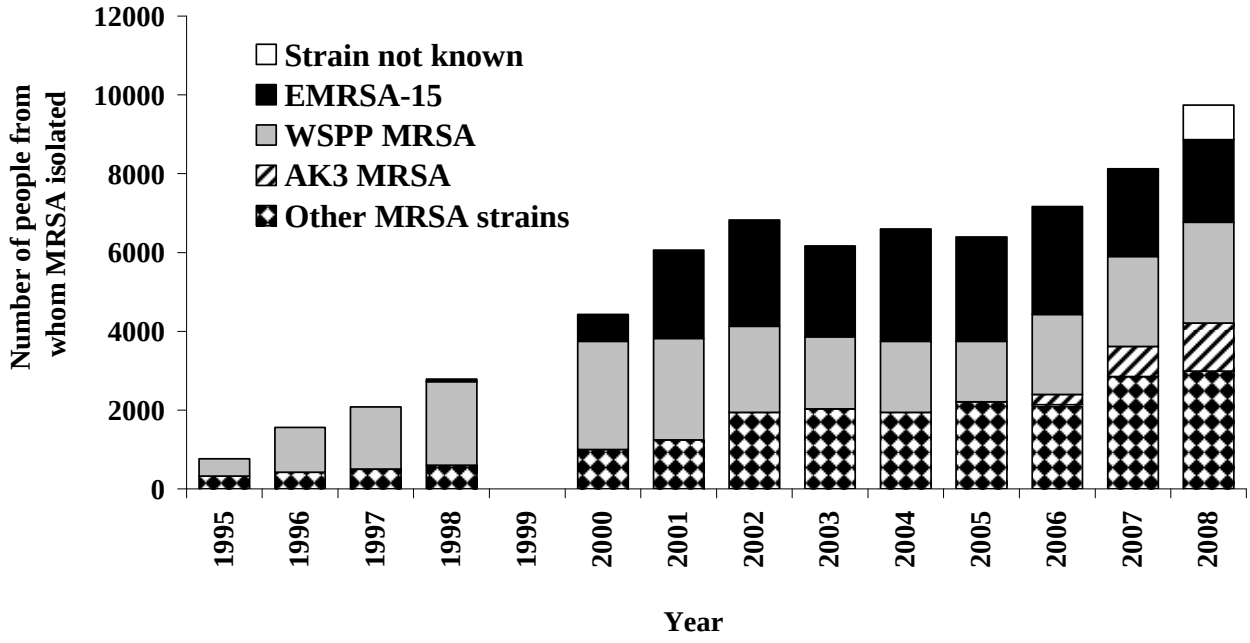
Annual survey of methicillin-resistant *Staphylococcus aureus* (MRSA), 2008

Each year ESR conducts a one-month survey of methicillin-resistant *Staphylococcus aureus* (MRSA) to provide ongoing information on the epidemiology of MRSA in New Zealand (NZ). Hospital and community microbiology laboratories are asked to refer all MRSA isolated during the month to ESR.

The 2008 survey was conducted in August 2008. Due to staff shortages, Middlemore Hospital laboratory was unable to refer isolates for the survey. Instead, this laboratory reported the number of people from whom MRSA was isolated during the month of August. This number has been included when calculating the national and district health board (DHB) MRSA incidence rates. All other analyses included in this report (eg, the strain distribution and susceptibility data) are based only on the MRSA isolates referred to ESR for the survey.

During the survey month, MRSA were referred from 736 people (706 patients and 30 staff). In addition, Middlemore Hospital laboratory reported that, after exclusion of duplicates, they isolated MRSA from 73 people during August 2008. These numbers equate to an annualised incidence rate of 227.4 per 100 000 population; an 18.8% increase on the 2007 rate of 191.5. Figure 1 shows the annual or annualised incidence of MRSA over the years 1995 to 2008 and the distribution of the most common MRSA strains.

Figure 1. MRSA isolations, 1995-2008



Data for 1995 to 1998 are based on continuous surveillance of all MRSA isolations. Data for 2000 to 2008 are annualised and based on one-month surveys conducted in these years. No survey was undertaken in 1999. The category 'Strain not known' for 2008 represents the number of people identified with MRSA by Middlemore Hospital laboratory.

Among the 706 patients with MRSA, 38.0% were categorised as hospital patients and 62.0% as community patients. Patients were classified as hospital patients if they were in a healthcare facility (including residential-care facility) when MRSA was isolated, or had been in a healthcare facility in the previous three months. The proportion of hospital patients is likely to be an

underestimate due to the missing Middlemore Hospital laboratory data. MRSA was reported as causing infection in 82.5% of the 639 patients for whom this information was provided.

Seven MRSA strains were predominant in 2008 and collectively represented 83.2% of all MRSA. MRSA strains are often described in terms of their multilocus sequence type (ST) and SCC*mec* cassette type (SCC*mec*). This information is included in the following descriptions of the seven most prevalent strains:

- WSPP MRSA [ST30, SCC*mec* type IV]: a usually non-multiresistant community strain. In 2008, WSPP MRSA was the dominant strain. The increase in MRSA in New Zealand from the mid-1990s to 2000 was driven by the spread and almost total dominance of this strain. However, since 2001, WSPP MRSA has accounted for a smaller proportion of MRSA (Figure 1). WSPP MRSA is isolated throughout NZ.

- EMRSA-15 [ST22, SCC*mec* type IV]: a healthcare-associated British epidemic MRSA strain. Between the years 2002 and 2006, EMRSA-15 was the dominant MRSA strain in New Zealand. EMRSA-15 is isolated throughout NZ.

- AK3 MRSA [ST5, SCC*mec* type IV]: a usually non-multiresistant community strain. This strain was first identified in New Zealand in 2005, and isolations of the strain have increased markedly over the last 3 years (Figure 1). While AK3 MRSA is now sporadically isolated throughout the country, in the 2008 survey 73.5% of the isolates of this strain were from Northland DHB and the greater Auckland area.

- WR/AK1 MRSA [ST1, SCC*mec* type IV]: a usually multiresistant community strain. While WR/AK1 is sporadically isolated throughout the country, in the 2008 survey all but one of the isolates of this strain were from the North Island.

- USA300 MRSA [ST8, SCC*mec* type IV]: a usually multiresistant strain that is widely disseminated in the United States, where it was initially considered a community-associated strain, but it is now also associated with healthcare facilities. During the 2008 survey period, this strain was most commonly isolated from people in the greater Auckland area and Canterbury DHB.

- Queensland clone [ST93, SCC*mec* type IV]: a non-multiresistant community strain that was first recognised in Queensland, Australia. This strain is now common in several parts of Australia, including Queensland, New South Wales and the Northern Territory.

- AKh4 MRSA [ST239, SCC*mec* type III]: a multiresistant healthcare-associated MRSA closely related to the Australian Aus2/3 MRSA.

The prevalence of each of these strains, their distribution among hospital patients or staff versus people in the community, and their association with patient age are shown in Table 1. Community-associated MRSA strains are generally isolated from children and younger adults, whereas the healthcare-associated EMRSA-15 strain is commonly isolated from elderly patients (Table 1). The susceptibility of each of the strains to non-β-lactam antibiotics is presented at the end of this report.

Table 1. MRSA strain prevalence, association with healthcare facilities versus the community, and association with patient age, August 2008[1]

Strain	Number of isolates	Proportion of all MRSA isolates[2]	Proportion of each strain isolated from:		
			Hospital patients or staff	People in the community	Patients ≥60 years of age[3]
WSPP MRSA	213	31.5%	22.5%	77.5%	10.8%
EMRSA-15	175	25.8%	72.6%	27.4%	77.3%
AK3 MRSA	102	15.1%	18.6%	81.4%	8.9%
WR/AK1 MRSA	60	8.9%	23.3%	76.7%	16.7%
USA300 MRSA	34	5.0%	36.4%	63.6%	33.3%
Queensland MRSA clone	14	2.1%	14.3%	85.7%	0.0%
AKh4 MRSA	14	2.1%	85.7%	14.3%	50.0%
total	612	83.2%[2]			

[1] The data in this table is based only on the isolates received at ESR. Therefore, it does not include the MRSA identified by Middlemore Hospital laboratory during August 2008. This omission is likely to influence the relative prevalence of healthcare-associated MRSA strains. In particular, the proportion of MRSA isolates that were EMRSA-15 is less than in recent years and this may be due to MRSA from Middlemore Hospital laboratory not being included.

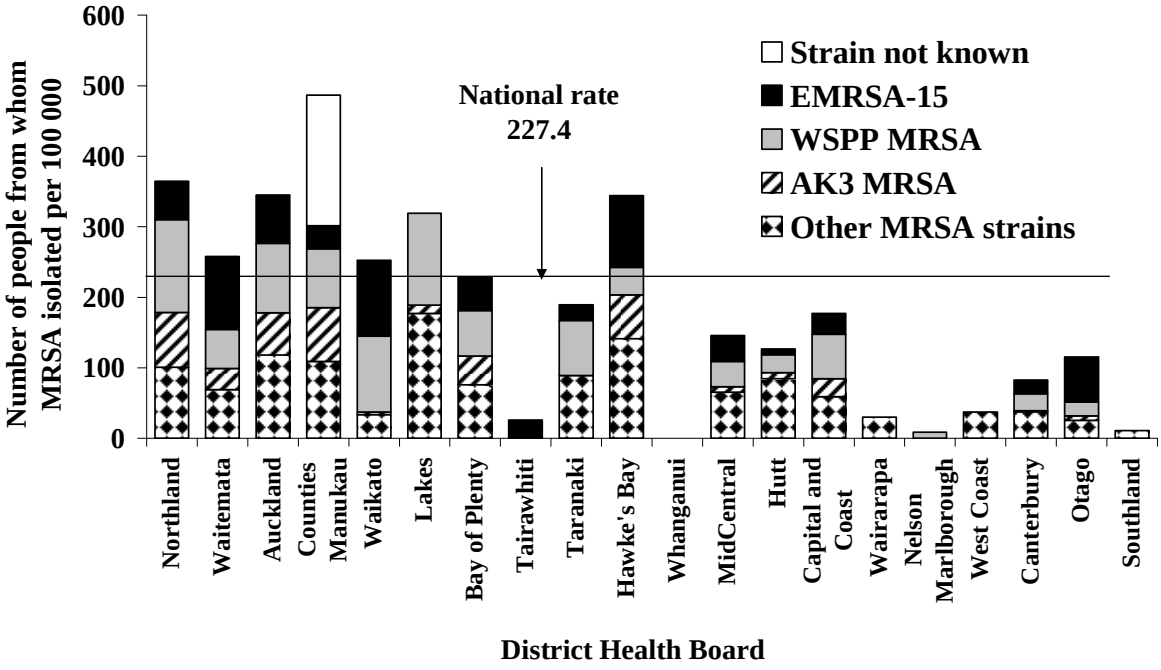
[2] Other strains accounted for the remaining 16.8% of MRSA. Except for three isolates of the EMRSA-16 strain, none of the other isolates belonged to a recognised strain.

[3] Age distribution for patients only, staff not included.

There continue to be marked geographic variations in the incidence of MRSA in New Zealand (Figure 2). Rates above the national average of 227.4 per 100 000 were recorded for: Counties Manukau (486.7 per 100 000), Northland (364.6), Auckland (345.1), Hawke's Bay (344.4), Lakes (319.2), Waitemata (258.1), and Waikato (252.7) DHBs. Differences in screening policies may contribute to some of the differences in incidence between DHBs.

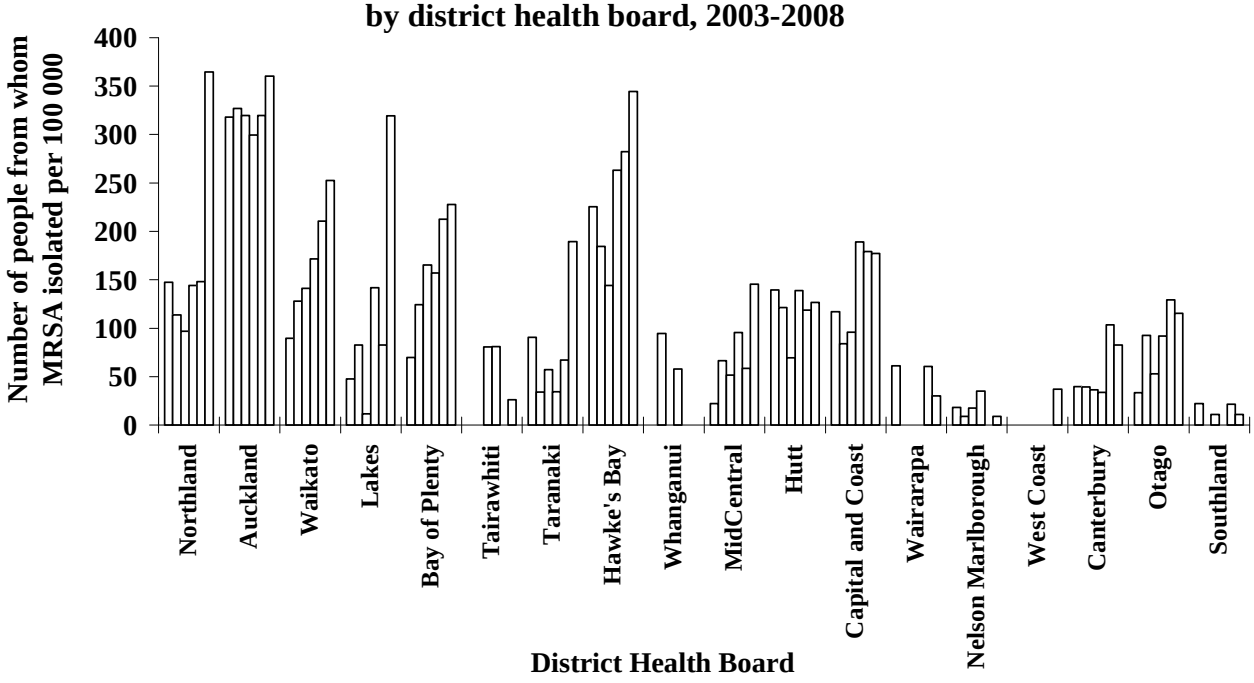
The incidence of MRSA in each DHB area over the last 6 years, 2003-2008, is shown in Figure 3. Poisson regression analysis indicated that there were significant ($P < 0.05$) increases in the incidence of MRSA in the Northland, the combined Waitemata/Auckland/Countries Manukau, Waikato, Lakes, Bay of Plenty, Taranaki, Hawke's Bay, MidCentral, Capital and Coast, Canterbury, and Otago DHBs. There were no significant changes in the other DHBs. Nationally, over the same 6 years, there was a significant increase in the incidence of MRSA.

Figure 2. Annualised incidence of MRSA by district health board, 2008



Data for the Canterbury and South Canterbury DHBs are combined as 'Canterbury'.

Figure 3. Annualised incidence of MRSA by district health board, 2003-2008



The series of bars for each DHB represent the individual years 2003 to 2008 from left to right.

Data for the three DHBs in the greater Auckland area (Waitemata, Auckland and Counties Manukau) are combined, and similarly data for the Canterbury and South Canterbury DHBs are combined as 'Canterbury'.

The antimicrobial susceptibility of the MRSA isolates referred during August 2008 is shown in Table 2. All MRSA tested were susceptible to linezolid. One EMRSA-15 isolate had intermediate vancomycin resistance (MIC of 4 mg/L). A further three isolates, with vancomycin MICs of 2 mg/L, were screened for heterogeneous vancomycin intermediate resistance and were negative.

The susceptibility patterns of some MRSA strains are becoming more variable over time. In particular, the WR/AK1 MRSA strain used to be almost invariably resistant to fusidic acid and high-level mupirocin. In the 2008 survey, 40.0% of the WR/AK1 MRSA were mupirocin susceptible and 15.0% were fusidic acid susceptible. Isolates of the AK3 MRSA were initially characterised by fusidic acid resistance, but only 57.8% of the AK3 MRSA included in the survey were fusidic acid resistant, and 28.4% were fully susceptible to non-β-lactam antibiotics. USA300 MRSA originally isolated in New Zealand were ciprofloxacin and erythromycin resistant, but 14.7% of the survey isolates were resistant to only erythromycin and 5.9% were only ciprofloxacin resistant. Finally, 2 of the 88 EMRSA-15 isolates included in the survey and susceptibility tested were ciprofloxacin susceptible.

Table 2. Resistance among MRSA referred during August 2008

Antimicrobial agent (resistance breakpoint, mg/L)[1]	Percent resistance							
	All isolates (n = 739)[2]	EMRSA-15 (n = 88)[3]	WSPP (n = 107)[4]	AK3 (n = 102)	WR/AK1 (n = 60)	USA300 (n = 34)	Queensland clone (n = 14)	AKh4 (n= 14)
Chloramphenicol (MIC ≥32)	0.4	0	0	0	0	0	0	0
Ciprofloxacin (MIC ≥4)	31.3	97.7	1.9	0	0	82.4	0	100
Clindamycin (MIC ≥4)[5]	4.9	4.6	0.9	0.9	1.7	2.9	0	100
Constitutive + inducible clindamycin[6]	25.9	55.7	5.6	28.4	26.7	5.9	0	100
Co-trimoxazole (MIC ≥4/76)	1.9	0	0	0	0	0	0	100
Erythromycin (MIC ≥8)	32.7	55.7	8.4	28.4	28.3	91.2	0	100
Fusidic acid (MIC ≥2)	16.1	1.1	0.9	57.8	85.0	0	0	0
Gentamicin (MIC ≥16)	4.5	4.6	0	0	0	0	0	100
Mupirocin (MIC ≥8)[7]	7.0	2.3	1.9	0	60.0	0	0	7.1
high-level mupirocin (MIC ≥512)	6.0	1.1	0.9	0	60.0	0	0	7.1
Rifampicin (MIC ≥4)	0.5	1.1	0	0	3.3	0	0	0
Tetracycline (MIC ≥16)	4.1	3.4	0.9	0	1.7	0	0	100
Multiresistant[8]	30.9	60.2	2.8	14.7	76.7	76.5	0	100

[1] All isolates tested were susceptible to linezolid. One EMRSA-15 isolate had intermediate vancomycin resistance.

[2] MRSA isolates were received from 736 people, but three people had isolates of two different strains. Therefore the total number of isolates included in this susceptibility analysis is 739. These data have been adjusted to allow for the full numbers of EMRSA-15 and WSPP MRSA isolates, even though the susceptibility of only a sample of isolates of both these strains was tested – see footnotes 3 and 4.

[3] A sample of 88 of the total 175 EMRSA-15 isolates was tested.

[4] A sample of 107 of the total 213 WSPP MRSA isolates was tested.

[5] Constitutive clindamycin resistance.

[6] Constitutive and inducible clindamycin resistance. Erythromycin-resistant, clindamycin-susceptible isolates were tested for inducible clindamycin resistance by the D-zone test. However, only 15 of the 45 erythromycin-resistant, clindamycin-susceptible EMRSA-15 isolates were tested, as this strain is known to have inducible clindamycin resistance. All 15 EMRSA-15 isolates tested demonstrated inducible clindamycin resistance. For the constitutive + inducible clindamycin resistance percentages given for all isolates and for EMRSA-15, all erythromycin-resistant, clindamycin-susceptible EMRSA-15 were assumed to have inducible clindamycin resistance.

[7] Includes low-level (MIC 8-256 mg/L) and high-level (MIC ≥512 mg/L) mupirocin resistance.

[8] Resistant ≥2 classes of antibiotics in addition to β-lactams.

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