly from figures reported by Irish Meningococcal and Meningitis Reference Laboratory (IMMRL). The latter are based on admission or specimen date.

Material & Methods

Data analysis was performed using a combination of MS Access and MS Excel. Population data were taken from the 1996 and 2002 censuses. Census data were used to estimate the populations for the intervening years 1998 to 2001 but also for 2003. A population breakdown by 5-year age group, gender and community care area (CCA) was also generated. The 1998-2003 population estimates for each of the ten CCAs by age class and sex within the Eastern Region are based on their current boundaries. All

records were assigned a district electoral division (DED) code based on the residence address of patient, where available. Of the 990 cases of bacterial meningitis analysed, only 20 cases could not be DED coded, of which only one case could not be given a CCA code. The DED coding was used to reflect the current CCA boundaries. 28 cases had their original CCA coding, given at the time of notification, updated as a result of the boundary changes.

Bacterial Meningitis Septicaemia Notifications

Fig. 1 presents the number of bacterial meningitis cases occurring in the Eastern Region as well as nationally between 1988 and 2003². In addition to giving a breakdown of the number of cases by CCA and by year, Table 1 also highlights (in bold font and in brackets) the original CCA assigned to some cases during 1998 and 2000. Henceforth, all data presented by CCA will be based on the current boundaries. An imported case is defined as a case where the onset of illness occurs within two days of arrival in the country or where the infection is known to have been acquired abroad. Only two cases of meningococcal disease (serogroup B) were imported, both of which occurred in 2001.

The total number of bacterial meningitis notifications (including meningococcal septicaemia) decreased from 172 (12.9 cases per 100,000) in 1998 to 107 (7.5/100,000) in 2003 i.e. a decrease of 39% (Fig. 2; Appendix 2A). The highest rate of notification for bacterial meningitis was in CCA4 in 1999 (27.7/100,000). There was one case, a non-grouped presumed meningococcal case that could not be attributed a CCA code in 1999.

Invasive meningococcal disease (IMD) accounted for the majority (86.7%) of the bacterial meningitis notifications, while *Streptococcus pneumoniae*, *Haemophilus influenzae*, Group B streptococci and *Mycobacterium tuberculosis* accounted for 4.8%, 1.2%, 0.6% and 0.4% of the notifications respectively (Table 2).

The male:female ratio was 1:0.89, with males accounting for 53% (n=525) of the cases. The breakdown in Fig. 3 shows that the ratio was higher for males for the years 1999 and 2000. Annual rates per 100,000 for each type of bacterial meningitis are presented in Table 3. The breakdown of bacterial meningitis cases by age group and year are presented in Table 4. The highest incidence rates occurred in 1999 in the 0-4 year old group with an age specific rate of 162.3/100,000 (Table 5).

Meningococcal Disease (IMD) Notifications

Between 1998 and 2003 there were 460 male and 399 female cases of IMD, a ratio of 1:0.87.

In 1999, the numbers of invasive meningococcal disease (IMD) notifications had reached a peak of 232 cases (17.20/100,000) but by 2003, this number had fallen to 74 (5.21/100,000), a decline of 68.1% (Table 2; Appendix 2B). From 1999 to 2003 the number of cases defined as *definite* cases has dropped steadily from 193 to 71 per year (Fig. 4). The number of presumed and possible cases has also steadily declined during this same period of time and totaled 73 and 30 cases respectively (Fig. 4). Table 6 features a breakdown of meningococcal case serogroups by year, of which groups B and C are the most common.

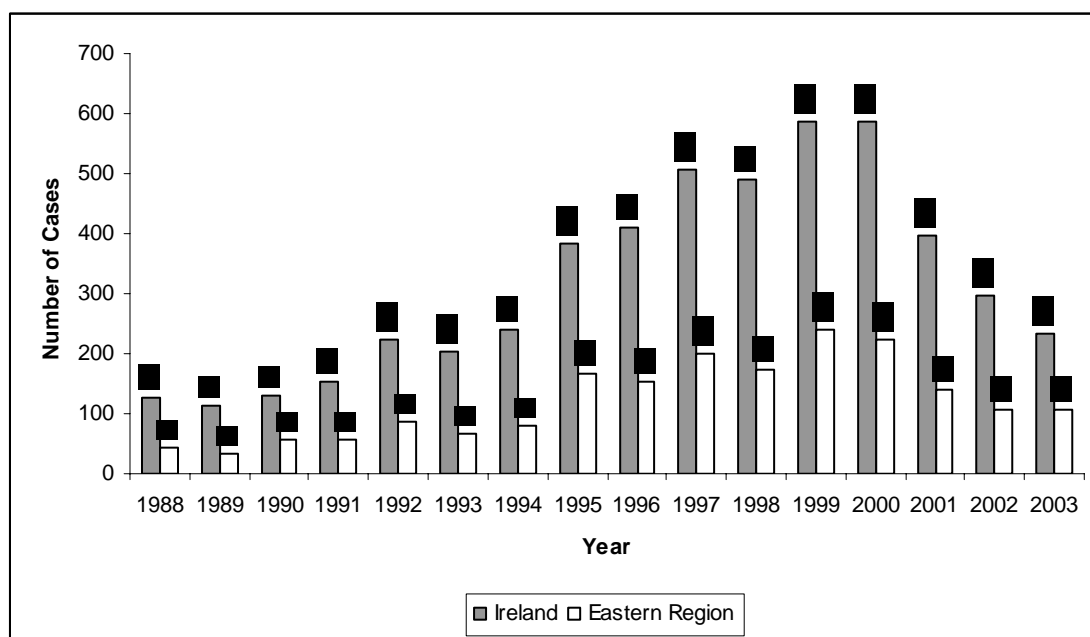


Fig. 1. The number of bacterial meningitis cases in Ireland¹ and in the Eastern Region, 1988-2003

Table 1. Annual number of cases of bacterial meningitis by CCA in the Eastern Region, 1998-2003*

CCA	1998	1999	2000	2001	2002	2003	1998-2003
CCA1	9	10	11	7	8	6	51
CCA2	7 (8)	14 (22)	13 (15)	3	5	1	54
CCA3	14 (13)	26 (18)	19 (16)	7	15	11	80
CCA4	15	40	37 (38)	18	6	13	130
CCA5	20	20	25	22	10	14	111
CCA6	27	31	25	14	18	8	123
CCA7	17	25	19	14	10	12	97
CCA8	34	37	39	24	13	16	163
CCA9	17 (16)	29 (26)	23	24	15	20	123
CCA10	12 (13)	7 (10)	13	6	8	6	57
Unknown	0	1	0	0	0	0	1
Total	172	240	224	139	108	107	990

*Original allocation of CCA codes before the redrawing of boundaries in 2001 is highlighted in bold font and in brackets

In 1999, CCA4 had the highest notification rate of meningococcal disease (26.30/100,000; n=38), while CCA10 in the same year had the lowest (6.32/100,000; n=6) (Table 7; Appendix 2B). In contrast, CCA7 had the highest rate in 2003 (8.13/100,000; n=10) whereas CCA1 had the lowest (0.77/100,000; n=1) (Table 7; Appendix 2B).

Group B *Neisseria meningitidis* accounted for 146 notifications (10.83/100,000) in 1999, an increase of 28.8% from 1998 (8.41/100,000; n=112). Since 1999 the numbers have fallen by 55.8% by 2003 (4.79/100,000; n=68) (Table 8; Appendix 2C).

Group C *Neisseria meningitidis* accounted for 46 notifications (3.41/100,000) in 1999, an increase of 81.4% from 1998 (1.88/100,000; n=25). Since 1999 the numbers have fallen sharply by 95.7% by 2003 (0.14/100,000; n=2) (Table 9; Appendix 2D).

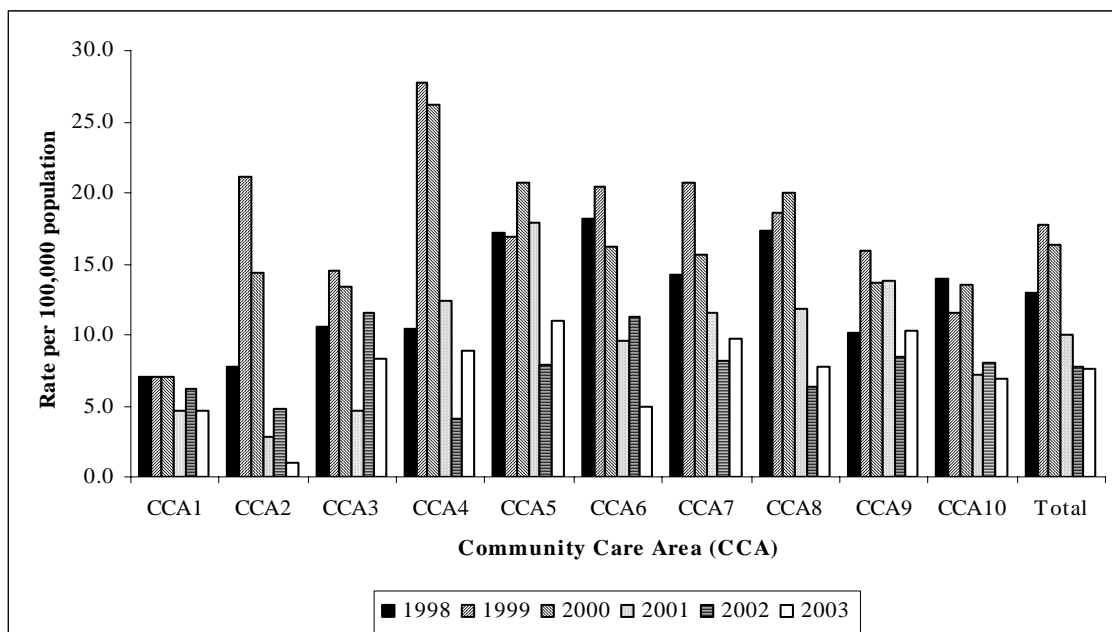


Fig. 2. Annual bacterial meningitis notification rates for the Eastern Region, 1998-2003

Table 2. Annual number of cases of bacterial meningitis by disease type in the Eastern Region, 1998-2003

Bacterial Meningitis Type	1998	1999	2000	2001	2002	2003	Total
<i>Neisseria meningitidis</i> (IMD)	150	232	192	122	89	74	859
<i>Streptococcus pneumoniae</i>	2	6	16	8	6	10	48
<i>Haemophilus influenzae</i> type b	2	2	2	1	1	4	12
Group B streptococcus	1	0	1	1	2	1	6
<i>Mycobacterium tuberculosis</i>	0	0	0	0	1	3	4
<i>Escherichia coli</i>	0	0	1	0	0	2	3
<i>Listeria monocytogenes</i>	0	0	0	0	0	2	2
<i>Staphylococcus aureus</i>	0	0	1	0	0	0	1
<i>Enterobacter</i> species	0	0	0	0	0	1	1
Organism unspecified	17	0	11	7	9	10	54
Total	172	240	224	139	108	107	990

Table 3. Bacterial meningitis rates per 100,000 by disease type in the Eastern Region, 1998-2003

Bacterial Meningitis Type	1998	1999	2000	2001	2002	2003	Total
<i>Neisseria meningitidis</i> (IMD)	11.27	17.20	14.05	8.82	6.35	5.21	10.41
<i>Streptococcus pneumoniae</i>	0.15	0.44	1.17	0.58	0.43	0.70	0.58
<i>Haemophilus influenzae</i> type b	0.15	0.15	0.15	0.07	0.07	0.28	0.15
Group B streptococcus	0.08	0.00	0.07	0.07	0.14	0.07	0.07
<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.07	0.21	0.05
<i>Escherichia coli</i>	0.00	0.00	0.07	0.00	0.00	0.14	0.04
<i>Listeria monocytogenes</i>	0.00	0.00	0.00	0.00	0.00	0.14	0.02
<i>Staphylococcus aureus</i>	0.00	0.00	0.07	0.00	0.00	0.00	0.01
<i>Enterobacter</i> species	0.00	0.00	0.00	0.00	0.00	0.07	0.01
Organism unspecified	1.28	0.00	0.81	0.51	0.64	0.70	0.65
Total	12.92	17.80	16.39	10.04	7.71	7.54	12.00

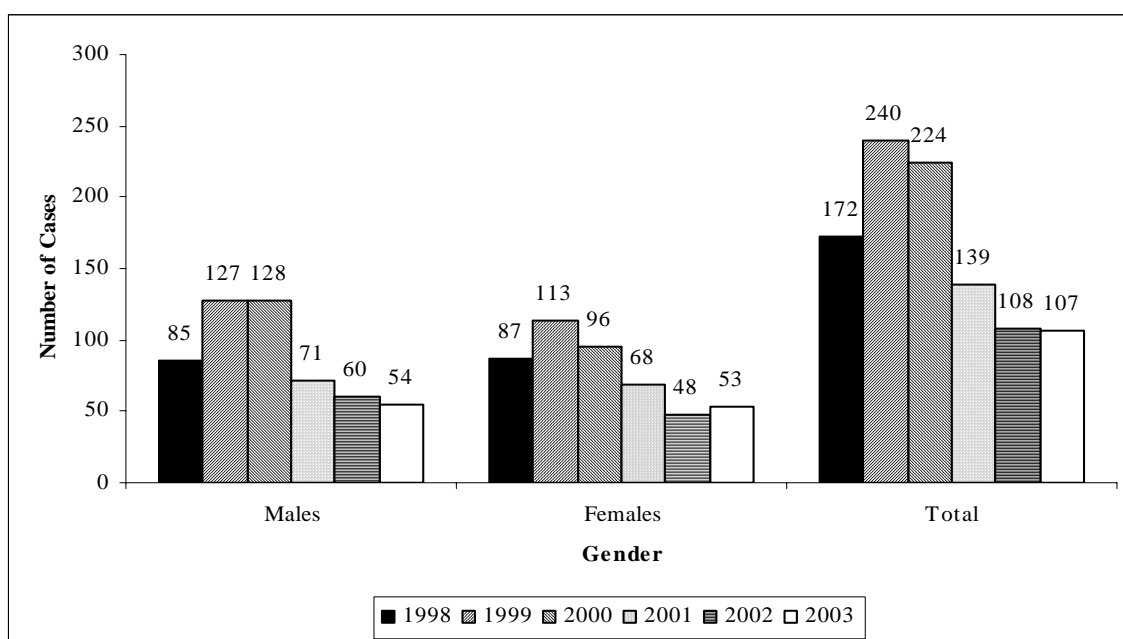


Fig. 3. Annual bacterial meningitis cases by gender for the Eastern Region, 1998-2003

Table 4. Number of cases of bacterial meningitis notified in the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	116	152	126	80	67	65	606
5-9	14	25	25	15	4	4	87
10-14	11	16	18	12	11	7	75
15-19	8	21	28	15	7	12	91
20-24	2	10	11	6	3	3	35
25-34	6	6	5	4	5	9	35
35-44	4	3	4	4	3	2	20
45-54	3	0	1	1	2	0	7
55-64	5	3	4	1	3	3	19
>65	3	4	2	1	3	2	15
Total	172	240	224	139	108	107	990

Table 5. Annual bacterial meningitis rates per 100,000 by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	125.3	162.3	133.0	83.5	69.2	66.4	106.0
5-9	14.9	27.0	27.4	16.7	4.5	4.6	16.0
10-14	10.7	15.9	18.3	12.4	11.7	7.6	12.8
15-19	7.0	18.7	25.3	13.8	6.5	11.4	13.8
20-24	1.6	7.8	8.4	4.5	2.2	2.1	4.4
25-34	2.7	5.0	4.0	3.1	3.7	6.5	4.6
35-44	2.1	2.7	3.5	3.4	2.5	1.6	2.9
45-54	2.0	0.0	1.0	1.0	1.9	0.0	1.1
55-64	4.7	3.3	4.3	1.1	3.1	3.1	3.4
>65	2.3	3.1	1.5	0.7	2.2	1.4	1.9
Total	12.9	17.8	16.4	10.0	7.7	7.5	12.0

Between 1999 and 2003 there has been a steady increase in the proportion of Group B *N. meningitidis* cases reported, accounting for 62.9%, 64.1%, 77.9, 79.8 and 91.9% of the total meningococcal notifications in 1999, 2000, 2001, 2002 and 2003, respectively. Conversely, the proportion of Group C *N. meningitidis* has shown an overall decline from 19.8% of the total meningococcal notifications in 1999, to 22.3%, 10.7%, 10.1% and 1.4% in 2000, 2001, 2002 and 2003, respectively.

Of the ten CCAs in the ERHA, CCA4 reported the highest rate of Group B *N. meningitidis* in 2003 (7.52/100,000; n=11), while the lowest notification rate was in CCA1 (0.77/100,000; n=1) (Appendix 2C, Table 8). In the same year CCA6 had the highest notification rate for Group C *N. meningitidis* (0.66/100,000; n=1), while all other CCAs, apart from CCA10 reported no cases at all (Table 9; Appendix 2D).

A breakdown of IMD cases is presented in Table 9. Age specific rates per 100,000 have been plotted for both Group B and C in Figs. 5 and 6 respectively. A breakdown of the cases and rates for Groups B and C are given in Appendices 3 and 4 respectively.

Since 1999 the number of Group B IMD cases has fallen from 93 (99.30/100,000) to 44 (44.95/100,000) in 2003 in the 0-4 age group, a drop of 54.7%. Similar declines have been observed in the age groups 5-9, 10-14 but less so in the 15-19 year bracket (Appendices 3A, 3B).

The Group C IMD numbers between 1999 and 2002 show an even sharper decline between 1999 and 2003 falling to zero in all age groups, apart from two cases in 2003 in the 15-19 age bracket (Appendices 4A, 4B). Fig. 7 shows a decline of 96% in the annual cumulative number of Group C IMD cases between 1999 and 2003.

The primary reason why there has been a dramatic fall in the notification of Group C IMD has been because of the success of the National Meningitis C Immunisation Programme which commenced in October 2000. The immunisation programme involved approximately 1.3 million people. Every person in Ireland aged 22 or under was offered immunisation as part of this phased programme. The first phase targeted groups of the population most vulnerable to the infection, babies and children aged 0-4 years and adolescents aged 15-18 years⁴.

Meningococcal disease rates per 100,000 cases by serogroup and by notification year and quarter are presented in Fig. 8. In addition to a decline on Group C cases in the years after 2000, a decline in the number of Group B cases has been observed.

Figs. 9 and 10 present the age standardised incidence rates (ASIR) per 100,000 with 95% confidence intervals (CIs) for Group B and C meningococcal disease respectively. Appendix 5 gives a breakdown of the annual number of cases, crude rates and age standardised incidence rates per 100,000 with 95% CIs for all IMD cases and for Group B and C cases.

Fig. 11 presents the percentage uptake of the Men C vaccine in children aged 12 and 24 months between 2002 and 2003. In the final quarter of 2003 the uptake was 77.6% and 82.2 % respectively, which is short of the 95% required to achieve the herd immunity effect.

Of the 65 cases confirmed by the IMMRL for 2003, 53.9% (n=35) were by PCR, and 46.2% (n=30) by blood culture.

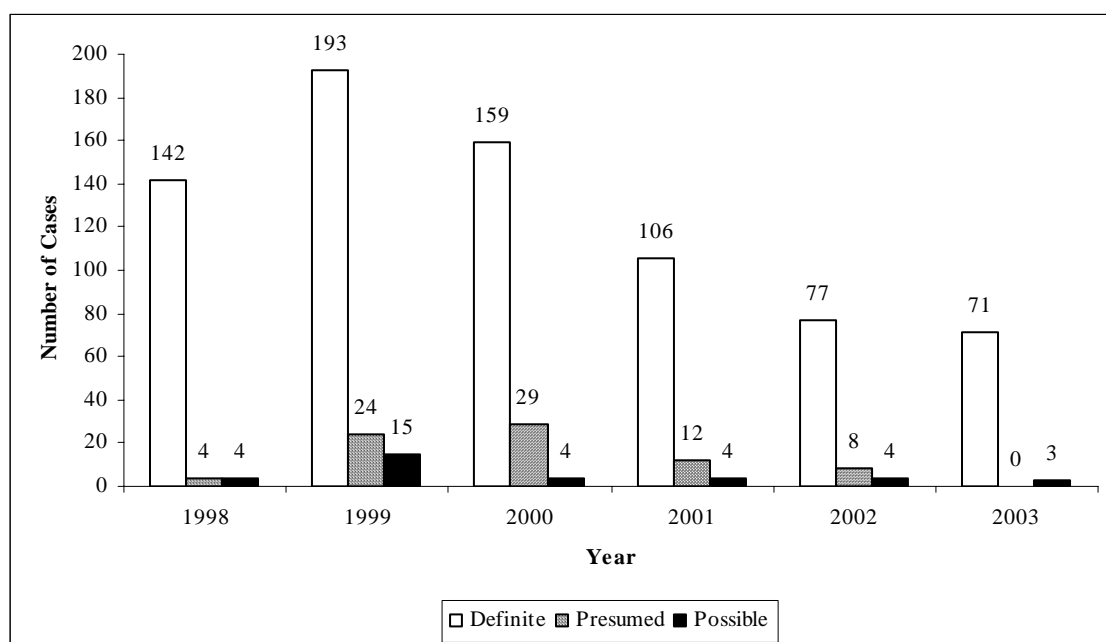


Fig. 4. Annual meningococcal disease cases by classification type for the Eastern Region, 1998-2003

Table 6. Annual meningococcal disease cases by serogroup for the Eastern Region, 1998-2003

Serogroup	1998	1999	2000	2001	2002	2003	Total
Group B	112	146	123	95	71	68	615
Group C	25	46	43	13	9	2	138
Other Group	7	25	22	10	5	1	70
No Organism	6	15	4	4	4	3	36
Total	150	232	192	122	89	74	859

Table 7. Annual meningococcal disease cases by CCA for the Eastern Region, 1998-2003

CCA	1998	1999	2000	2001	2002	2003	Total
CCA1	7	10	8	7	7	1	40
CCA2	6	14	9	3	5	1	38
CCA3	13	26	18	7	12	9	85
CCA4	15	38	32	18	4	11	118
CCA5	16	20	24	21	9	8	98
CCA6	24	28	24	14	16	5	111
CCA7	17	25	17	11	8	10	88
CCA8	30	36	33	22	12	10	143
CCA9	15	28	20	15	11	14	103
CCA10	7	6	7	4	5	5	34
Unknown	0	1	0	0	0	0	1
Total	150	232	192	122	89	74	859

Table 8. Annual meningococcal disease Group B cases by CCA for the Eastern Region, 1998-2003

CCA	1998	1999	2000	2001	2002	2003	Total
CCA1	5	8	4	6	6	1	30
CCA2	4	6	2	2	5	1	20
CCA3	10	13	13	3	10	8	57
CCA4	12	23	14	13	3	11	76
CCA5	12	12	17	15	5	8	69
CCA6	18	23	17	13	15	4	90
CCA7	13	16	13	9	5	9	65
CCA8	20	23	27	18	11	10	109
CCA9	13	17	13	13	8	11	75
CCA10	5	5	3	3	3	5	24
Total	112	146	123	95	71	68	615

Table 9. Annual meningococcal disease Group C cases by CCA for the Eastern Region, 1998-2003

CCA	1998	1999	2000	2001	2002	2003	Total
CCA1	1	2	3	1	1	0	8
CCA2	1	4	4	1	0	0	10
CCA3	1	8	4	1	1	0	15
CCA4	1	6	10	1	1	0	19
CCA5	3	3	3	2	0	0	11
CCA6	4	2	5	1	1	1	14
CCA7	4	6	3	1	2	0	16
CCA8	8	8	5	3	0	0	24
CCA9	1	6	5	1	3	1	17
CCA10	1	1	1	1	0	0	4
Total	25	46	43	13	9	2	138

Table 10. Annual meningococcal disease cases by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
<1	41	67	44	31	28	22	233
1-4	62	80	65	40	24	25	296
5-9	14	25	22	14	4	3	82
10-14	10	16	18	11	11	2	68
15-19	8	21	26	15	6	11	87
20-24	2	10	11	5	3	2	33
25-34	5	5	1	2	4	5	22
35-44	1	2	1	1	2	2	9
45-54	3	0	1	1	2	0	7
55-64	2	2	2	1	3	2	12
>65	2	4	1	1	2	0	10
Total	150	232	192	122	89	74	859

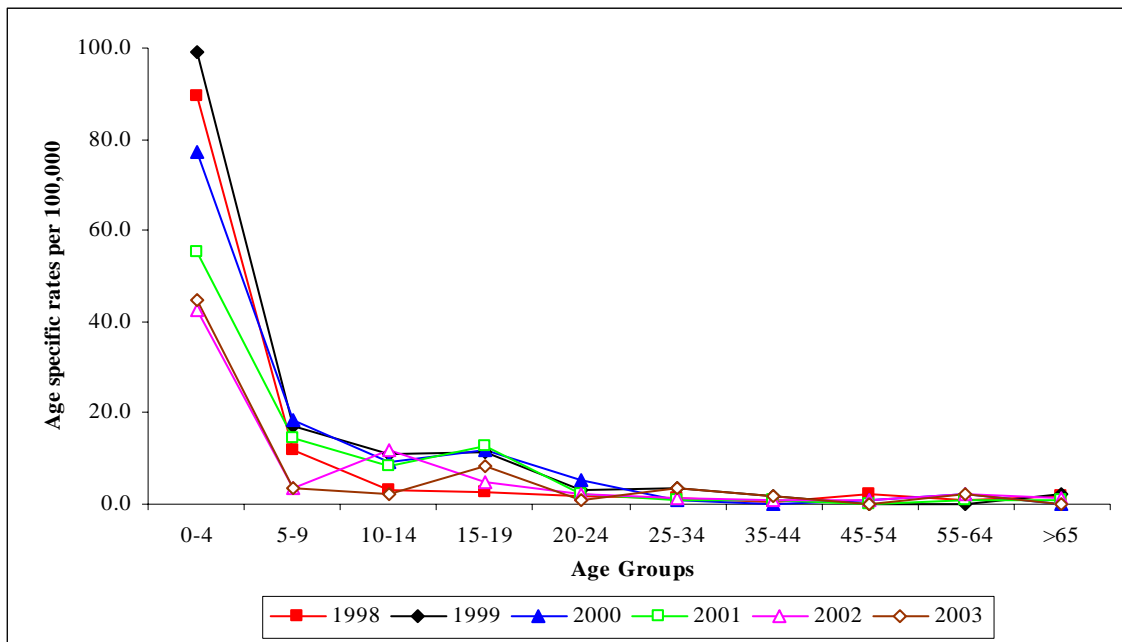


Fig 5. Age specific rates per 100,000 for meningococcal disease Group B in the Eastern Region, 1998-2003

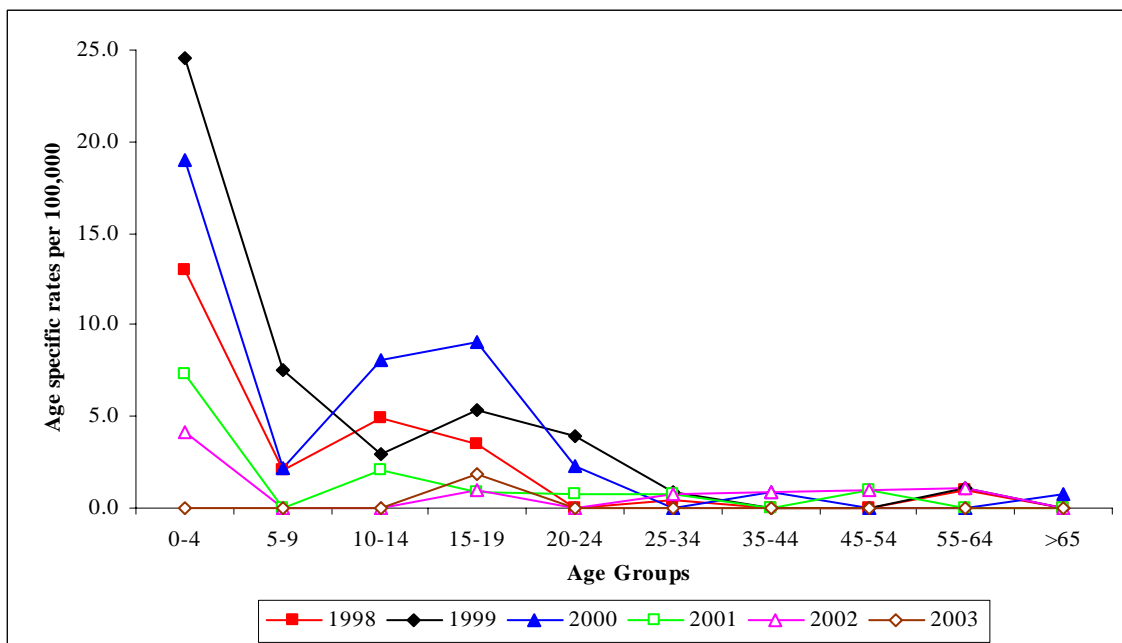


Fig 6. Age specific rates per 100,000 for meningococcal disease Group C in the Eastern Region, 1998-2003

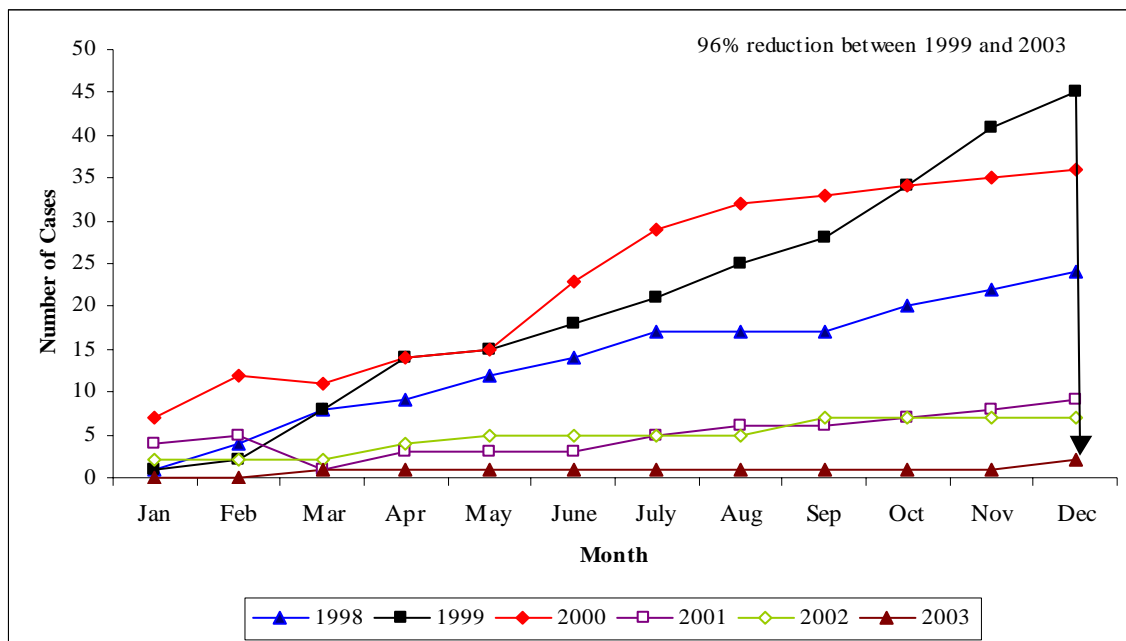


Fig. 7 Cumulative number of meningococcal C cases for the Eastern Region, 1998-2003

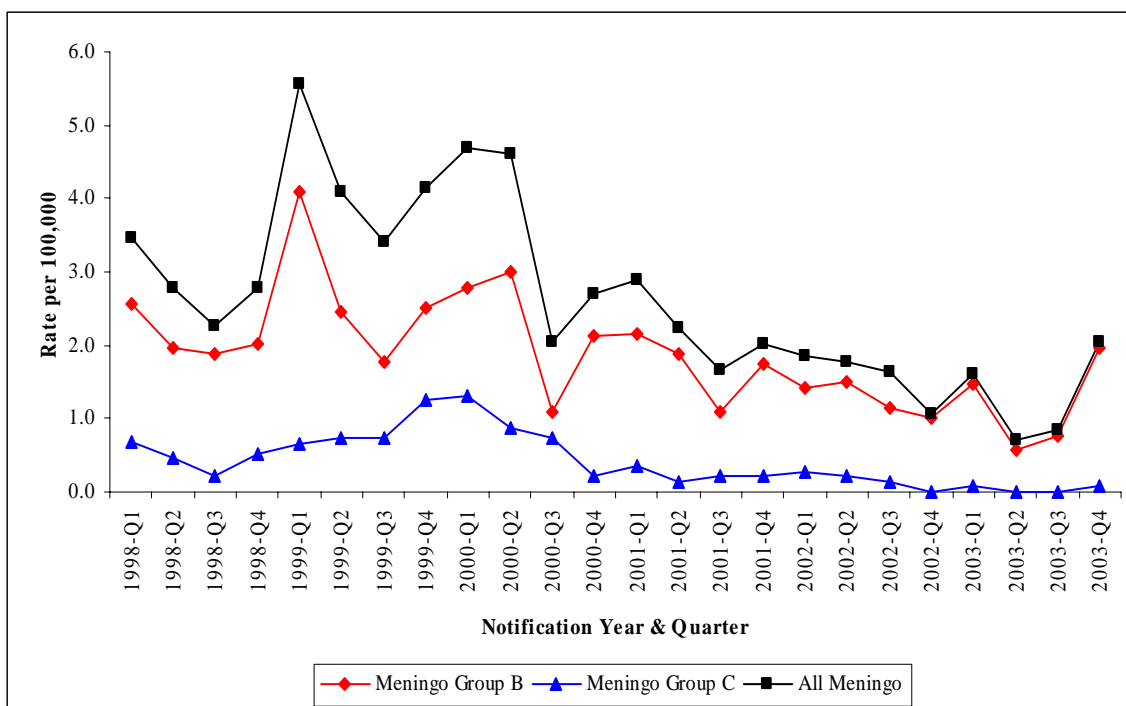


Fig. 8. Annual meningococcal disease rates per 100,000 cases by serogroup and by notification year and quarter for the Eastern Region, 1998-2003

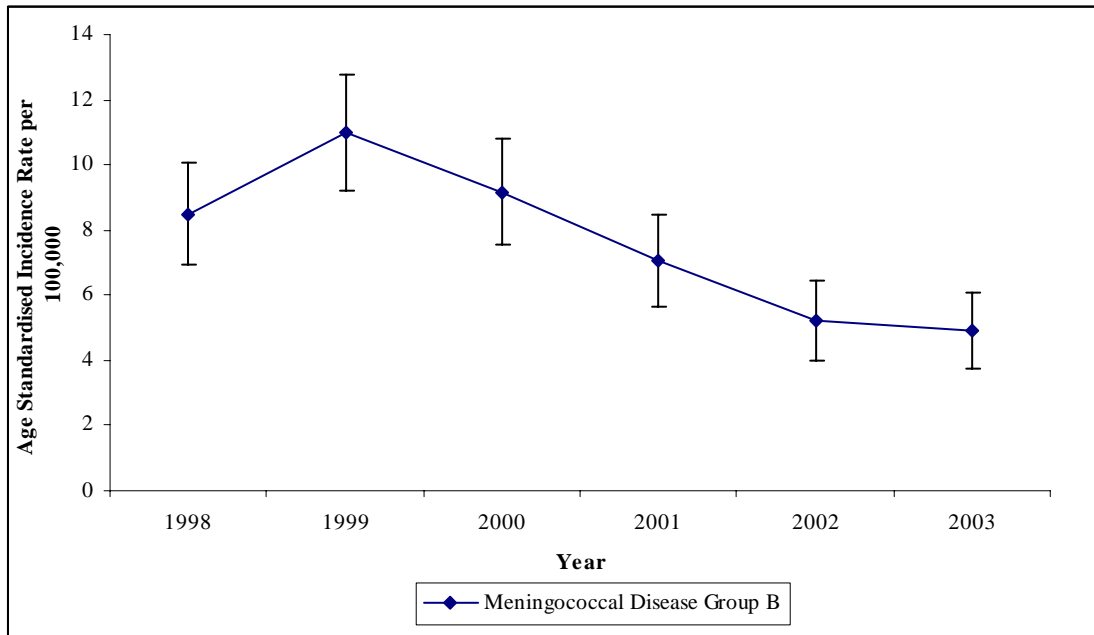


Fig. 9. Age standardised incidence rates (ASIR) per 100,000 with 95% CIs for Group B IMD by notification year for the Eastern Region, 1998-2003

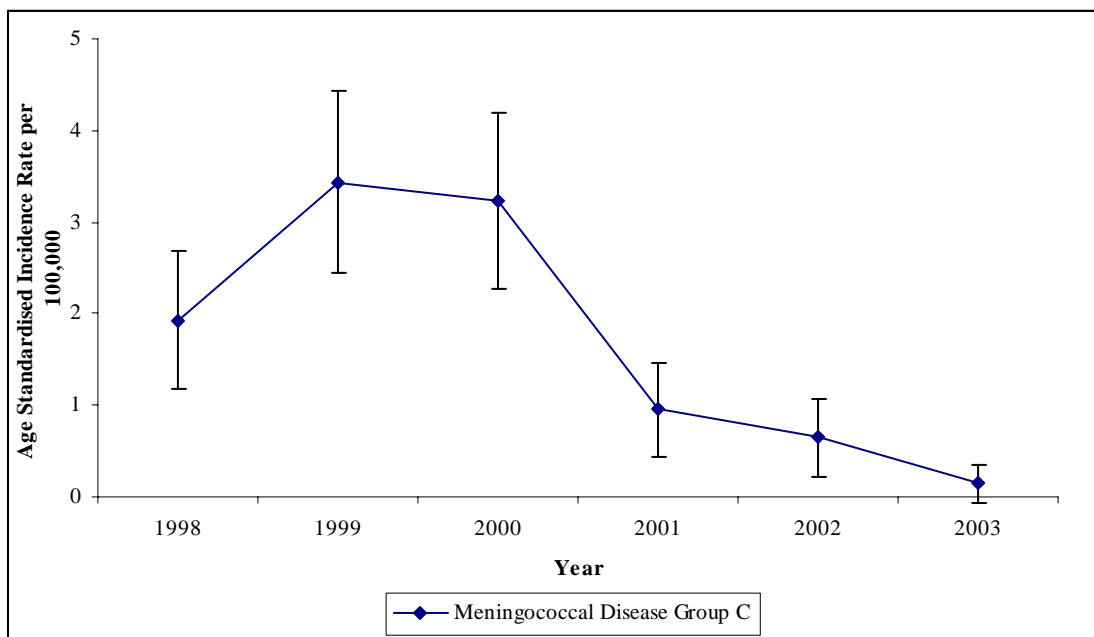


Fig. 10. Age standardised incidence rates (ASIR) per 100,000 with 95% CIs for Group C IMD by notification year for the Eastern Region, 1998-2003

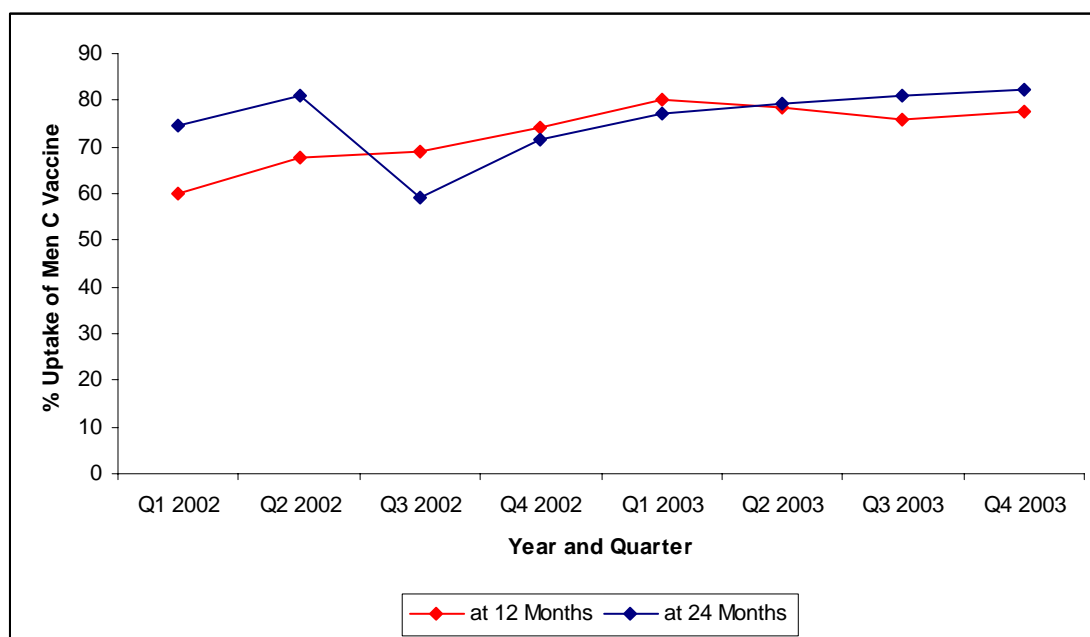


Fig. 11. Percentage uptake at 12 and at 24 months of age of the MenC by notification year and quarter for the Eastern Region, 2000-2003

Bacterial Meningitis other than Meningococcal Disease

Streptococcus pneumoniae

Although *S. pneumoniae* was the second most common form of bacterial meningitis notified after *N. meningitidis*, it accounted for only 4.9% of the notifications between 1998 and 2003 (Table 2). In 2003, 10 cases of *S. pneumoniae* meningitis were notified in the Eastern Region (Appendix 6A). This was equivalent to a notification rate of 0.7/100,000 (Appendix 6B). The highest notification rate in 2003 for *S. pneumoniae* meningitis was in CCA10 (1 case, 0.98/100,000), while no cases of *S. pneumoniae* meningitis were notified in CCA2, CCA7 and CCA9 (Appendix 6B).

Haemophilus influenzae type B

The total number of meningitis cases caused by *H. influenzae* (type B) notified between 1998 and 2003 was 12 (Table 2), with the highest annual number (4 cases) recorded in 2003, equivalent to a rate of 0.28/100,000 (Appendix 6B). CCA1 recorded the highest incidence rate in that year with two cases (1.55/100,000) (Appendix 6B).

Group B Streptococcus

Between 1998 and 2003 the total number of meningitis cases caused by Group B Streptococcus notified was six (0.07/100,000) (Tables 2, 3), with the highest annual number recorded in 2002 with two cases, equivalent to a rate of 0.14/100,000 (Appendices 6A, 6B).

Deaths from bacterial meningitis

There were 29 deaths due to meningococcal disease notified between 1998 and 2003 (0.35/100,000) (Tables 11, 12), all of which occurred in the group defined as “Definite” meningococcal disease (Table 14). The number of deaths peaked in 2000 with 13 cases (0.95/100,000) but has since fallen significantly to five deaths annually in 2003 (0.35/100,000). The case fatality rate (%CSF) for 2000 was 5.2%, compared with 4.1% in 2003 (Table 13). The %CSF values for Groups B and C IMD between 1998 and 2003 were similar at 3.9% and 3.6% respectively (Table 13).

Table 11. Deaths from bacterial meningitis in the Eastern Region, 1998-2003

Bacterial Meningitis Type	1998	1999	2000	2001	2002	2003	Total
<i>Neisseria meningitidis</i> (IMD)	5	5	10	2	4	3	29
<i>Streptococcus pneumoniae</i>	0	0	3	1	0	1	5
Group B streptococcus	1	0	0	0	1	0	2
<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	1	1
Organism unspecified	3	0	0	0	1	0	4
Total	9	5	13	3	6	5	41

Table 12. Annual death rates per 100,000 from bacterial meningitis in the Eastern Region, 1998-2003

Bacterial Meningitis Type	1998	1999	2000	2001	2002	2003	Total
<i>Neisseria meningitidis</i> (IMD)	0.38	0.37	0.73	0.14	0.29	0.21	0.35
<i>Streptococcus pneumoniae</i>	0.00	0.00	0.22	0.07	0.00	0.07	0.06
Group B streptococcus	0.08	0.00	0.00	0.00	0.07	0.00	0.02
<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.07	0.01
Organism unspecified	0.23	0.00	0.00	0.00	0.07	0.00	0.05
Total	0.68	0.37	0.95	0.22	0.43	0.35	0.50

Table 13. Deaths from meningococcal disease by serogroup in the Eastern Region, 1998-2003

Year Noti	Group B	Group C	Total Deaths	Total Cases	%CSF
1998	5	0	5	150	3.3%
1999	4	1	5	232	2.2%
2000	6	4	10	192	5.2%
2001	2	0	2	122	1.6%
2002	4	0	4	89	4.5%
2003	3	0	3	74	4.1%
Total Deaths	24	5	29	859	3.4%
Total Cases	615	138			
%CSF	3.9%	3.6%			

Table 14. Deaths from meningococcal disease by classification type in the Eastern Region, 1998-2003

Year	Definite	Presumed	Possible	Total
1998	5	0	0	5
1999	5	0	0	5
2000	10	0	0	10
2001	2	0	0	2
2002	4	0	0	4
2003	3	0	0	3
Total	29	0	0	29
CFR (%)	4.7	0.0	0.0	3.4

Table 15 gives an annual breakdown by age group of the number of IMD deaths by serogroup. The %CSF values for Group B IMD peaked in 2002 at 5.6%. For Group C IMD the %CSF was highest at 9.3% in 2000 but in 2003 it has fallen to zero.

Table 15. Deaths from meningococcal disease by serogroup in the Eastern Region, 1998-2003

Age Group	1998	1998	1999	1999	2000	2000	2001	2001	2002	2002	2003	2003	Total
	Group B	Group C	Group B	Group C	Group B	Group C	Group B	Group C	Group B	Group C	Group B	Group C	
0-4	4	0	4	0	4	1	1	0	4	0	2	0	20
5-9	1	0	0	1	0	0	0	0	0	0	0	0	2
10-14	0	0	0	0	0	0	0	0	0	0	1	0	1
15-19	0	0	0	0	1	2	1	0	0	0	0	0	4
20-24	0	0	0	0	1	1	0	0	0	0	0	0	2
Total	5	0	4	1	6	4	2	0	4	0	3	0	29
CFR (%)	4.5	0.0	2.7	2.2	4.9	9.3	2.1	0.0	5.6	0.0	4.4	0.0	3.9

Conclusions

- Bacterial meningitis / septicaemia is an important cause of morbidity and mortality amongst children in the Eastern Region.
- Invasive meningococcal disease (IMD) accounts for the majority of cases of bacterial meningitis / septicaemia in the region.
- From 1998 to 2003, 990 cases of bacterial meningitis / septicaemia were notified in the eastern region.
- These cases included 859 cases of IMD, 48 cases of pneumococcal meningitis and twelve cases of haemophilus influenzae type B.
- There were 41 deaths due to bacterial meningitis / septicaemia in the region between 1998-2003.
- Between 1999 and 2003 there was a 98% decrease in meningococcal disease caused by Group C meningococcus highlighting the success of the mEn C immunization programme.

Acknowledgements

The authors wish to thank all those who contributed to the data, namely the Meningococcal Reference Laboratory, the hospital microbiology laboratories, the specialists in public health medicine within the Department, especially Dr. Gerardine Sayers and the Community Care Senior Area Medical Officers and Area Medical Officers. Thanks also to Dr. Margaret Fitzgerald of the NDSC for providing an electronic version of the 1998-2001 data and for assisting with data validation. Also, a very special thanks to Margaret McIver for vital administrative and surveillance support.

References

1. Bacterial meningitis 2002. National Disease Surveillance Centre, Annual report 2002, p12-17. Available at <http://www.ndsc.ie/Publications/AnnualReports/>
2. The Department of Health and Children's Working Group Report on Bacterial Meningitis and Related Conditions, July 1999. <http://www.doh.ie/publications/bm99.html>
3. NDSC Provides Reassurance to Parents on the Safety of Meningitis C Vaccine. Press release 2000. <http://www.ndsc.ie/PressReleases/2000/d231.HTML.html>

Appendices

Appendix 1: Invasive Meningococcal Disease (IMD) Case definitions

For surveillance purposes the diagnosis of IMD is classified as Definite, Presumed or Possible², details of which are to be found in Appendix 1.

A **Definite** case of IMD includes children or adults who have:

- *Neisseria meningitidis* isolated from blood, CSF or other normally sterile body site (e.g. synovial, pleural or pericardial fluid) or from a petechial or purpuric lesion.
- A positive PCR test for *N. meningitidis* obtained on blood, CSF or specimen from another sterile site.

A **Presumed** case of IMD includes children or adults who have:

- Gram negative intracellular diplococci detected in CSF on microscopy. *N. meningitidis* isolated from eye, throat or nasal swab, together with as characteristic purpuric rash.
- *N. meningitidis* isolated from eye, throat or nasal swab and who have clinical and laboratory features of bacterial meningitis (CSF pleocytosis) in whom no other cause of meningitis is identified.
- A clinically compatible illness and who have Gram negative intracellular diplococci detected in skin scrapings taken from the characteristic haemorrhagic rash.
- A clinically compatible illness with a serological response, which is reported by a reference laboratory as consistent with recent acute infection.

A **Possible** case of IMD includes children and adults who have:

- Evidence of acute sepsis, with or without meningitis, together with characteristic haemorrhagic purpura.
- Clinical evidence of sepsis without purpuric rash, in whom no other cause of sepsis, is identified, and in whom *N. meningitidis* is isolated from an eye, throat or nasal swab.
- Received pre-admission antibiotics and have laboratory evidence of bacterial meningitis but are culture negative.

Appendix 2A: Rates of bacterial meningitis per 100,000 by CCA in the Eastern Region, 1998-2003

All Cases*	1998	1999	2000	2001	2002	2003	Total
CCA1	7.05	7.81	8.58	5.45	6.21	4.65	6.62
CCA2	6.74	13.44	12.44	2.86	4.76	0.95	6.85
CCA3	11.44	20.89	15.02	5.45	11.49	8.30	12.03
CCA4	10.41	27.69	25.54	12.39	4.12	8.89	14.82
CCA5	17.22	16.87	20.67	17.84	7.95	10.93	15.14
CCA6	18.15	20.43	16.16	8.88	11.21	4.89	13.13
CCA7	14.19	20.75	15.69	11.50	8.17	9.75	13.31
CCA8	17.26	18.62	19.46	11.87	6.37	7.78	13.49
CCA9	10.76	17.77	13.66	13.83	8.40	10.88	12.48
CCA10	12.86	7.37	13.45	6.10	8.00	5.90	8.89
Total	12.92	17.80	16.39	10.04	7.71	7.54	12.00

*includes one case with an unknown CCA code in 1999

Appendix 2B: Rates of meningococcal meningitis per 100,000 by CCA in the Eastern Region, 1998-2003

All Meningo*	1998	1999	2000	2001	2002	2003	Total
CCA1	5.48	7.81	6.24	5.45	5.43	0.77	5.19
CCA2	5.78	13.44	8.61	2.86	4.76	0.95	6.05
CCA3	10.62	20.89	14.23	5.45	9.20	6.79	11.11
CCA4	10.41	26.30	22.09	12.39	2.74	7.52	13.55
CCA5	13.77	16.87	19.84	17.02	7.16	6.24	13.37
CCA6	16.13	18.45	15.52	8.88	9.96	3.06	11.85
CCA7	14.19	20.75	14.03	9.03	6.53	8.13	12.08
CCA8	15.23	18.12	16.46	10.88	5.88	4.86	11.84
CCA9	9.49	17.16	11.88	8.65	6.16	7.62	10.04
CCA10	7.50	6.32	7.24	4.07	5.00	4.92	5.81
Total	11.27	17.20	14.05	8.82	6.35	5.21	10.41

*includes one case with an unknown CCA code in 1999

Appendix 2C: Rates of Group B meningococcal meningitis per 100,000 by CCA in the Eastern Region, 1998-2003

Group B Meningo	1998	1999	2000	2001	2002	2003	Total
CCA1	3.92	6.25	3.12	4.67	4.66	0.77	3.89
CCA2	3.85	5.76	1.91	1.91	4.76	0.95	3.19
CCA3	8.17	10.45	10.28	2.34	7.66	6.04	7.45
CCA4	8.33	15.92	9.66	8.95	2.06	7.52	8.73
CCA5	10.33	10.12	14.05	12.16	3.98	6.24	9.41
CCA6	12.10	15.16	10.99	8.25	9.34	2.45	9.61
CCA7	10.85	13.28	10.73	7.39	4.08	7.31	8.92
CCA8	10.15	11.57	13.47	8.90	5.39	4.86	9.02
CCA9	8.23	10.42	7.72	7.49	4.48	5.99	7.31
CCA10	5.36	5.27	3.10	3.05	3.00	4.92	4.10
Total	8.41	10.83	9.00	6.86	5.07	4.79	7.45

Appendix 2D: Rates of Group C meningococcal meningitis per 100,000 by CCA in the Eastern Region, 1998-2003

Group C Meningo	1998	1999	2000	2001	2002	2003	Total
CCA1	0.78	1.56	2.34	0.78	0.78	0.00	1.04
CCA2	0.96	3.84	3.83	0.95	0.00	0.00	1.59
CCA3	0.82	6.43	3.16	0.78	0.77	0.00	1.96
CCA4	0.69	4.15	6.90	0.69	0.69	0.00	2.18
CCA5	2.58	2.53	2.48	1.62	0.00	0.00	1.50
CCA6	2.69	1.32	3.23	0.63	0.62	0.61	1.49
CCA7	3.34	4.98	2.48	0.82	1.63	0.00	2.20
CCA8	4.06	4.03	2.49	1.48	0.00	0.00	1.99
CCA9	0.63	3.68	2.97	0.58	1.68	0.54	1.66
CCA10	1.07	1.05	1.03	1.02	0.00	0.00	0.68
Total	1.88	3.41	3.15	0.94	0.64	0.14	1.67

Appendix 3A: Annual meningococcal disease Group B cases by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	83	93	73	53	41	44	387
5-9	11	16	17	13	3	3	63
10-14	3	11	9	8	11	2	44
15-19	3	13	13	14	5	9	57
20-24	2	4	7	3	3	1	20
25-34	3	4	1	1	2	5	16
35-44	1	2	0	1	1	2	7
45-54	3	0	1	0	1	0	5
55-64	1	0	2	1	2	2	8
>65	2	3	0	1	2	0	8
Total	112	146	123	95	71	68	615

Appendix 3B: Annual meningococcal disease Group B rates per 100,000 by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	89.64	99.30	77.07	55.34	42.34	44.95	67.72
5-9	11.71	17.27	18.61	14.43	3.38	3.43	11.57
10-14	2.92	10.93	9.13	8.30	11.66	2.17	7.52
15-19	2.62	11.55	11.74	12.86	4.67	8.55	8.65
20-24	1.59	3.11	5.32	2.24	2.19	0.72	2.51
25-34	1.33	3.30	0.80	0.77	1.50	3.62	2.09
35-44	0.53	1.79	0.00	0.85	0.83	1.63	1.01
45-54	1.97	0.00	0.98	0.00	0.94	0.00	0.81
55-64	0.93	0.00	2.15	1.06	2.08	2.04	1.42
>65	1.55	2.29	0.00	0.74	1.47	0.00	1.00
Total	8.41	10.83	9.00	6.86	5.07	4.79	7.45

Appendix 4A: Annual meningococcal disease Group C cases by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	12	23	18	7	4	0	64
5-9	2	7	2	0	0	0	11
10-14	5	3	8	2	0	0	18
15-19	4	6	10	1	1	2	24
20-24	0	5	3	1	0	0	9
25-34	1	1	0	1	1	0	4
35-44	0	0	1	0	1	0	2
45-54	0	0	0	1	1	0	2
55-64	1	1	0	0	1	0	3
>65	0	0	1	0	0	0	1
Total	25	46	43	13	9	2	138

Appendix 4B: Annual meningococcal disease Group C rates per 100,000 by age group for the Eastern Region, 1998-2003

Age Group	1998	1999	2000	2001	2002	2003	Total
0-4	12.96	24.56	19.00	7.31	4.13	0.00	11.20
5-9	2.13	7.55	2.19	0.00	0.00	0.00	2.02
10-14	4.86	2.98	8.12	2.07	0.00	0.00	3.08
15-19	3.50	5.33	9.03	0.92	0.93	1.90	3.64
20-24	0.00	3.88	2.28	0.75	0.00	0.00	1.13
25-34	0.44	0.83	0.00	0.77	0.75	0.00	0.52
35-44	0.00	0.00	0.87	0.00	0.83	0.00	0.29
45-54	0.00	0.00	0.00	0.96	0.94	0.00	0.32
55-64	0.93	1.10	0.00	0.00	1.04	0.00	0.53
>65	0.00	0.00	0.75	0.00	0.00	0.00	0.12
Total	1.88	3.41	3.15	0.94	0.64	0.14	1.67

Appendix 5A: Annual Numbers of Cases, Crude Incidence Rates (CIR) and Age Standardised Incidence Rates (ASIR) per 100,000 with 95% Confidence Intervals (CIs) for the Eastern Region, 1998-2003 for all IMD cases

Year Notif	Number	CIR	CIR 95%CI L	CIR 95%CI U	ASIR	ASIR 95%CI L	ASIR 95%CI U	CIR SE	ASIR SE
1998	150	11.27	9.47	13.07	11.40	9.57	13.22	0.92	0.93
1999	232	17.20	14.99	19.42	17.44	15.19	19.69	1.13	1.15
2000	192	14.05	12.07	16.04	14.35	12.32	16.38	1.01	1.04
2001	122	8.82	7.25	10.38	9.04	7.43	10.64	0.80	0.82
2002	89	6.35	5.03	7.67	6.53	5.17	7.89	0.67	0.69
2003	74	5.21	4.03	6.40	5.32	4.11	6.53	0.61	0.62

Appendix 5B: Annual Numbers of Cases, Crude Incidence Rates (CIR) and Age Standardised Incidence Rates (ASIR) per 100,000 with 95% Confidence Intervals (CIs) for the Eastern Region, 1998-2003 for Meningococcal Group B Cases

Year Notif	Number	CIR	CIR 95%CI L	CIR 95%CI U	ASIR	ASIR 95%CI L	ASIR 95%CI U	CIR SE	ASIR SE
1998	112	8.41	6.86	9.97	8.48	6.91	10.06	0.80	0.80
1999	146	10.83	9.07	12.58	10.99	9.21	12.78	0.90	0.91
2000	123	9.00	7.41	10.59	9.18	7.55	10.80	0.81	0.83
2001	95	6.86	5.48	8.25	7.06	5.64	8.48	0.70	0.72
2002	71	5.07	3.89	6.24	5.23	4.01	6.45	0.60	0.62
2003	68	4.79	3.65	5.93	4.89	3.73	6.06	0.58	0.59

Appendix 5C: Annual Numbers of Cases, Crude Incidence Rates (CIR) and Age Standardised Incidence Rates (ASIR) per 100,000 with 95% Confidence Intervals (CIs) for the Eastern Region, 1998-2003 for Meningococcal Group C Cases

Year Notif	Number	CIR	CIR 95%CI L	CIR 95%CI U	ASIR	ASIR 95%CI L	ASIR 95%CI U	CIR SE	ASIR SE
1998	25	1.88	1.14	2.61	1.93	1.17	2.68	0.38	0.39
1999	46	3.41	2.43	4.40	3.43	2.44	4.42	0.50	0.51
2000	43	3.15	2.21	4.09	3.23	2.27	4.20	0.48	0.49
2001	13	0.94	0.43	1.45	0.95	0.43	1.47	0.26	0.26
2002	9	0.64	0.22	1.06	0.65	0.22	1.07	0.21	0.22
2003	2	0.14	-0.05	0.34	0.15	-0.06	0.35	0.10	0.10

Appendix 6A: Cases of Bacterial Meningitis other than Meningococcal Disease by CCA in the Eastern Region, 1998-2003

Year	Disease	CCA1	CCA2	CCA3	CCA4	CCA5	CCA6	CCA7	CCA8	CCA9	CCA10	Total
1998	<i>Haemophilus influenzae</i> type b	0	0	0	0	0	2	0	0	0	0	2
	<i>Streptococcus pneumoniae</i>	0	0	0	0	0	0	0	0	0	2	2
	Group B streptococci	0	0	0	0	0	0	0	0	1	0	1
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Escherichia coli</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	Bacterial Meningitis	2	1	1	0	4	1	0	4	1	3	17
1999	<i>Haemophilus influenzae</i> type b	0	0	0	0	0	1	0	1	0	0	2
	<i>Streptococcus pneumoniae</i>	0	0	0	2	0	2	0	0	1	1	6
	Group B streptococci	0	0	0	0	0	0	0	0	0	0	0
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Escherichia coli</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	Bacterial Meningitis	0	0	0	0	0	0	0	0	0	0	0
2000	<i>Haemophilus influenzae</i> type b	0	0	0	0	0	0	0	0	0	2	2
	<i>Streptococcus pneumoniae</i>	0	2	0	3	1	1	1	5	1	2	16
	Group B streptococci	0	0	0	1	0	0	0	0	0	0	1
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Escherichia coli</i>	0	0	0	0	0	0	0	0	0	1	1
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	1	0	1
	<i>Listeria</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	Bacterial Meningitis	3	2	1	1	0	0	1	1	1	1	11
2001	<i>Haemophilus influenzae</i> type b	0	0	0	0	0	0	0	1	0	0	1
	<i>Streptococcus pneumoniae</i>	0	0	0	0	0	0	2	1	4	1	8
	Group B streptococci	0	0	0	0	0	0	0	0	1	0	1
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Escherichia coli</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	Bacterial Meningitis	0	0	0	0	1	0	1	0	4	1	7
2002	<i>Haemophilus influenzae</i> type b	1	0	0	0	0	0	0	0	0	0	1
	<i>Streptococcus pneumoniae</i>	0	0	1	1	1	1	0	0	2	0	6
	Group B streptococci	0	0	0	0	0	0	0	0	1	1	2
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	0	1	0	0	0	0	1
	<i>Escherichia coli</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	0	0	0	0
	Bacterial Meningitis	0	0	2	1	0	0	2	1	1	2	9
2003	<i>Haemophilus influenzae</i> type b	2	0	0	0	1	0	0	0	1	0	4
	<i>Streptococcus pneumoniae</i>	1	0	2	1	2	1	0	2	0	1	10
	Group B streptococci	0	0	0	0	1	0	0	0	0	0	1
	<i>Mycobacterium tuberculosis</i>	0	0	0	0	1	0	2	0	0	0	3
	<i>Escherichia coli</i>	0	0	0	1	0	1	0	0	0	0	2
	<i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> sp.	0	0	0	0	0	1	0	0	1	0	2
	<i>Enterobacter</i> sp.	0	0	0	0	0	0	0	1	0	0	1
	Bacterial Meningitis	2	0	0	0	1	0	0	3	4	0	10
Total		11	5	7	11	13	12	9	20	25	18	131

Appendix 6B: Rates per 100,000 of Bacterial Meningitis other than Meningococcal Disease by CCA in the Eastern Region, 1998-2003

Year	Disease	CCA1	CCA2	CCA3	CCA4	CCA5	CCA6	CCA7	CCA8	CCA9	CCA10	Total
1998	<i>Haemophilus influenzae</i> type b	0.00	0.00	0.00	0.00	0.00	1.34	0.00	0.00	0.00	0.00	0.15
	<i>Streptococcus pneumoniae</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	0.15
	Group B streptococci	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.08
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bacterial Meningitis	1.57	0.96	0.82	0.00	3.44	0.67	0.00	2.03	0.63	3.22	1.28
1999	<i>Haemophilus influenzae</i> type b	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.50	0.00	0.00	0.15
	<i>Streptococcus pneumoniae</i>	0.00	0.00	0.00	1.38	0.00	1.32	0.00	0.00	0.61	1.05	0.44
	Group B streptococci	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bacterial Meningitis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	<i>Haemophilus influenzae</i> type b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	0.15
	<i>Streptococcus pneumoniae</i>	0.00	1.91	0.00	2.07	0.83	0.65	0.83	2.49	0.59	2.07	1.17
	Group B streptococci	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.07
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.07
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bacterial Meningitis	2.34	1.91	0.79	0.69	0.00	0.00	0.83	0.50	0.59	1.03	0.81
2001	<i>Haemophilus influenzae</i> type b	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.07
	<i>Streptococcus pneumoniae</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.64	0.49	2.31	1.02	0.58
	Group B streptococci	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.07
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bacterial Meningitis	0.00	0.00	0.00	0.00	0.81	0.00	0.82	0.00	2.31	1.02	0.51
2002	<i>Haemophilus influenzae</i> type b	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	<i>Streptococcus pneumoniae</i>	0.00	0.00	0.77	0.69	0.80	0.62	0.00	0.00	1.12	0.00	0.43
	Group B streptococci	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	1.00	0.14
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.07
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bacterial Meningitis	0.00	0.00	1.53	0.69	0.00	0.00	1.63	0.49	0.56	2.00	0.64
2003	<i>Haemophilus influenzae</i> type b	1.55	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.54	0.00	0.28
	<i>Streptococcus pneumoniae</i>	0.77	0.00	1.51	0.68	1.56	0.61	0.00	0.97	0.00	0.98	0.70
	Group B streptococci	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.07
	<i>Mycobacterium tuberculosis</i>	0.00	0.00	0.00	0.00	0.78	0.00	1.63	0.00	0.00	0.00	0.21
	<i>Escherichia coli</i>	0.00	0.00	0.00	0.68	0.00	0.61	0.00	0.00	0.00	0.00	0.14
	<i>Staphylococcus aureus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Listeria</i> sp.	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.54	0.00	0.14
	<i>Enterobacter</i> sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.07
	Bacterial Meningitis	1.55	0.00	0.00	0.00	0.78	0.00	0.00	1.46	2.18	0.00	0.70
Total		1.43	0.80	0.92	1.26	1.77	1.28	1.24	1.66	2.44	3.08	1.59