ESR

**SURVEILLANCE** REPORT

# The epidemiology of meningococcal disease in New Zealand

# 2012

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Lopez, L. and K. Sexton
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## Disclaimer

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# SUMMARY

# SUMMARY

Surveillance of meningococcal disease in 2012 revealed these key findings:

- 85 cases of meningococcal disease were notified. This equates to a notification rate of 1.9 per 100 000 population, the lowest rate of meningococcal disease in New Zealand for two decades.
- The number of confirmed cases was 74, giving a confirmation rate of 87.1%.
- Canterbury District Health Board had the highest number of cases (10), followed by Waitemata (9) and Capital & Coast (9) District Health Boards (DHBs). The highest rates of disease were in Taranaki (5.4 per 100 000 population, 6 cases) and Lakes (4.8 per 100 000 population, 5 cases) DHBs.
- The highest age-specific rates of meningococcal disease continued to occur in children younger than five years: 19.8 per 100 000 population for those aged less than one year and 5.6 per 100 000 population for those aged 1–4 years. As in previous years a secondary peak in the notification rate was observed for the 15–19 years age group (4.8 per 100 000 population). The 2012 rates of disease for the less than one year and 1–4 year age groups were around half the previous year's rates (38.5 per 100 000 and 12.7 per 100 000, respectively, in 2011).
- Although age-standardised rates decreased for all ethnic groups between 2008 and 2012, Māori and Pacific Peoples continued to experience higher rates of disease than the European or Other ethnic group in 2012. The highest disease rate was in the Māori ethnic group (3.3 per 100 000 population, 29 cases), followed by Pacific Peoples (3.0 per 100 000 population, 10 cases) and European or Other (1.5 per 100 000 population, 42 cases) ethnic groups.
- The strain type was determined for 68 (91.9%) of the 74 confirmed meningococcal disease cases. Over 60% of cases were group B strains and approximately 33% were group C strains, with 22.1% due to group B:P1.7-2,4 and 26.5% due to group C:P1.5-1,10-8.
- Hospitalisation status was recorded for all notified cases, and 82 (96.5%) were hospitalised. Of the three cases that were not hospitalised, two died.
- Six fatalities occurred, giving a case-fatality rate of 7.1%. All fatalities in 2012 were confirmed cases. Four fatalities were due to group C strains, including three with group C:P1.5-1,10-8 strain. Two were group B strains, one with group B:P1.7-2,4 strain.
- The case-fatality rate for group C disease was 17.4% and for group B disease was 4.7%.
- The antimicrobial susceptibility of 50 viable meningococcal isolates, received by ESR from cases of invasive disease in 2012, was tested. All isolates were susceptible to ceftriaxone, rifampicin and ciprofloxacin. More than 30% (16/50) had reduced susceptibility to penicillin, with minimum inhibitory concentrations (MICs) of 0.12–0.5 mg/L.

# INTRODUCTION

# INTRODUCTION

Invasive meningococcal disease is a serious disease caused by infection with the bacterium *Neisseria meningitidis* that can rapidly progress from a mild flu-like illness to death [1].

A large epidemic of meningococcal disease due to a single group B strain, B:P1.7-2,4, occurred in New Zealand between 1991 and 2007 [2],[3]. This led to the development of a strain-specific vaccine, MeNZB™ [4], and a vaccination programme between 2004 and 2008. Smaller, localised outbreaks of meningococcal disease have also occurred in New Zealand, including a group A disease outbreak in Auckland in 1985/86 [5] and several group C regional outbreaks, most recently in Northland in 2012 [6].

The epidemiology of meningococcal disease in New Zealand has been summarised annually as reports to the Ministry of Health since the mid-1990s. These are accessible for 2005 onwards on the websites http://www.health.govt.nz (for 2005–2007) and http://www.surv.esr.cri.nz (for 2008 onwards). This report summarises the epidemiology of meningococcal disease in 2012 and reviews the trends in disease patterns from 2008 onwards, with a focus on the period following the B:P1.7-4 epidemic. Laboratory typing methodologies have also been stable in New Zealand since 2007. The report provides historic and recent data, against which the current rates of meningococcal disease in New Zealand can be assessed.

# METHODS

# METHODS

## Data sources

Surveillance of meningococcal disease in New Zealand is based on a combination of notification and laboratory-based surveillance.

### Case definition

The case definition for meningococcal disease changed during the period covered in this report. From 2008 to the end of May 2012, *Neisseria meningitidis* invasive disease was defined in the Ministry of Health's *Communicable Disease Control Manual* (2011) [1] as: 'Meningococcal disease presents as meningitis or meningococcal septicaemia. The disease presents as an acute fever, nausea, vomiting, and headache and may rapidly progress to shock and death. Petechial rash is seen in about 50 percent.' Cases with a clinically compatible illness are classified as probable or confirmed as follows.

Probable case:

- a clinically compatible illness and isolation of *Neisseria meningitidis* from the throat or
- a clinically compatible illness.

Confirmed case: a clinically compatible illness with at least one of the following

- isolation of *N. meningitidis* from an otherwise sterile body site [cerebrospinal fluid (CSF), blood, aspirate or skin biopsy] or
- a positive nucleic acid test using the polymerase chain reaction (PCR) on CSF, blood, serum or aspirate or
- detection of Gram-negative intracellular diplococci in CSF, blood, aspirate or skin biopsy or
- a positive meningococcal antigen test on CSF.

On 31 May 2012, a revised case definition was released by the Ministry of Health. In the *Communicable Disease Control Manual* (2012) [7], the updated clinical description of *Neisseria meningitidis* invasive disease is: 'Meningococcal disease is a serious invasive disease with an acute onset and may start as a mild flu-like illness and rapidly progress to fulminant septicaemia and death. Cases typically experience acute fever, malaise, nausea, myalgia, arthralgia and prostration. A rash occurs in about two-thirds of cases – this may be ill defined and macular, petechial or purpuric. More severe infection leads to shock, disseminated intra-vascular coagulation (DIC), acrocyanosis and multi-organ failure. Approximately 75 percent of cases with invasive disease have meningitis (typically causing headache, photophobia and neck stiffness). Infants present with less-specific features. Other locations of invasive disease with *N. meningitidis* are possible though rare, such as orbital cellulitis, septic arthritis, and pericarditis.'

Probable case:

- a clinically compatible illness.

Confirmed case: a clinically compatible illness with at least one of the following

- isolation of *Neisseria meningitidis* bacteria or detection of *N. meningitidis* nucleic acid from blood, CSF or other normally sterile site (eg, pericardial or synovial fluid)
- detection of gram negative intracellular diplococci in blood, CSF or skin petechiae
- detection of meningococcal antigen (ie, latex agglutination test) in CSF

The impact of the change in case definition since May 2012 on trends in the meningococcal disease notification rates will be negligible. The main changes were a more detailed clinical description and modification of the probable case definition (where a redundant description was dropped).

### EpiSurv, the national notifiable disease surveillance system

Meningococcal disease is notifiable to Medical Officers of Health under the Health Act 1956. Data relating to each case is entered onto the EpiSurv database by the respective public health unit (PHU) via a secure web-based portal. This near real-time data is collated and analysed on behalf of the Ministry of Health by the Institute of Environmental Science and Research Ltd (ESR).

The notification data contained in this report is based on information recorded on EpiSurv as at 7 February 2013. Updates or additions made to EpiSurv data after this date are not reflected in this report. Consequently, future data analysis may produce revised results. Notification data from 2008 to 2012 presented in this report has been updated to reflect EpiSurv data as at 7 February 2013.

### Reference Laboratories at ESR

Diagnostic laboratories routinely refer invasive samples from cases of meningococcal disease to the Invasive Pathogens Laboratory at ESR for characterisation to determine the strain type. In addition, some laboratories are asked to send isolates from non-invasive sites to help monitor the strains circulating in the community.

Antimicrobial resistance data contained in this report is taken from the national surveillance of antimicrobial resistance among human pathogens conducted by the Antibiotic Reference Laboratory at ESR.

## Laboratory methods

### Strain characterisation

Strain characterisation is carried out by the Invasive Pathogens Laboratory at ESR. Routine characterisation includes determining the group, serotype (for isolates only, not DNA samples) and subtype (PorA type).

The group is identified either serologically or by PCR. Serology is used to determine the serotype, and DNA sequence analysis of the *porA* gene is used to determine the PorA type.

Using B:4:P1.7-2,4, as an example, ‘B’ is the group, ‘4’ is the serotype and ‘P1.7-2,4’ is the PorA type. In this report, the strain responsible for the New Zealand epidemic is defined as B:P1.7-2,4. A serotype is not specified, since the serotype cannot be determined from the DNA samples submitted to ESR for strain typing. For this reason, serotypes are also not included in the analyses of dominant circulating strains in this report.

Because the MeNZB™ vaccine targeted the P1.4 variable region of the PorA protein of the meningococcus causing the epidemic [8], it was expected to be effective against all meningococci that have this variable region. Therefore, for the purpose of these analyses, any meningococci or meningococcal DNA PorA typed as P1.n-n,4-n (where n can be any number or missing) conforms to the P1.4 type, and is described as being targeted by the MeNZB™ vaccine. For example, the strain responsible for the New Zealand epidemic, B:P1.7-2,4, has a P1.4 variable region.

### Antimicrobial resistance determination

Ceftriaxone, ciprofloxacin, penicillin and rifampicin minimum inhibitory concentrations (MICs) were determined by Etest on Mueller-Hinton agar + 5% sheep blood. MICs were interpreted according to the Clinical and Laboratory Standards Institute’s criteria [9].

## Analytical methods

Denominator data used to determine all disease rates, except for those relating to ethnicity, were derived from the 2012 mid-year population estimates published by Statistics New Zealand. Denominator data used to determine disease rates for ethnic groups was based on the proportion of people in each ethnic group (accounting for differences in these proportions in age and sex groups) from the estimated resident 2006 census population applied to the 2012 mid-year population estimates from Statistics New Zealand. For different ethnic groups, numbers and rates are based on a prioritised classification of ethnicity, with the Māori ethnic group at the top of the hierarchy, followed by Pacific Peoples, Asian, Middle Eastern/Latin American/African (MELAA) and European or Other Ethnicity (including New Zealander) ethnic groups. The 'European or Other Ethnicity' ethnic group is presented as European or Other ethnic group in this report.

Rates were not calculated if there were fewer than five notified cases in any category, since calculating population rates from fewer than five cases produces unstable rates.

This report analyses the distribution of meningococcal disease by deprivation using the New Zealand Deprivation Index 2006 (NZDep06) [10]. The index, measuring relative socioeconomic deprivation, is derived from a weighted combination of nine variables from the 2006 census, each reflecting a different aspect of material and social deprivation. The deprivation score, which ranges from 1 (least deprived) to 10 (most deprived), is calculated for each geographical meshblock in New Zealand. Approximately equal numbers of people reside in areas associated with each of the 10 deprivation levels [11].

Fisher's exact tests were used to determine statistical significance. Results are considered to be statistically significant when the value of $P$ is less than or equal to 0.05.

# RESULTS

# RESULTS

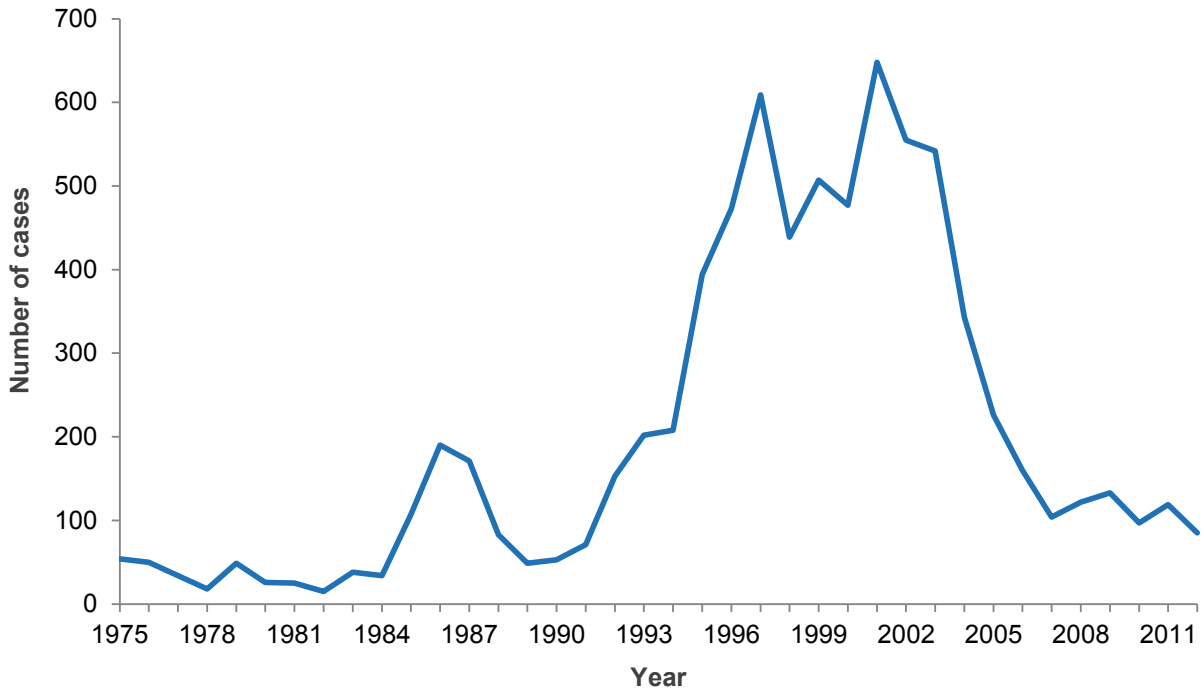
These analyses include all notified cases of meningococcal disease, both confirmed and probable, unless indicated otherwise.

## Case characteristics

### Incidence and rates by year

Figure 1 shows the number of notified cases of meningococcal disease between 1975 and 2012. Three peaks in the notification counts were observed over this period. They correspond to the 190 cases observed in 1986, driven by the outbreak of group A disease in Auckland, and the 609 and 648 cases observed in 1997 and 2001 respectively, as part of the B:P1.7-2,4 disease epidemic.

**Figure 1. Notified cases of meningococcal disease, 1975–2012**




In 2012, a total of 85 cases of meningococcal disease were notified, which equates to a rate of notification 1.9 per 100 000 population (Table 1). This is the lowest rate of meningococcal disease for two decades. Between 2008 and 2011, the number of cases ranged from 97 to 133, with an annual average rate of 2.7 per 100 000 population. Of the 85 cases notified in 2012, 74 (87.1%) were confirmed, giving a rate of 1.7 per 100 000 population for confirmed disease.

**Table 1. Notified cases and rate of meningococcal disease, 2008–2012**

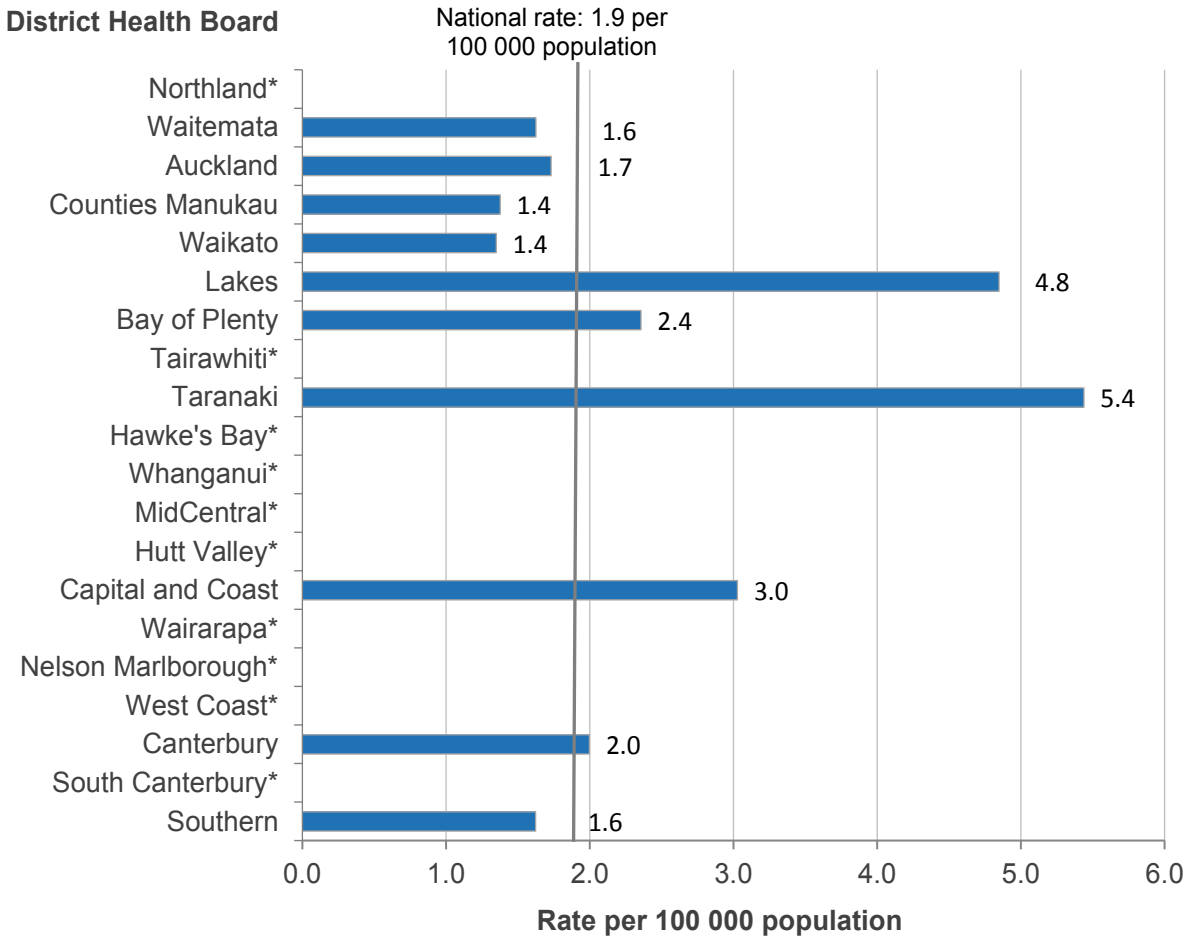
| Year | No. | Rate[1] |
|---|---|---|
| 2008 | 122 | 2.9 |
| 2009 | 133 | 3.1 |
| 2010 | 97 | 2.2 |
| 2011 | 119 | 2.7 |
| 2012 | 85 | 1.9 |

[1] Rate per 100 000 population

## Geographic variation

A marked geographic variation in the numbers of notified cases and rates of meningococcal disease has been observed since at least 1991, and 2012 was no exception. In 2012, cases of meningococcal disease were spread through 18 of the 20 DHBs with 1 to 10 cases per DHB. The highest rates of disease were in Taranaki (5.4 per 100 000 population, 6 cases) and Lakes (4.8 per 100 000 population, 5 cases) DHBs (Figure 2).

**Figure 2. Meningococcal disease rates by District Health Board, 2012**




Note: An asterisk (*) alongside the DHB name denotes there were fewer than five cases in the DHB. Rates have not been calculated for these DHBs as such small numbers of cases produce unstable rates.

A comparison of cases by DHB over the last five years is shown in Table 2. Tairawhiti (4.7 per 100 000), Northland (4.6 per 100 000), Hawke's Bay (4.1 per 100 000) and Lakes (3.9 per 100 000) DHBs have the highest average annualised five-year rates.

**Table 2. Meningococcal disease cases by DHB, 2008–2012**

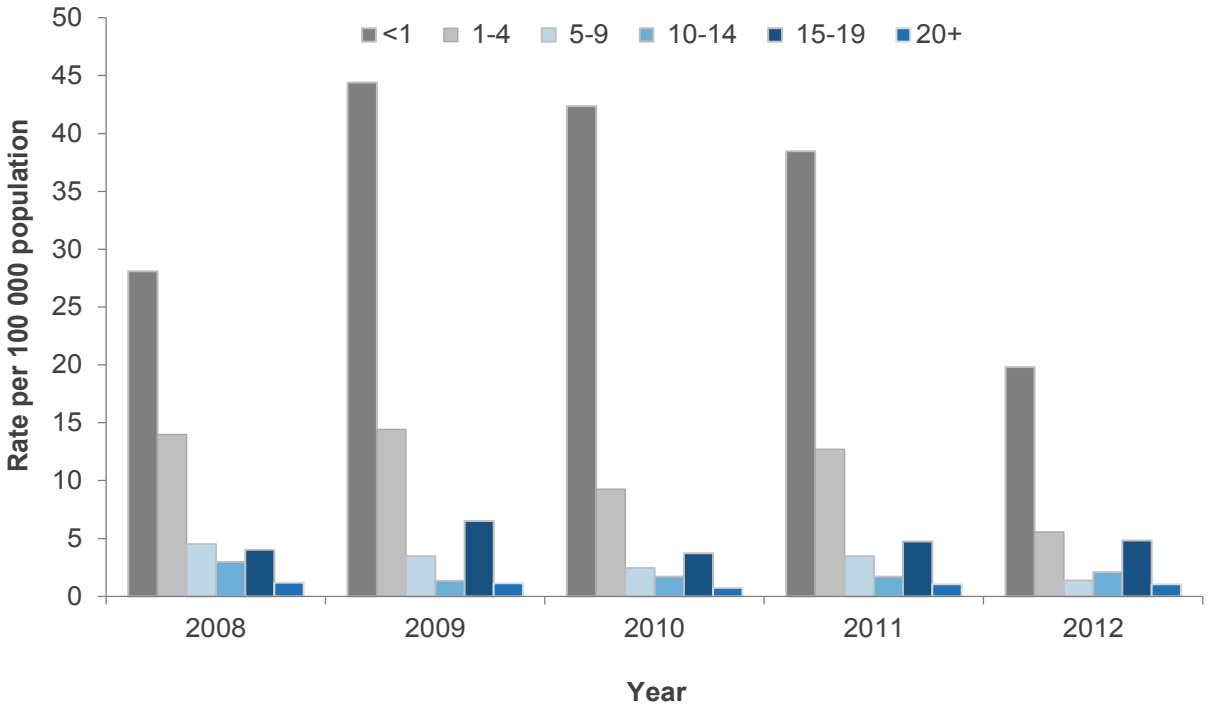
| District Health Board | Year | | | | | Total | Average annual rate[1] |
|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | | |
| Northland | 8 | 6 | 6 | 13 | 3 | 36 | 4.6 |
| Waitemata | 7 | 6 | 9 | 9 | 9 | 40 | 1.5 |
| Auckland | 10 | 11 | 7 | 7 | 8 | 43 | 1.9 |
| Counties Manukau | 16 | 19 | 16 | 17 | 7 | 75 | 3.1 |
| Waikato | 11 | 9 | 7 | 13 | 5 | 45 | 2.5 |
| Lakes | 0 | 5 | 3 | 7 | 5 | 20 | 3.9 |
| Bay of Plenty | 3 | 9 | 6 | 4 | 5 | 27 | 2.6 |
| Tairawhiti | 1 | 7 | 1 | 1 | 1 | 11 | 4.7 |
| Taranaki | 4 | 3 | 1 | 3 | 6 | 17 | 3.1 |
| Hawke's Bay | 12 | 7 | 7 | 4 | 2 | 32 | 4.1 |
| Whanganui | 5 | 1 | 0 | 3 | 1 | 10 | 3.2 |
| MidCentral | 3 | 10 | 5 | 3 | 3 | 24 | 2.9 |
| Hutt Valley | 4 | 6 | 8 | 5 | 1 | 24 | 3.3 |
| Capital and Coast | 8 | 11 | 5 | 7 | 9 | 40 | 2.7 |
| Wairarapa | 2 | 1 | 0 | 2 | 0 | 5 | 2.5 |
| Nelson Marlborough | 6 | | 1 | 2 | 2 | 11 | 1.6 |
| West Coast | 1 | 1 | 1 | 1 | 0 | 4 | - |
| Canterbury | 9 | 12 | 7 | 9 | 10 | 47 | 1.9 |
| South Canterbury | 2 | 0 | 0 | 1 | 3 | 6 | 2.1 |
| Southern | 10 | 9 | 7 | 8 | 5 | 39 | 2.6 |
| **Total** | **122** | **133** | **97** | **119** | **85** | **556** | **2.6** |

[1] Rates have not been calculated where there are fewer than five notified cases in any category. Calculating population rates from fewer than five cases produces unstable rates.

## Incidence by age

In 2012, the highest age-specific disease rates were among those aged less than one year (19.8 per 100 000 population, 12 cases) and 1–4 years (5.6 per 100 000 population, 14 cases), which is consistent with rates observed previously (Figure 3 and Table 13). As in previous years, there was also a secondary peak in the notification rate for the 15–19 years age group (4.8 per 100 000 population, 15 cases).

**Figure 3. Meningococcal disease rates by age group, 2008–2012**




## Incidence by ethnic group

Ethnic group was recorded for all notified meningococcal disease cases in 2012. The highest disease rate was for the Māori ethnic group (4.5 per 100 000 population, 29 cases), followed by the Pacific Peoples (3.7 per 100 000 population, 10 cases) and European or Other (1.4 per 100 000 population, 42 cases) ethnic groups.

In 2012, the age-standardised meningococcal disease rates for the Māori (3.3 per 100 000 population, 29 cases) and Pacific Peoples (3.0 per 100 000 population, 10 cases) ethnic groups were also higher than the rate for the European or Other ethnic group (1.5 per 100 000 population, 42 cases) (Figure 4 and Table 3).

The highest disease rate by age group in 2012 was in the Māori ethnic group for those aged less than one year (49.0 per 100 000 population, 8 cases) (Table 15). Prior to 2004, the highest rate was consistently observed in the Pacific Peoples ethnic group, in those aged less than one year. Since then, however, Māori aged less than one year have sometimes recorded the highest rate, as was seen in 2012.

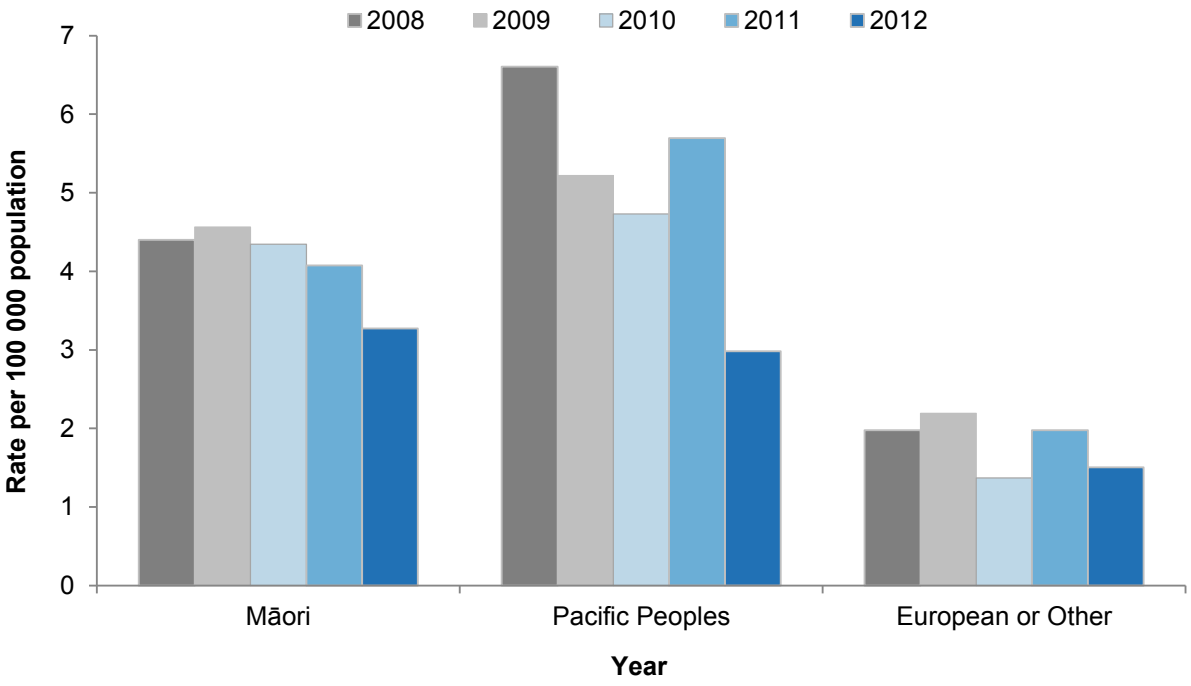
The median age of meningococcal disease cases differed markedly across different ethnic groups in 2012. Median ages were 2.0 years for Māori, 10.5 years for Pacific Peoples and 19.5 years for cases in the European or Other ethnic groups.

**Table 3. Age-standardised meningococcal disease rates by ethnic groups, 2012**

| Ethnic group | No. | Rate[1] |
|---|---|---|
| Māori | 29 | 3.3 |
| Pacific Peoples | 10 | 3.0 |
| Asian | 1 | - |
| MELAA[2] | 3 | - |
| European or Other | 42 | 1.5 |

[1] Rate per 100 000 population
[2] Middle Eastern/Latin American/African

**Figure 4. Age-standardised meningococcal disease rates by ethnic group, 2008–2012**

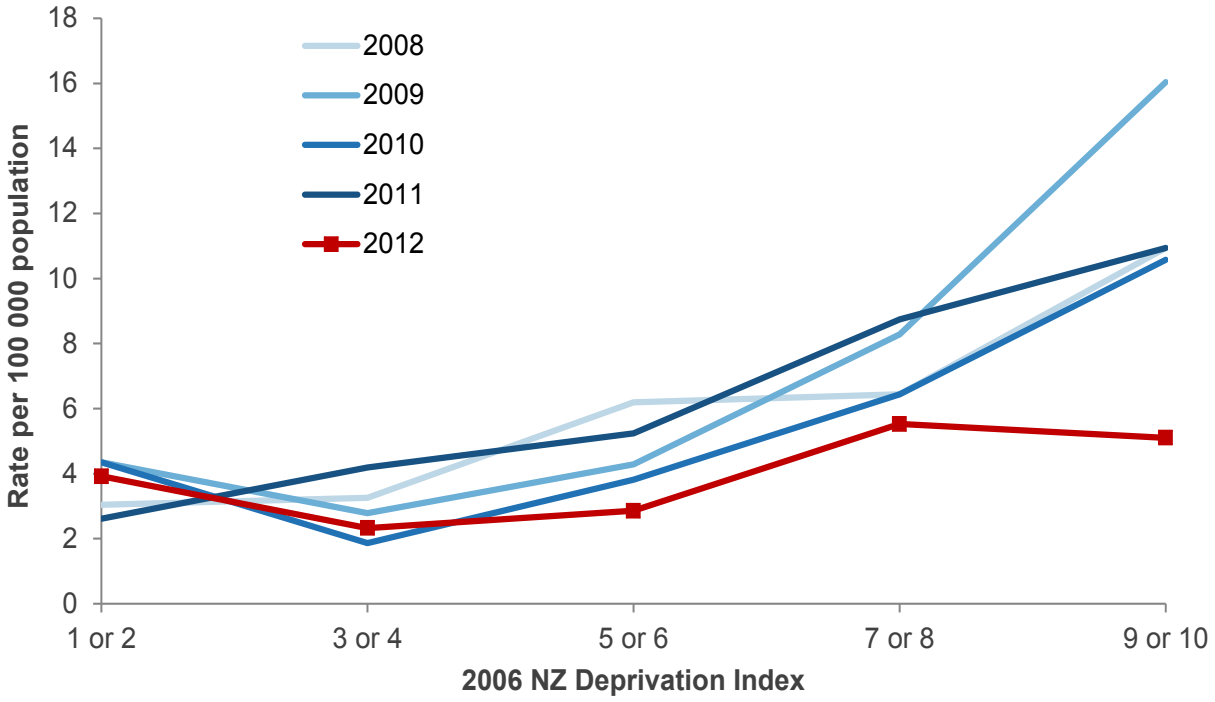



Note: Rates have not been calculated where fewer than five cases were notified in any category. Asian and MELAA ethnic groups are not presented in this graph due to the small number of cases.

## Incidence by deprivation index for cases aged less than 20 years

A gradient in meningococcal disease rates by socio-economic status was a consistent feature of the disease data between 2008 and 2011 (Figure 5). Incidence rates rose with increasing socio-economic deprivation for cases aged less than 20 years, based on NZDep06. However, in 2012, the gradient was much less apparent.

**Figure 5. Meningococcal disease rates by quintiles of NZDep06 for cases aged less than 20 years, 2008–2012**



# Laboratory confirmation and typing

In 2012, 74 (87.1%) cases of meningococcal disease were confirmed by laboratory analysis. Fifty cases were confirmed by the isolation of *N. meningitidis* and a further 24 by the detection of meningococcal DNA by PCR.

## Strain types among confirmed cases

Table 4 shows the distribution of strain types among meningococcal disease cases in 2012. The strain type was determined for 68 (91.9%) of the 74 confirmed cases. Over 60% of cases were group B strains and approximately 33% were group C strains. The most common strain type in 2012 was group C:P1.5-1,10-8 (18 cases) followed by group B:P1.7-2,4 (15 cases).

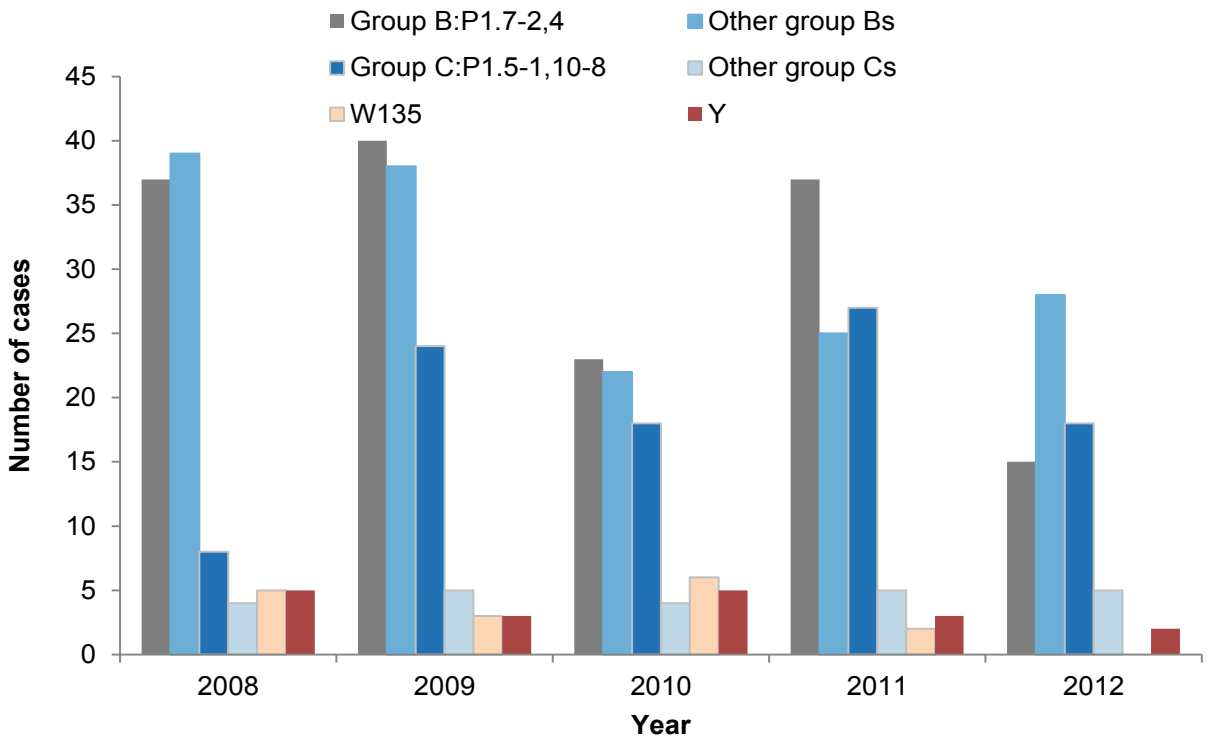
**Table 4. Distribution of strain types among meningococcal disease cases, 2012**

| Strain group | Number of cases | Percentage[1] |
|---|---|---|
| **Group B** | **43** | **63.2** |
| P1.7-2,4 | 15 | 22.1 |
| Other group Bs | 28 | 41.2 |
| **Group C** | **23** | **33.8** |
| P1.5-1,10-8 | 18 | 26.5 |
| Other group Cs | 5 | 7.4 |
| **Other** | **2** | **2.9** |
| Group Y | 2 | 2.9 |
| **Total** | **68** | **100.0** |

[1] Percentage was calculated using the total number of laboratory-confirmed cases where strain group was determined.

The groups and dominant subtypes among strain-typed meningococcal disease cases between 2008 and 2012 are shown in Figure 6 and Table 12. Trends in the numbers of cases due to the two most common strains (groups B:P1.7-2,4 and C:P1.5-1,10-8), are described in the following sections. The numbers of cases due to other group B strains have varied from year to year, but were generally lower in 2010, 2011 and 2012 compared with 2008 and 2009. Cases due to other group C strains, and to strain groups W135 and Y have been consistently uncommon.

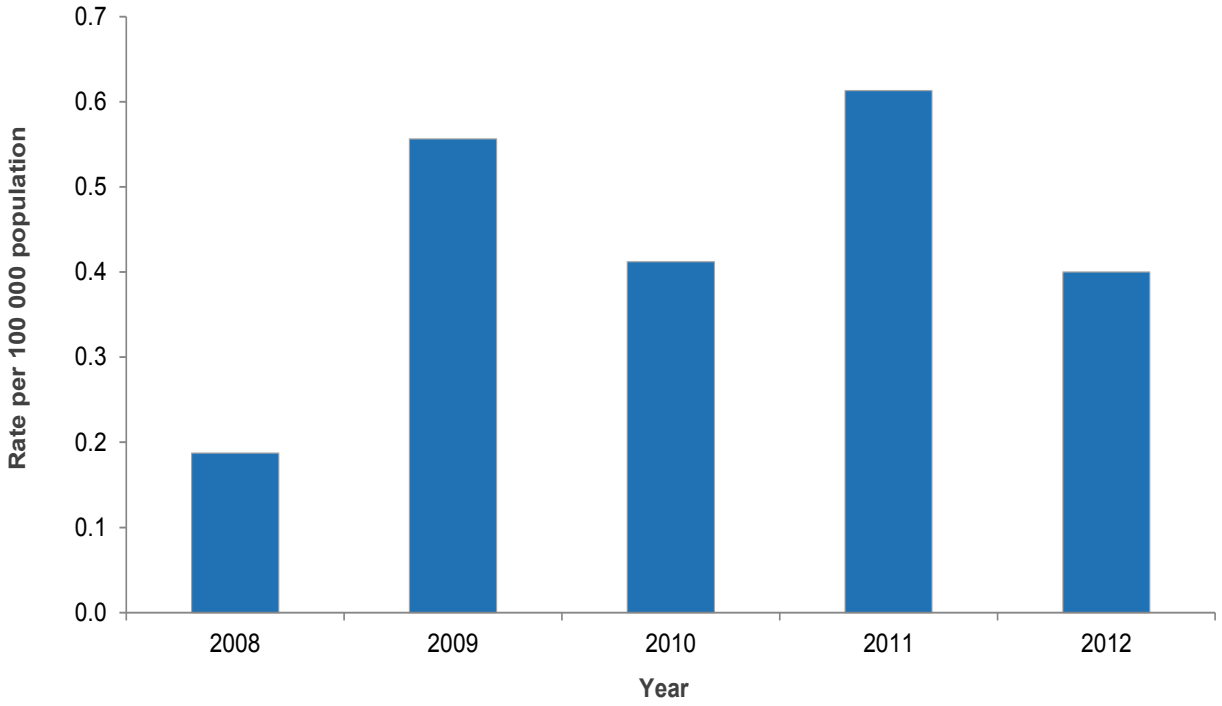
**Figure 6. Groups and dominant subtypes among strain-typed meningococcal disease cases, 2008–2012**




## Dominant circulating strain – Group C:P1.5-1,10-8

The number of cases due to the group C:P1.5-1,10-8 strain increased from eight cases in 2008 (0.2 per 100 000 population) to 27 cases (0.6 per 100 000 population) in 2011, but dropped to 18 cases (0.4 per 100 000 population) in 2012. In 2012, the cases were spread across 10 DHBs, with between one and five cases reported in each DHB (Table 5). Northland (1.8 per 100 000, 14 cases) and MidCentral (1.8 per 100 000, 15 cases) DHBs had the highest five-year average annual rates.

**Figure 7. Rate of group C:P1.5-1,10-8 strain disease by year, 2008–2012**



### Table 5. Number of cases of group C:P1.5-1,10-8 strain by District Health Board, 2008–2012

| District Health Board | Year | | | | | Total | Average annual rate[1] |
|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | | |
| Northland | 3 | 1 | 0 | 9 | 1 | 14 | 1.8 |
| Waitemata | 1 | 1 | 0 | 0 | 1 | 3 | - |
| Auckland | 0 | 1 | 2 | 0 | 1 | 4 | - |
| Counties Manukau | 0 | 3 | 2 | 2 | 1 | 8 | 0.3 |
| Waikato | 0 | 2 | 1 | 5 | 0 | 8 | 0.4 |
| Lakes | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Bay of Plenty | 1 | 3 | 1 | 0 | 0 | 5 | 0.5 |
| Tairawhiti | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Taranaki | 0 | 1 | 0 | 0 | 2 | 3 | - |
| Hawke's Bay | 0 | 0 | 2 | 0 | 0 | 2 | - |
| Whanganui | 0 | 1 | 0 | 0 | 1 | 2 | - |
| MidCentral | 0 | 5 | 5 | 2 | 3 | 15 | 1.8 |
| Hutt Valley | 0 | 0 | 1 | 1 | 0 | 2 | - |
| Capital and Coast | 1 | 1 | 0 | 2 | 5 | 9 | 0.6 |
| Wairarapa | 0 | 1 | 0 | 0 | 0 | 1 | - |
| Nelson Marlborough | 0 | 0 | 0 | 0 | 0 | 0 | - |
| West Coast | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Canterbury | 0 | 0 | 0 | 3 | 2 | 5 | 0.2 |
| South Canterbury | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Southern | 2 | 4 | 4 | 3 | 1 | 14 | 0.9 |
| **Total** | **8** | **24** | **18** | **27** | **18** | **95** | **0.4** |

[1] Rates have not been calculated where there are fewer than five notified cases in any category. Calculating population rates from fewer than five cases produces unstable rates.

Between 2008 and 2012, the highest annual rate of disease from group C:P1.5-1,10-8 strain has occurred in the 1–4 years or the 15–19 years age groups (the two age groups with enough cases to calculate a rate). In 2012, the highest rate was for the 15–19 years age group (1.9 per 100 000 population, 6 cases) (Table 6). However, the highest five-year rate was for the less than one year age group (2.2 per 100 000, 7 cases), followed by the 15–19 years (1.8 per 100 000, 28 cases) and the 1–4 years (1.4 per 100 000, 17 cases) age groups.

**Table 6. Number of cases of group C:P1.5-1,10-8 strain by year, 2008–2012**

| Category | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | Total | Average annual rate[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | | |
| **Age group (years)** | | | | | | | | | | | | |
| <1 | 1 | - | 3 | - | 1 | - | 1 | - | 1 | - | 7 | 2.2 |
| 1–4 | 3 | - | 5 | 2.1 | 2 | - | 6 | 2.4 | 1 | - | 17 | 1.4 |
| 5–9 | 1 | - | 1 | - | 2 | - | 2 | - | 2 | - | 8 | 0.6 |
| 10–14 | 0 | - | 1 | - | 2 | - | 3 | - | 1 | - | 7 | 0.5 |
| 15–19 | 2 | - | 9 | 2.8 | 5 | 1.6 | 6 | 1.9 | 6 | 1.9 | 28 | 1.8 |
| 20–29 | 1 | - | 1 | - | 3 | - | 2 | - | 3 | - | 10 | 0.3 |
| 30–39 | 0 | - | 1 | - | 2 | - | 1 | - | 0 | - | 4 | - |
| 40+ | 0 | - | 3 | - | 1 | - | 6 | 0.3 | 4 | - | 14 | 0.1 |
| **Sex** | | | | | | | | | | | | |
| Male | 6 | 0.3 | 9 | 0.4 | 8 | 0.4 | 11 | 0.5 | 7 | 0.3 | 41 | 0.4 |
| Female | 2 | - | 15 | 0.7 | 10 | 0.4 | 16 | 0.7 | 11 | 0.5 | 54 | 0.5 |
| **Ethnic group** | | | | | | | | | | | | |
| Māori | 6 | 0.9 | 9 | 1.4 | 8 | 1.2 | 11 | 1.7 | 2 | - | 36 | 1.1 |
| Pacific Peoples | 0 | - | 1 | - | 2 | - | 1 | - | 1 | - | 5 | 0.4 |
| Asian | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| MELAA[2] | 0 | - | 1 | - | 0 | - | 0 | - | 1 | - | 2 | - |
| European or Other | 2 | - | 13 | 0.4 | 8 | 0.3 | 15 | 0.5 | 14 | 0.5 | 52 | 0.3 |
| **Total** | **8** | **0.2** | **24** | **0.6** | **18** | **0.4** | **27** | **0.6** | **18** | **0.4** | **95** | **0.4** |

[1] Rate per 100 000 population

[2] Middle Eastern/Latin American/African

[3] Rates have not been calculated where there are fewer than five notified cases in any category. Calculating population rates from fewer than five cases produces unstable rates.

From 2008 to 2011, the rates of disease from the group C:P1.5-1,10-8 strain remained highest in the Māori ethnic group (Table 6). In 2012, the European or Other ethnic group was the only ethnic group with enough cases to calculate a rate (0.5 per 100 000 population, 14 cases). The five-year rate was highest in the Māori (1.1 per 100 000, 36 cases) ethnic group.

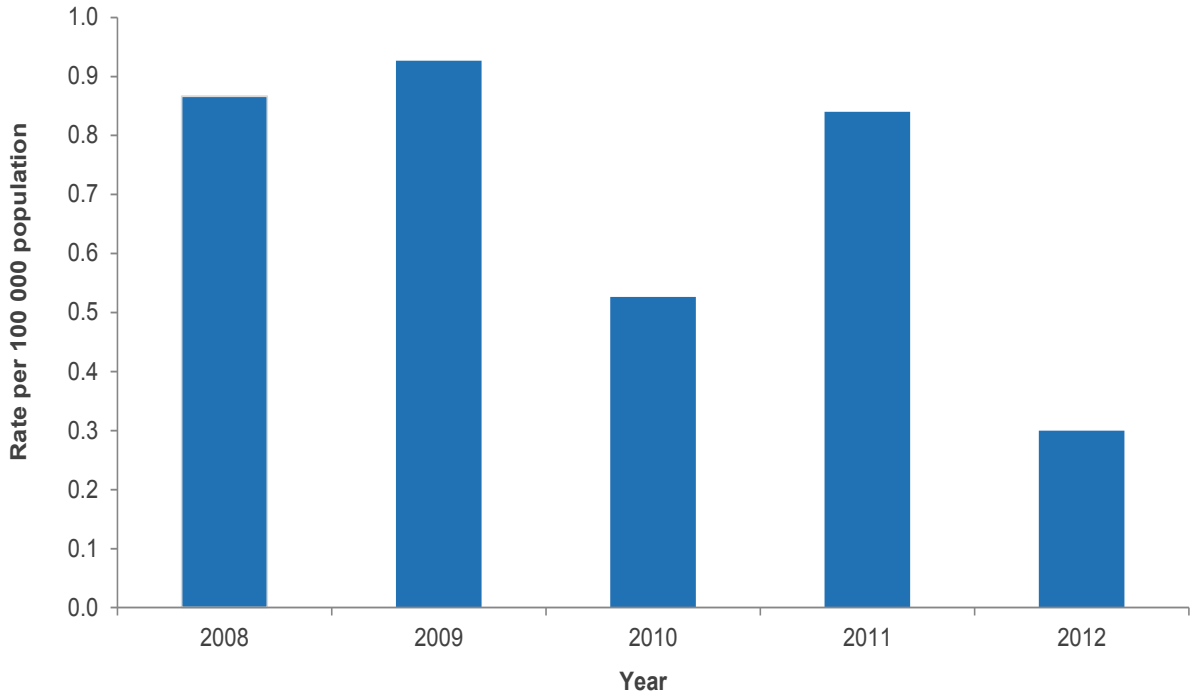
Hospitalisation status was recorded for all 18 cases of group C:P1.5-1,10-8 strain disease reported in 2012, of which 17 cases (94.4%) were hospitalised. Of these, eight cases (47.1%) had been seen by a doctor before hospital admission, and three of the eight (37.5%) had been given antibiotics.

A total of 16 fatalities (case-fatality rate of 16.8%) were reported as being due to group C:P1.5-1,10-8 strain disease from 2008 to 2012, including three in 2012 (Table 17). For the three fatalities in 2012, one was seen by a doctor prior to hospital admission but was not given antibiotics, one was not seen by a doctor prior to hospital admission and one was not hospitalised.

### Dominant circulating strain – Group B:P1.7-2,4

Between 2008 and 2011, the number of cases due to the group B:P1.7-2,4 strain decreased from 40 to 23. In 2012, the group B:P1.7-2,4 disease rate decreased to 0.3 per 100 000 population (15 cases) – down from 0.8 per 100 000 population (37 cases) in 2011, and lower than the previous lowest rate of 0.5 per 100 000 population (23 cases) in 2010 (Figure 8). The cases were spread across 11 DHBs, with between one and three cases in each DHB (Table 7). Lakes DHB had the highest average annual five-year rate (2.0 per 100 000, 10 cases) followed by Hawke's Bay (1.6 per 100 000, 12 cases), and Whanganui (1.6 per 100 000, 5 cases) DHBs (Table 7).

## Figure 8. Rate of group B:P1.7-2,4 strain disease by year, 2008–2012




## Table 7. Number of cases of group B:P1.7-2,4 strain by District Health Board, 2008–2012

| District Health Board | Year | | | | | Total | Average annual rate[1] |
|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | | |
| Northland | 2 | 3 | 3 | 3 | 1 | 12 | 1.5 |
| Waitemata | 1 | 3 | 3 | 2 | 3 | 12 | 0.4 |
| Auckland | 2 | 4 | 1 | 2 | 1 | 10 | 0.4 |
| Counties Manukau | 4 | 3 | 7 | 9 | 1 | 24 | 1.0 |
| Waikato | 4 | 3 | 1 | 4 | 0 | 12 | 0.7 |
| Lakes | 0 | 4 | 1 | 3 | 2 | 10 | 2.0 |
| Bay of Plenty | 0 | 3 | 1 | 3 | 1 | 8 | 0.8 |
| Tairawhiti | 0 | 2 | 0 | 0 | 0 | 2 | - |
| Taranaki | 2 | 2 | 0 | 0 | 0 | 4 | - |
| Hawke's Bay | 6 | 3 | 1 | 1 | 1 | 12 | 1.6 |
| Whanganui | 3 | 0 | 0 | 2 | 0 | 5 | 1.6 |
| MidCentral | 1 | 1 | 0 | 1 | 0 | 3 | - |
| Hutt Valley | 1 | 0 | 3 | 2 | 1 | 7 | 1.0 |
| Capital and Coast | 3 | 6 | 1 | 2 | 2 | 14 | 1.0 |
| Wairarapa | 1 | 0 | 0 | 0 | 0 | 1 | - |
| Nelson Marlborough | 0 | 0 | 0 | 0 | 0 | 0 | - |
| West Coast | 1 | 0 | 0 | 0 | 0 | 1 | - |
| Canterbury | 2 | 1 | 1 | 2 | 1 | 7 | 0.3 |
| South Canterbury | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Southern | 4 | 2 | 0 | 1 | 1 | 8 | 0.5 |
| **Total** | **37** | **40** | **23** | **37** | **15** | **152** | **0.7** |

[1] Rates have not been calculated where there are fewer than five notified cases in any category. Calculating population rates from fewer than five cases produces unstable rates.

Sex and age were recorded for all group B:P1.7-2,4 cases. Since 2008, the rate of meningococcal disease due to this strain had consistently been higher for males than for females, but in 2012 the rate for females was slightly higher than males (Table 8). The difference between male and female rates of meningococcal disease due to this strain in 2012 (0.3 and 0.4 per 100 000 population, respectively) was not statistically significant.

The rate of group B:P1.7-2,4 strain disease has consistently been highest for individuals aged less than five years, particularly among those aged less than one year (Table 8). For individuals aged less than one year, the 2012 rate of 8.3 per 100 000 population (5 cases) was the lowest rate for this age group reported the last five years. Similarly, the 2012 rate in the 1–4 years age group (2.0 per 100 000 population, 5 cases) was also the lowest in the last five years.

**Table 8. Number of cases of group B:P1.7-2,4 strain by year, 2008–2012**

| | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | Total | Average annual rate[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | | |
| **Age group (years)** | | | | | | | | | | | | |
| <1 | 9 | 14.0 | 10 | 15.9 | 15 | 23.5 | 7 | 11.2 | 5 | 8.3 | 46 | 14.7 |
| 1–4 | 9 | 3.8 | 13 | 5.4 | 6 | 2.4 | 12 | 4.8 | 5 | 2.0 | 45 | 3.7 |
| 5–9 | 3 | - | 3 | - | 1 | - | 3 | - | 1 | - | 11 | 0.8 |
| 10–14 | 3 | - | 2 | - | 0 | - | 1 | - | 1 | - | 7 | 0.5 |
| 15–19 | 1 | - | 3 | - | 0 | - | 1 | - | 1 | - | 6 | 0.4 |
| 20–29 | 3 | - | 2 | - | 0 | - | 1 | - | 1 | - | 7 | 0.2 |
| 30–39 | 1 | - | 2 | - | 0 | - | 5 | 0.9 | 0 | - | 8 | 0.3 |
| 40+ | 8 | 0.4 | 5 | 0.3 | 1 | - | 7 | 0.3 | 1 | - | 22 | 0.2 |
| **Sex** | | | | | | | | | | | | |
| Male | 20 | 1.0 | 21 | 1.0 | 13 | 0.6 | 20 | 0.9 | 7 | 0.3 | 81 | 0.8 |
| Female | 17 | 0.8 | 19 | 0.9 | 10 | 0.4 | 17 | 0.8 | 8 | 0.4 | 71 | 0.6 |
| **Ethnic group** | | | | | | | | | | | | |
| Māori | 15 | 2.4 | 19 | 3.0 | 12 | 1.9 | 14 | 2.2 | 8 | 1.2 | 68 | 2.1 |
| Pacific Peoples | 5 | 1.9 | 6 | 2.3 | 8 | 3.0 | 6 | 2.3 | 2 | - | 27 | 2.0 |
| Asian | 1 | - | 1 | - | 1 | - | 1 | - | 0 | - | 4 | - |
| MELAA[2] | 1 | - | 1 | - | 0 | - | 1 | - | 1 | - | 4 | - |
| European or Other | 13 | 0.4 | 13 | 0.4 | 2 | - | 15 | 0.5 | 4 | - | 47 | 0.3 |
| Unknown | 2 | - | 0 | - | 0 | - | 0 | - | 0 | - | 2 | - |
| **Total** | **37** | **0.9** | **40** | **0.9** | **23** | **0.5** | **37** | **0.8** | **15** | **0.3** | **152** | **0.7** |

[1] Rate per 100 000 population

[2] Middle Eastern/Latin American/African

[3] Rates have not been calculated where there are fewer than five notified cases in any category. Calculating population rates from fewer than five cases produces unstable rates.

From 2008 to 2011, rates of group B:P1.7-2,4 disease were highest for the Pacific Peoples and Māori ethnic groups (Table 8). In 2012, the Māori ethnic group was the only ethnic group with sufficient cases for a rate to be calculated (1.2 per 100 000 population, 8 cases).

Hospitalisation status was recorded for all 15 cases of group B:P1.7-2,4 disease in 2012, of which 14 cases (93.3%) were hospitalised. Of these, seven cases (50.0%) were seen by a doctor prior to hospital admission, and one case (14.3%) was given antibiotics. From 2008 to 2012, a total of 11 fatalities (case-fatality rate of 7.2%) were reported as being due to group B:P1.7-2,4 disease, including one fatality reported in 2012 (Table 17). The fatal case in 2012 was seen by a doctor prior to hospital admission but was not given antibiotics.

## Vaccine-targeted strains

In 2012, 15 (22.1%) of the strain-typed cases were caused by a strain targeted by the MeNZB™ vaccine (Table 9). One of these cases reported being vaccinated with MeNZB™ (three doses) and received their last dose six years prior to disease onset. The MeNZB™ vaccine was in use between 2004 and 2008, as part of a mass immunisation programme for under 20 year olds and the routine childhood immunisation schedule [3]. Twenty-three (33.8%) of the strain-typed cases in 2012 were caused by strains targeted by the group C conjugate vaccine, none of whom had been previously immunised with the vaccine. Group C conjugate vaccine is not part of the routine childhood immunisation schedule. Most of the remaining 2012 cases were infected with group B strains other than P1.7-2,4 (28 cases) (Table 12). Currently, there is no vaccine licensed in New Zealand that targets group B strains. A new group B vaccine has recently been licensed in Europe but it is not yet available commercially [12]. Table 10 shows the age distribution of cases caused by vaccine-targeted strains reported in 2012.

Between 2008 and 2012, the number of cases due to strains targeted by MeNZB™ fell from 46 to 15. By contrast, the number of cases due to C conjugate vaccine-targeted strains almost trebled between 2008 and 2011 (from 12 to 32) and then decreased by a third in 2012 to 23 cases. The trends in cases due to strains targeted by quadrivalent vaccine are increasingly being driven by group C disease cases. Only two out of 25 cases of quadrivalent vaccine-targeted strains in 2012 were due to non-group C strains.

**Table 9. Number of meningococcal disease cases caused by vaccine-targeted strains, 2008–2012**

| Vaccine | Year | | | | | Total |
|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | |
| MeNZB™ [1] | 46 | 42 | 26 | 37 | 15 | 166 |
| C conjugate[2] | 12 | 29 | 22 | 32 | 23 | 118 |
| Quadrivalent[3] | 22 | 35 | 33 | 37 | 25 | 152 |

[1] Targets the P1.4 PorA variable region, and was part of the routine childhood immunisation schedule between 2004 and 2008.

[2] Targets all group C strains and may be funded to control a community outbreak, otherwise not funded.

[3] Targets all group A, C, Y and W135 strains. Polysaccharide quadrivalent vaccine is funded for adults and children pre- or post-splenectomy and may be funded to control a community outbreak. Conjugate quadrivalent vaccine is not currently licensed in New Zealand [3].

**Table 10. Number of meningococcal disease cases caused by vaccine-targeted strains by age group, 2012**

| Vaccine | Age group (years) | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | <1 | 1–4 | 5–9 | 10–14 | 15–19 | 20+ | |
| MeNZB™ [1] | 5 | 5 | 1 | 1 | 1 | 2 | 15 |
| C conjugate[2] | 1 | 1 | 2 | 1 | 8 | 10 | 23 |
| Quadrivalent[3] | 1 | 1 | 2 | 2 | 8 | 11 | 25 |

[1] Targets the P1.4 PorA variable region, and was part of the routine childhood immunisation schedule between 2004 and 2008.

[2] Targets all group C strains and may be funded to control a community outbreak, otherwise not funded.

[3] Targets all group A, C, Y and W135 strains. Polysaccharide quadrivalent vaccine is funded for adults and children pre- or post-splenectomy and may be funded to control a community outbreak. Conjugate quadrivalent vaccine is not currently licensed in New Zealand [3].

## Antimicrobial susceptibility

The antimicrobial susceptibility of all 50 viable meningococcal isolates received by ESR from cases of invasive disease in 2012 was tested (Table 11).

All isolates were susceptible to ceftriaxone, rifampicin and ciprofloxacin. Reduced penicillin susceptibility (MIC ≥0.12 mg/L) was observed in 32.0% (16/50) of isolates: 50.0% (1/2) of group Y isolates, 37.9% (11/29) of group B isolates (but none of the isolates belonging to the group B:P1.7-2,4 strain) and 21.1% (4/19) of group C isolates.

Reduced penicillin susceptibility in meningococci was first seen in the mid-1990s. Since then, a trend towards an increasing proportion of isolates with reduced susceptibility has been observed, with a prevalence of ≥20% in recent years (Figure 9). Meningococci categorised as having reduced penicillin susceptibility have penicillin MICs of 0.12, 0.25 or 0.5 mg/L. Prior to 2012, approximately half of the isolates with reduced penicillin susceptibility had an MIC of 0.12 mg/L, but, in 2012, most isolates (14/16) had MICs of 0.25 and 0.5 mg/L. Infections from isolates with reduced susceptibility are still treatable with penicillin.

Rifampicin resistance is rare among meningococci from invasive disease in New Zealand, with a total of only seven isolates identified to date, most recently in 2011. Ciprofloxacin resistance is also rare, with just one ciprofloxacin-resistant isolate having been identified in 2010. A full report on antimicrobial susceptibility of *N. meningitidis* is provided separately in the report entitled 'Antimicrobial susceptibility of invasive *Neisseria meningitidis*, 2012', available at www.surv.esr.cri.nz/PDF_surveillance/Antimicrobial/NME [13].

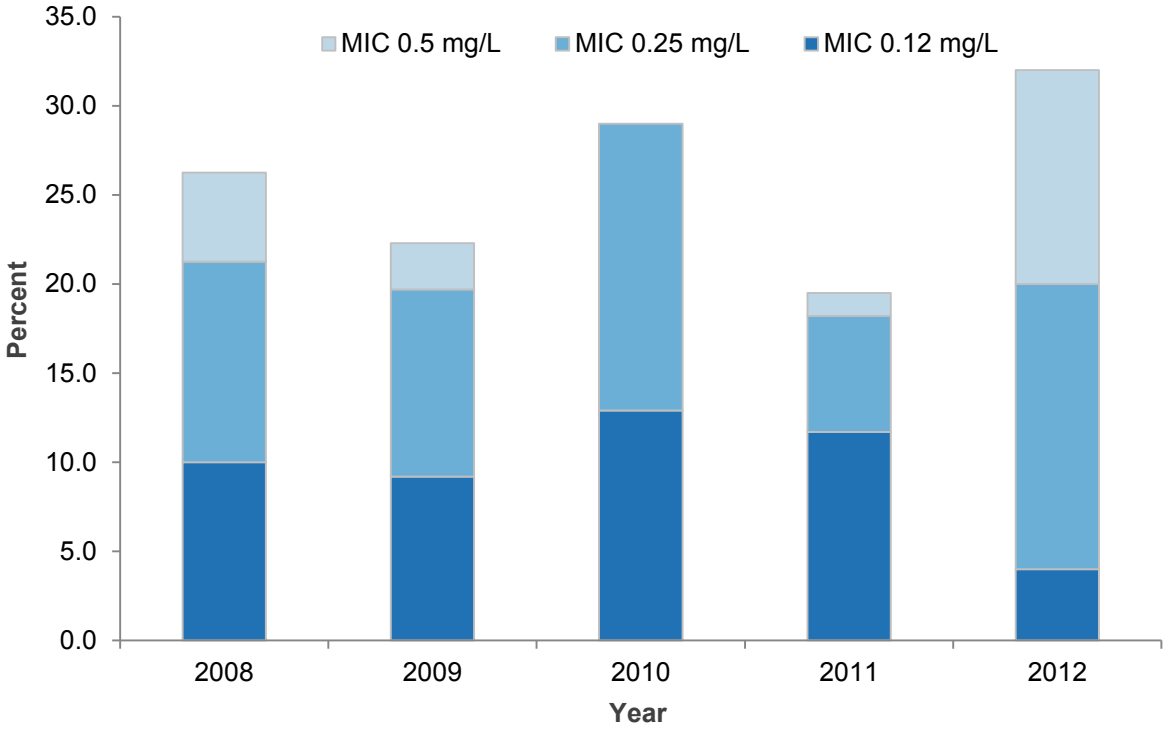
**Table 11. MIC range and MIC90 of isolates, 2012**

| Antimicrobial | MIC[1] range (mg/L) | $MIC_{90}$[2] (mg/L) |
|---|---|---|
| Penicillin | 0.016–0.5 | 0.5 |
| Ceftriaxone | 0.002–0.004 | 0.004 |
| Rifampicin | 0.002–0.5 | 0.12 |
| Ciprofloxacin | 0.002–0.008 | 0.008 |

[1] Minimum inhibitory concentration

[2] Concentration that inhibits at least 90% of the isolates

**Figure 9. Reduced penicillin susceptibility among *N. meningitidis* from invasive disease, 2008–2012**



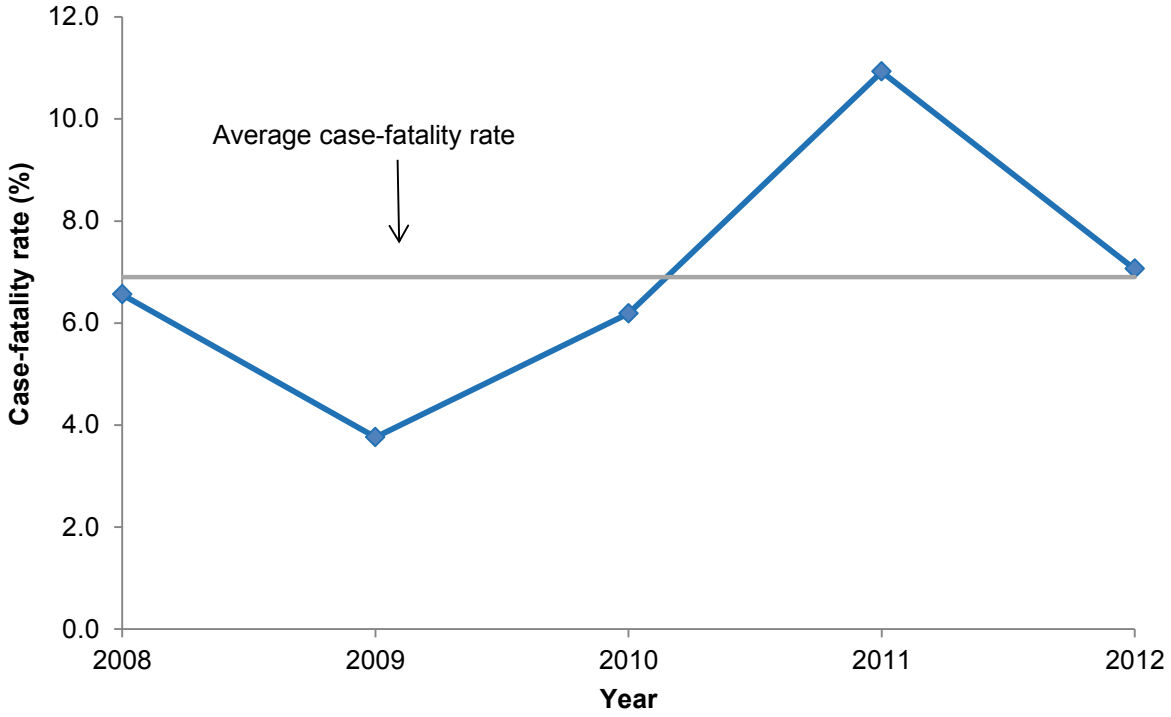

## Clinical outcomes

Six fatalities due to meningococcal disease occurred in 2012. The case-fatality rate was 7.1% (Figure 10).

All fatalities in 2012 were confirmed cases. Four fatalities were due to group C strains, including three with group C:P1.5-1,10-8 strain. Two were due to group B strains, and one was group B:P1.7-2,4 strain. Between 2008 and 2012, the overall group C strain case-fatality rate was 16.1% (19 fatalities) and the case-fatality rate for group C:P1.5-1,10-8 strain was 16.8% (16 fatalities) (Table 17). By comparison, the case-fatality rate for group B strain was 4.9% (15 fatalities) with a case-fatality rate for group B:P1.7-2,4 strain of 7.2% (11 fatalities) (Table 17 ).

The case-fatality rate over the last five years was highest for those in the 15–19 years age group (9.2%, 7 fatalities) and lowest in the 5–9 years age group (no fatalities). Between 2008 and 2012, the case-fatality rate was highest for the Asian ethnic group (15.4%, 2 fatalities), followed by the European or Other (8.2%, 20 fatalities), Māori (7.0%, 14 fatalities) and Pacific Peoples (2.4%, 2 fatalities) ethnic groups (Table 17 ).

**Figure 10. Meningococcal disease case-fatality rates, 2008–2012**




## Case management

Information about hospitalisation was recorded for all 85 cases of meningococcal disease reported in 2012, of which 82 cases (96.5%) were hospitalised.

For the hospitalised cases, pre-hospital management information was recorded for 79 (96.3%) cases. Of these, 34 cases (43.0%) were seen by a doctor prior to hospital admission and 10 (12.7%) were given intravenous or intramuscular antibiotics before admission. Among the six fatalities reported in 2012, two had been seen by a doctor but not given antibiotics and four were not seen by a doctor prior to hospital admission.

# DISCUSSION

# DISCUSSION

The rate of meningococcal disease in New Zealand in 2012 was significantly lower than in 2011, and was the lowest for twenty years. The less than one year age group continued to experience a disproportionately high burden of disease, despite the approximate halving of the rate of disease in this age group between 2011 and 2012. The rate of meningococcal disease in the 20–29 year age group was notable in 2012 as being double the previous year's rate and the highest rate for this age group in recent years. Reductions in case numbers were apparent for all of the monitored ethnic groups but age-standardised rates continued to be higher for the Māori and the Pacific Peoples ethnic groups, and were at least double the European or Other ethnic group rate in 2012. Northland DHB had noticeably fewer cases in 2012, whereas Taranaki DHB experienced the highest rate per DHB, which was uncharacteristic. Lakes DHB continued to have a high burden of disease.

Group B strains continued to be the most prevalent, infecting over 60% of cases in 2012. However, a group C strain was the most common individual strain type. Over a quarter of strain-typed cases in 2012 were infected with a C:P1.5-1,10-8 strain. Even though the number of cases infected with C:P1.5-1,10-8 meningococcal strains was much higher in 2011, the group B strain B:P1.7-2,4 had remained the most prevalent strain in 2011. This strain was responsible for the 1991–2007 meningococcal disease epidemic in New Zealand and was the target for the now withdrawn MeNZB$^{TM}$ vaccine. It is noteworthy that there was just one case of meningococcal disease due to a C:P1.5-1,10-8 strain in the Northland DHB in 2012. In 2011, a mass vaccination campaign using conjugate group C vaccine was initiated in this region, after nine cases of C:P1.5-1,10-8 strain disease were identified.

After a particularly high number of deaths due to meningococcal disease in 2011, the number of deaths more than halved in 2012. A substantial drop in the case-fatality rate was also seen. Over the last five years, the case-fatality rate was significantly higher ($p=0.0005$) for group C disease compared with other groups, with a particularly high case-fatality rate for C:P1.5-1,10-8 strain disease ($p<0.0010$). Multilocus sequence typing undertaken on C:P1.5-1,10-8 isolates from 2011 identified them as belonging to the ST-11 clonal complex, a complex that has been associated with more severe disease [14]. Between 2008 and 2012, the risk of dying from meningococcal disease was highest for those aged 15–19 years.

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# REFERENCES

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# APPENDIX

# APPENDIX

## Table 12. Strain group distribution by year, 2008–2012

| Strain group | Year | | | | | Total |
|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | |
| **Group B** | **76** | **78** | **45** | **62** | **43** | **304** |
| B:P1.7-2,4 | 37 | 40 | 23 | 37 | 15 | 152 |
| Other group Bs | 39 | 38 | 22 | 25 | 28 | 152 |
| **Group C** | **12** | **29** | **22** | **32** | **23** | **118** |
| C:P1.5-1,10-8 | 8 | 24 | 18 | 27 | 18 | 95 |
| Other group Cs | 4 | 5 | 4 | 5 | 5 | 23 |
| **Other** | **34** | **26** | **30** | **25** | **19** | **134** |
| Group W135 | 5 | 3 | 6 | 2 | 0 | 16 |
| Group Y | 5 | 3 | 5 | 3 | 2 | 18 |
| Non-groupable | 5 | 1 | 4 | 1 | 0 | 17 |
| Other laboratory confirmed[1] | 8 | 4 | 3 | 8 | 6 | 23 |
| Probable | 11 | 15 | 12 | 11 | 11 | 60 |
| **Total** | **122** | **133** | **97** | **119** | **85** | **556** |

[1] Includes DNA laboratory-confirmed by PCR where type was not determined, and laboratory-confirmed isolates not received by the Meningococcal Reference Laboratory

## Table 13. Age distribution of meningococcal disease cases, 2008–2012

| Age group (years) | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] |
| **<5** | **51** | **17.0** | **63** | **20.6** | **50** | **16.0** | **56** | **17.8** | **26** | **8.3** |
| <1 | 18 | 28.1 | 28 | 44.4 | 27 | 42.4 | 24 | 38.5 | 12 | 19.8 |
| 1–4 | 33 | 14.0 | 35 | 14.4 | 23 | 9.3 | 32 | 12.7 | 14 | 5.6 |
| **≥5** | **71** | **1.8** | **70** | **1.7** | **47** | **1.2** | **63** | **1.5** | **59** | **1.4** |
| 5–9 | 13 | 4.5 | 10 | 3.5 | 7 | 2.4 | 10 | 3.5 | 4 | 1.4 |
| 10–14 | 9 | 3.0 | 4 | - | 5 | 1.7 | 5 | 1.7 | 6 | 2.1 |
| 15–19 | 13 | 4.0 | 21 | 6.5 | 12 | 3.7 | 15 | 4.7 | 15 | 4.8 |
| 20–29 | 7 | 1.2 | 8 | 1.4 | 8 | 1.3 | 5 | 0.8 | 12 | 1.9 |
| 30–39 | 4 | - | 4 | - | 3 | - | 7 | 1.2 | 7 | 1.3 |
| 40+ | 25 | 1.3 | 23 | 1.2 | 12 | 0.6 | 21 | 1.0 | 15 | 0.7 |
| **Total** | **122** | **2.9** | **133** | **3.1** | **97** | **2.2** | **119** | **2.7** | **85** | **1.9** |

[1] Rate per 100 000 population

## Table 14. Numbers and age-standardised incidence rates by ethnicity for cases of meningococcal disease in 2008–2012

| Ethnic group | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] | No. | Rate[1] |
| Māori | 40 | 4.4 | 49 | 4.6 | 42 | 4.3 | 41 | 4.1 | 29 | 3.3 |
| Pacific Peoples | 21 | 6.6 | 17 | 5.2 | 17 | 4.7 | 19 | 5.7 | 10 | 3.0 |
| Asian | 4 | - | 4 | - | 2 | - | 2 | - | 1 | - |
| MELAA[2] | 2 | - | 2 | - | 0 | - | 1 | - | 3 | - |
| European or Other | 53 | 2.0 | 59 | 2.2 | 36 | 1.4 | 55 | 2.0 | 42 | 1.5 |
| Unknown | 2 | - | 2 | - | 0 | - | 1 | - | 0 | - |
| **Total** | **122** | **2.9** | **133** | **3.1** | **97** | **2.2** | **119** | **2.7** | **85** | **1.9** |

[1] Rate per 100 000 population
[2] Middle Eastern/Latin American/African

## Table 15. Numbers and incidence rates for cases of meningococcal disease by age group and ethnic group, 2012

| Age group (years) | Māori | | Pacific Peoples | | Asian | | MELAA[1] | | European or Other | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate[2] | No. | Rate[2] | No. | Rate[2] | No. | Rate[2] | No. | Rate[2] | No. | Rate[2] |
| <1 | 8 | 49.0 | 2 | - | 0 | - | 0 | - | 2 | - | 12 | 19.8 |
| 1–4 | 9 | 14.2 | 2 | - | 0 | - | 0 | - | 3 | - | 14 | 5.6 |
| 5–9 | 2 | - | 0 | - | 0 | - | 1 | - | 1 | - | 4 | - |
| 10–14 | 1 | - | 2 | - | 0 | - | 0 | - | 3 | - | 6 | 2.1 |
| 15–19 | 1 | - | 1 | - | 1 | - | 0 | - | 12 | 6.6 | 15 | 4.8 |
| 20–29 | 3 | - | 1 | - | 0 | - | 2 | - | 6 | 1.7 | 12 | 1.9 |
| 30–39 | 3 | - | 1 | - | 0 | - | 0 | - | 3 | - | 7 | 1.3 |
| 40+ | 2 | | 1 | - | 0 | - | 0 | - | 12 | 0.7 | 15 | 0.7 |
| **Total** | **29** | **4.5** | **10** | **1.5** | **1** | **-** | **3** | **-** | **42** | **1.4** | **85** | **1.9** |

[1] Middle Eastern/Latin American/African
[2] Rate per 100 000 population

## Table 16. Distribution of strain types among meningococcal disease cases and total cases by District Health Board, 2012

| District Health Board | Group B | | | | Group C | | | | Other | | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P1.7-2,4 | All other Bs | Total | % | P1.5-1,10-8 | All other Cs | Total | % | Y | % | | |
| Northland | 1 | 1 | 2 | 85.0 | 1 | 0 | 1 | 33.3 | 0 | 0.0 | 3 | 3.5 |
| Waitemata | 3 | 4 | 7 | 77.8 | 1 | 0 | 1 | 11.1 | 0 | 0.0 | 9 | 10.6 |
| Auckland | 1 | 6 | 7 | 87.5 | 1 | 0 | 1 | 12.5 | 0 | 0.0 | 8 | 9.4 |
| Counties Manukau | 1 | 1 | 2 | 28.6 | 1 | 0 | 1 | 14.3 | 0 | 0.0 | 7 | 8.2 |
| Waikato | 0 | 3 | 3 | 60.0 | 0 | 1 | 1 | 20.0 | 0 | 0.0 | 5 | 5.9 |
| Lakes | 2 | 1 | 3 | 60.0 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 5 | 5.9 |
| Bay of Plenty | 1 | 3 | 4 | 80.0 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 5 | 5.9 |
| Tairawhiti | 0 | 1 | 1 | 100 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 1 | 1.2 |
| Taranaki | 0 | 1 | 1 | 16.7 | 2 | 0 | 2 | 33.3 | 0 | 0.0 | 6 | 7.1 |
| Hawke's Bay | 1 | 1 | 2 | 100 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 2 | 2.4 |
| Whanganui | 0 | 0 | 0 | 0.0 | 1 | 0 | 1 | 100 | 0 | 0.0 | 1 | 1.2 |
| MidCentral | 0 | 0 | 0 | 0.0 | 3 | 0 | 3 | 100 | 0 | 0.0 | 3 | 3.5 |
| Hutt Valley | 1 | 0 | 1 | 100 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 1 | 1.2 |
| Capital and Coast | 2 | 1 | 3 | 33.3 | 5 | 0 | 5 | 55.6 | 1 | 11.1 | 9 | 10.6 |
| Wairarapa | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Nelson Marlborough | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 2 | 2.4 |
| West Coast | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Canterbury | 1 | 2 | 3 | 30.0 | 2 | 1 | 3 | 30.0 | 1 | 10.0 | 10 | 11.8 |
| South Canterbury | 0 | 1 | 1 | 33.3 | 0 | 2 | 2 | 66.7 | 0 | 0.0 | 3 | 3.5 |
| Southern | 1 | 2 | 3 | 60.0 | 1 | 1 | 2 | 40.0 | 0 | 0.0 | 5 | 5.9 |
| **Total** | **15** | **28** | **43** | **50.6** | **18** | **5** | **23** | **27.1** | **2** | **2.4** | **85** | **100** |

## Table 17. Case-fatality rates for meningococcal disease cases by age, sex, ethnicity and strain group, 2008–2012

| Features of case and infecting organism | Annual fatalities | | | | | Total fatalities | Total cases | CFR[1] (%) |
|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | | | |
| **Age group (years)** | | | | | | | | |
| <1 | 3 | 2 | 1 | 3 | 0 | 9 | 109 | 8.3 |
| 1–4 | 4 | 0 | 3 | 3 | 1 | 11 | 137 | 8.0 |
| 5–9 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 0.0 |
| 10–14 | 0 | 1 | 0 | 0 | 1 | 2 | 29 | 6.9 |
| 15–19 | 1 | 1 | 1 | 3 | 1 | 7 | 76 | 9.2 |
| 20–29 | 0 | 1 | 0 | 0 | 1 | 2 | 40 | 5.0 |
| 30–39 | 0 | 0 | 0 | 1 | 0 | 1 | 25 | 4.0 |
| 40+ | 0 | 0 | 1 | 3 | 2 | 6 | 96 | 6.3 |
| **Sex** | | | | | | | | |
| Male | 6 | 4 | 0 | 7 | 0 | 17 | 285 | 6.0 |
| Female | 2 | 1 | 6 | 6 | 6 | 21 | 271 | 7.7 |
| **Ethnic group** | | | | | | | | |
| Māori | 4 | 2 | 2 | 5 | 1 | 14 | 201 | 7.0 |
| Pacific Peoples | 0 | 0 | 1 | 1 | 0 | 2 | 84 | 2.4 |
| Asian | 1 | 0 | 1 | 0 | 0 | 2 | 13 | 15.4 |
| MELAA[2] | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0.0 |
| European or Other | 3 | 3 | 2 | 7 | 5 | 20 | 245 | 8.2 |
| Unknown | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.0 |
| **Strain group** | | | | | | | | |
| B:P1.7-2,4 | 4 | 2 | 2 | 2 | 1 | 11 | 152 | 7.2 |
| Other group Bs | 2 | 0 | 0 | 1 | 1 | 4 | 152 | 2.6 |
| C:P1.5-1,10-8 | 1 | 2 | 1 | 9 | 3 | 16 | 95 | 16.8 |
| Other group Cs | 0 | 1 | 0 | 1 | 1 | 3 | 23 | 13.0 |
| Group W135 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0.0 |
| Group Y | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0.0 |
| Non-groupable | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0.0 |
| Other laboratory confirmed[3] | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0.0 |
| Probable | 1 | 0 | 3 | 0 | 0 | 4 | 60 | 6.7 |
| **Total** | **8** | **5** | **6** | **13** | **6** | **38** | **556** | **6.8** |

[1] Case-fatality rate

[2] Middle Eastern/Latin American/African

[3] Includes DNA laboratory-confirmed by PCR where type was not determined, and laboratory-confirmed isolates not received by the Meningococcal Reference Laboratory