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Improving immunisation coverage: what needs to be done?

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New Zealand has failed to achieve immunisation coverage targets and prevent recurring epidemics of vaccine-preventable diseases, such as measles and pertussis. Available estimates suggest that there has been no improvement in coverage since 1996, despite at least partial implementation of four of the five elements of the 1995 National Immunisation Strategy (*Immunisation 2000*). The fifth element, an immunisation surveillance system, has not yet been developed. Synthesis of evidence-based reviews identified interventions likely to improve coverage: (1) effective reminder and recall systems covering all children, (2) outreach systems to follow up children who do not respond to recall, (3) feedback of provider performance based on effective measurement of coverage, (4) financial incentives to providers and/or parents to increase demand for immunisation, (5) entry checks of immunisation at schools and early childhood centres, (6) education to promote immunisation, and, most importantly, (7) a national immunisation coverage surveillance system to enable implementation and evaluation of the other recommended strategies. An increase in resourcing and strong health professional commitment are also vital for success.

Childhood immunisation is one of the most cost-effective activities in healthcare.¹ In New Zealand, immunisation has eliminated wild polio,² and controlled tetanus and diphtheria,³ but epidemics of measles,^{4,5} rubella,⁶ and pertussis^{7,8} continue as a result of inadequate coverage. Although invasive *Haemophilus influenzae* type b (Hib) disease has been reduced by over 90% since the addition of Hib vaccine to the schedule in 1994,⁹ other countries have virtually eliminated the disease through immunisation.¹⁰ In 1998, the first case of diphtheria for 19 years³ raised concerns that low immunisation coverage could allow the return of previously controlled diseases. There have not been any studies to measure the national impact of hepatitis B immunisation on rates of carriage. However, as Maori and Pacific Islands children have only about 60% coverage against hepatitis B,¹¹ it is likely that only about half the potential gains are being achieved. Cases of acute hepatitis B have declined since the 1980s, but rates have levelled off since 1995.¹²

Despite concerns about coverage, there is no reliable national coverage information apart from the 1992 survey.¹³ Coverage estimates, based on immunisation benefit claim data, suggest that there has been no improvement in coverage since 1996.¹⁴ The 1995 National Immunisation Strategy (*Immunisation 2000*) failed to achieve its target of 95% of two year old children fully immunised

by the year 2000.¹⁵ We examined recent reviews of immunisation coverage to identify appropriate interventions to raise coverage levels.

Low immunisation coverage and poor coverage surveillance

The 1992 national survey found that less than 60% of children were fully immunised by the age of two years.¹³ The survey was designed to define the lower bound of coverage by only accepting a written record of immunisation. Furthermore, coverage for individual vaccine series was about 80%, excluding the 18 month episode. For Maori and Pacific Islands children, coverage was only 42% and 45%, respectively. A repeat coverage survey in 1996 in the Northern region found a small improvement, with an overall coverage rate of 63%, and rates of 45% for Maori and 53% for Pacific Islands children.¹¹

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Immunisation benefit claims have been used to estimate national coverage. A change to the claim form in 1994, which identified each dose in the series, improved the estimates,¹⁶ but they remain unreliable for several reasons. Not all vaccinators complete claim forms. Although coverage estimates are adjusted for children in practices which do not claim, accurate data on the numbers of these children have not been available. The low level of payment for the immunisation benefit (less than the cost to the practice),¹⁷ compared to a claim for a medical service, may encourage a claim for the latter instead of the former. Providers may simply mark an episode with a single tick under one vaccine, even though three vaccines were given at the episode. At the time of the 1996 immunisation schedule change, the relative order of the hepatitis B and DTPH vaccines on the claim form changed and there was a corresponding change in the relative coverage estimates for the two vaccines. As the primary purpose of the claim form is to claim the benefit rather than provide information, there isn't a strong motivation for providers to check the accuracy of the information on the form. Nor is the accuracy checked elsewhere. Finally, the coverage estimate is calculated from the number of claims divided by the target population and does not distinguish catch-up doses, that is, vaccine given to those outside the target age range. Nor is there any adjustment if the same child receives the same vaccine from another vaccinator.

Coverage estimated from claims improved up to 1996, but since then there has been no further improvement. Estimates for the years 1997-99 have remained below those for 1996.¹⁴ During the last few years, there have been increased concerns about vaccine safety, highlighted by the unfounded allegations about measles-mumps-rubella vaccine (MMR) causing autism and bowel disturbances.¹⁸ There have also been changes in the funding and delivery of health services, increased uncertainty about the numbers of children who are in capitated practices which do not claim the immunisation benefit, possibly increased numbers of children who do not have a regular general practitioner, and no increase in the immunisation benefit payment despite increases in other medical services payments. However, the relative contribution of these factors to the apparent lack of improvement in coverage is unknown.

Other sources have found higher coverage. The Plunket National Child Health Study followed up 4286 children born in 1990-91 and found that 83% were fully immunised by the age of two years.¹⁹ However, the validity of these findings was questioned because of the high loss to follow-up.²⁰ A cohort study in Christchurch²¹ and an independent practitioner association in Rotorua,²² both recently reported over 90% of children fully immunised by the age of two years. The Rotorua estimate was calculated based on children enrolled with providers rather than all children in the area.

Health authorities have recognised the need to raise immunisation coverage. The Public Health Commission convened an expert group on immunisation,²³ and advised the Minister of Health on recommended strategies in October 1993.²⁴ The Minister called for further policy work, which led to the 1995 National Immunisation Strategy composed of five elements:¹⁵

- a simplified immunisation schedule
- immunisation certificates for entry to school/early childhood centre
- standards for immunisation providers
- local immunisation co-ordination
- improved immunisation surveillance.

Several elements in the Public Health Commission's advice to the Minister were not included in the strategy. These elements included establishing the position of a national immunisation co-ordinator, exploring the use of financial incentives and

feedback of performance to improve the commitment of providers to immunisation, exploring ways of reducing the indirect cost barriers, and increasing the kind and range of resources to educate parents about immunisation.²⁴

By the time the strategy was launched, the decisions on the schedule had already been made, and some local co-ordinators were already in place. The immunisation standards had been developed, but no resources were made available for audit. Therefore, in effect the only really new strategies with potential to improve coverage were the *Health (Immunisation) Regulations 1995*, which require immunisation checks on entry to an early childhood centre or school, and the planned development of immunisation surveillance. As the surveillance system failed to materialise, and no resources were made available for implementation of the *Health (Immunisation) Regulations 1995*, it is perhaps not surprising that coverage has not improved.

This failure is in sharp contrast to the improvements in coverage in Britain,²⁵ the United States,²⁶ and Australia.²⁷ Australia introduced a national immunisation register in January 1996 to provide a recall and reminder system, improved surveillance, and an information base for provider and parent financial incentives. The proportion of two year old children fully immunised increased from 64% to 85% during the following two years.²⁷ New Zealand is now performing poorly compared to other Western countries and the Pacific Islands (*Table 1*).²⁸

Table 1: Coverage estimates for pertussis immunisation¹

Country	Percent immunised	Year of estimate
Niue	100	1998
Samoa	100	1998
Tokelau	100	1998
Sweden	99	1995
Canada	97	1998
France	97	1997
Tonga	97	1998
Cook Islands	95	1998
United States	94	1995
United Kingdom	93	1998
Australia	86	1998
New Zealand	81	1998
New Zealand	88	1999

Note: 1 All data, except those for New Zealand, are from reference 28. The New Zealand data are from reference 14.

Interventions to improve immunisation coverage

There is an increasing body of evidence on interventions to improve immunisation coverage. This evidence has been reviewed in New Zealand and overseas to identify strategies to improve coverage. We assessed and synthesised these evidence-based reviews to generate strategies relevant for New Zealand.

Evidence-based reviews: The New Zealand Department of Health's Health Research and Analytical Services used interviews and the literature to identify strategies to improve coverage among low coverage groups.²⁹ They identified the need to:

- increase the cultural appropriateness of services
- improve education and information, especially for caregivers
- implement comprehensive and effective follow-up and recall systems for all children.

A 1994 Canadian review, based on an overview of 54 comparative trials and expert opinion, recommended school entry legislation and an immunisation surveillance system with recall for childhood immunisation.³⁰ The authors considered the evidence insufficient to recommend consumer-based interventions or provider-orientated recommendations.

In 1999 the United States National Vaccine Advisory Committee reviewed American immunisation programmes, strategies and financing, published studies, and reached consensus conclusions.³¹ They made 15 recommendations grouped around four categories:

- financing to remove cost barriers

- provider practices to ensure the implementation of recall/reminder systems and office-based assessment of coverage levels
- information systems for monitoring disease, vaccination coverage, and immunisation delivery performance
- support for communities and families to ensure that the public is aware of the importance of vaccination, resources are focused to help underserved children, and citizen coalitions can advocate for improvements in the immunisation delivery system.

Another 1999 United States review of 197 published international studies recommended:³²

- increasing community demand by client reminder and recall systems, multi-component interventions including education, and immunisation entry requirements for early childhood centre, school and college
- enhancing access to vaccination services by reducing costs for immunisation, expanding access to immunisation clinics as part of multi-component intervention, immunisation programmes in food support programmes, and home visits
- provider-based interventions, notably, provider recall and reminder systems and assessment and feedback of provider performance.

In 1999, the New Zealand National Health Committee published a review recommending 12 strategies based on interviews with key informants within New Zealand and a review of literature.³³ The relevant strategies include:

- the need for a population-based focus
- more equitable distribution of funding within the primary care sector
- ensuring that every child is enrolled in primary care and followed up
- development of outreach immunisation services
- increased performance-based incentives for immunisation in primary care settings
- increased resources to help compliance with the *Health (Immunisation) Regulations 1995*
- a promotion campaign tailored to the 'hard to reach'
- reliable individual and national coverage information.

Synthesis and recommendations: Seven recommendations were identified that captured the recommendations of the reviews that are relevant to New Zealand (*Table 2*). The first recommendation, the establishment of a national immunisation coverage surveillance system, has a role in implementing and/or evaluating the other six recommended strategies.

Table 2: Interventions recommended for New Zealand, source(s) of the recommendation, and the role of a national immunisation coverage surveillance system

Intervention	Source of recommendation ¹	Role of national immunisation coverage surveillance system
Effective reminder and recall systems, with every child on a primary care register	HRAS, Can, NVC, UST, NHC	Enhance enrolment on provider-based reminder/recall systems
Coordinated outreach systems to follow up children who do not respond to recall	HRAS, UST, NHC	Identify children not covered by provider-based systems and those who have missed immunisation
Feedback of provider performance, based on effective measurement of coverage and peer comparison	UST	Measure coverage at provider, regional and national level
Financial incentives to providers and/or parents to increase demand for immunisation	UST (parents) NHC (providers)	Provide mechanism for calculating incentives
Immunisation check at entry to schools and early childhood centres	Can, UST, NHC	Provide back-up source of individual immunisation information and means to analyse coverage at school entry
Education to promote immunisation, using a variety of channels	HRAS, NVC, UST, NHC	Enable targeting and evaluation of interventions

Note: 1 HRAS, Health Research and Analytical Services, New Zealand, 1993²⁹
 Can, Canadian review, 1994³⁰
 NVC, National Vaccine Advisory Committee, United States, 1999³¹
 UST, United States taskforce, 1999³²
 NHC, National Health Committee, New Zealand, 1999³³

Discussion

Despite a major policy initiative with the 1995 National Immunisation Strategy, New Zealand has failed to achieve immunisation coverage targets. In addition, there remains uncertainty about the actual level of coverage. Comparing the evidence-based strategies to the New Zealand policy, it is apparent that this poor outcome has arisen from a number of failures. The most important was the failure to implement an immunisation surveillance system. Without a population-based system, it is not possible to ensure that every child is on a reminder/recall system, to arrange co-ordinated outreach, to give feedback of provider performance, or to offer financial incentives.

The *Health (Immunisation) Regulations 1995* have not achieved their intended outcome of increasing the priority that families give to the completion of immunisation. The reason for this requires further analysis, but may be related to inadequate resourcing of the policy. In contrast to the effective strategies in other countries, there has not been any substantial additional funding to achieve the New Zealand coverage targets.

The central role of an immunisation coverage surveillance system is highlighted in *Table 2*. Whatever the configuration of this system, it will require practice level and national level information processes. Computerised immunisation coverage systems offer other potential advantages, such as surveillance of vaccine-related adverse events.³⁴ Most importantly, without reliable coverage information it will be difficult to evaluate the effectiveness of any strategy. Once a national immunisation coverage surveillance system is established and reliable data are available, further strategies could be implemented, based on evidence of effectiveness and depending on need.

Britain, the United States and Australia have all been successful in improving immunisation coverage. If New Zealand is to achieve similar success, it will need to implement effective strategies, increase resourcing, and develop a strong health professional commitment to immunisation.

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Surveillance and control notes

Indigenous spread of murine typhus in the Auckland area

A case of murine typhus was notified in the Auckland area in April. The case had not travelled overseas during the incubation period of the disease. This is the seventh case of indigenously acquired murine typhus notified in New Zealand. All seven cases have been in the Auckland area: five in the Northwest Auckland Health District and two in the South Auckland Health District. All cases were confirmed serologically. The first of the cases occurred in 1989, and four have occurred within the last two years.

Typhus is a rickettsial disease. The classical (epidemic) louseborne typhus is a serious illness, which without treatment has a fatality rate of up to 40%. It is caused by *Rickettsia prowazekii*. Murine (endemic) flea-borne typhus is caused by *R typhi*, and is a worldwide zoonotic disease. Humans are incidental hosts, with fleas transmitting the organism from a reservoir of small mammals such as rats and cats. A feature of the seven indigenously acquired cases was their exposure to possums, which have been implicated as reservoir hosts.

The incubation period for murine typhus is approximately 1-2 weeks. The predominant clinical features are headache, fever, chills and myalgia, and a macular or maculopapular rash develops in about half the cases. Untreated, the illness persists for 2-3 weeks, and medical attention is often sought for the prolonged fever. Early diagnosis is based on clinical suspicion, and should be considered in patients with these signs and symptoms, particularly those with an appropriate exposure history (eg, rats and possums). Ideally, suspected cases should be discussed with, or seen by, an infectious diseases specialist as the features of this infection are non-specific and the differential diagnosis extensive. While the clinical course is usually uncomplicated, an intensive care admission rate of 10% has been reported and the case-fatality rate is 1-4%. The usual means of laboratory confirmation is rickettsial serology, which is available from the Virology and Immunology Laboratory at Auckland Hospital. Other forms of

typhus include the miteborne scrub typhus and the tickborne typhus fevers (eg, spotted fever). All rickettsial diseases are notifiable.

Outbreak of salmonellosis linked to a butchery

In July 1999, eight cases of salmonellosis, due to *Salmonella* Typhimurium phage type 135, were linked to produce from a Christchurch butcher's shop. Six of the cases had consumed cocktail saveloys from the shop. Four of these six cases were members of one family who had eaten some of the saveloys without heating them. The other two cases who ate the saveloys were young children who had been given saveloys during visits to the shop. The seventh case had bought mince patties from the butchery and cooked the patties at home. The eighth case was a member of the butchery staff, who reported eating a variety of meats, but not saveloys, from the butchery.

S Typhimurium phage 135, at a concentration of 540 organisms per gram, was isolated from the interior of left-over saveloys collected from the family's fridge. The level of contamination at the time of consumption may have been higher, as this count was estimated after the saveloys had been frozen and thawed twice during the course of successive laboratory testing. No mince patties were available for testing.

The saveloys were made on the butchery premises. An investigation of the premises found them to be in reasonable condition, but very old and too small for mass production of cooked product. While no specific cause for the contamination could be proven, it is most likely that meat grossly contaminated with *Salmonella* was used in the production of both the saveloys and meat patties. The temperature reached during the cooking of batches of saveloys was tested during the investigation and found to be sufficient to kill *Salmonella* when the saveloys were fully immersed (74.5°C for >10 seconds). However, some of the saveloys floated above the surface of the water and therefore possibly received insufficient heating. Batches of cooked saveloys

Surveillance and control notes

were sometimes held at ambient temperatures for periods long enough to allow any remaining viable *Salmonella* to multiply to high levels. In addition to the practices that probably contributed to this outbreak, there was cross contamination between raw and cooked products in the butchery, for example, the saveloys were displayed next to crumbed raw chicken, with no physical barrier between them, and there were crumbs on the saveloys.

There is a need for HACCP-based food safety programmes in butcheries, especially those preparing and handling cooked products. Following the identification of control point failures in this butchery, several recommendations were made:

- saveloys and other precooked sausages should be weighted or held under the water to ensure even cooking of the whole batch, and a temperature probe should be used to verify adequate cooking of each batch (Table 1)
- there should be a system to ensure that the cooked product does not remain at room temperature for more than two hours before being refrigerated
- the practice of giving customers, especially children, precooked smallgoods for immediate consumption should be discontinued
- there should be a physical barrier between precooked product and raw meats, and no-touch techniques (eg, using plastic bags) should be used when picking up all meats.

(Reported by Rosemary Whyte, Microbiologist, ESR; Barry Armstrong, Health Protection Officer, Crown Public Health; Chris Graham, Microbiologist, ESR.)

Table 1: Time and temperatures required for a 6.5D kill of *Salmonella* in meats and smallgoods manufacture¹

Temperature °C	Time
55	89 minutes
60	12 minutes
65	85 seconds
70	11 seconds
71.1	10 seconds

Note: 1 From the United States Code of Federal Regulations 9

Sexually transmitted infections in 1998

Surveillance of sexually transmitted infections (STIs) in New Zealand has been based on data supplied by sexual health clinics. Since the surveillance is limited to clinics, the results may not be representative of the epidemiology of STIs in the New Zealand general population.

The rates of STIs in 1998 cannot be compared with those in previous years because the denominator data used to calculate the rate have changed. In 1998, the rates were expressed as a percentage of all patient visits to sexual health clinics. In previous years, rates were expressed as a percentage of only the new patients attending sexual health clinics, that is, patients who had not visited a clinic in the previous three months. This change has the effect of appearing to reduce the rates of disease. Therefore, when making comparisons between 1998 and previous years, the number of cases, not rates, should be used.

The STIs diagnosed in each clinic and nationally in 1998 are shown in Table 2. Genital warts continued to be the most common STI diagnosed among patients attending sexual health clinics (4.7% of patients), followed by *Chlamydia* (3.0%) and genital herpes (1.0%). Between 1997 and 1998, there was an increase in the number of cases of both *Chlamydia* (13.7% increase from 1994 to 2268 cases) and gonorrhoea (12.7% increase from 292 to 329 cases). The number of cases of genital herpes and syphilis remained constant, while cases of genital warts decreased by 6.3% (from 3711 to 3479 cases). There were no cases of lymphogranuloma venereum, granuloma inguinale or chancroid reported in 1998. Trichomoniasis is no longer reported.

Females were more likely to attend sexual health clinics than males (56.5 vs 43.5%). Rates of all STIs were higher in male than female patients: *Chlamydia* (3.3 vs 2.9%), gonorrhoea (0.6 vs 0.3%), genital warts (5.5 vs 4.0%), genital herpes (1.2 vs 0.8%) and syphilis (0.05 vs 0.02%).

Fifty-one percent of clinic attendees were aged 15-24 years. Rates of *Chlamydia* and gonorrhoea were highest in those aged 15-19 years, genital warts rates were highest in those aged 20-24 years, genital herpes rates were highest in those aged 30-34 years, and syphilis rates were highest in those aged 45 years and older. Male sexual health clinic attendees diagnosed with *Chlamydia*, gonorrhoea, genital warts or genital herpes were significantly older than the female attendees diagnosed with these diseases.

Europeans accounted for 74% of clinic attendees, Maori 14% and Pacific Islands people 3%. Rates of *Chlamydia* were considerably higher in Maori (7.3%) and Pacific Islands people (7.1%) than in Europeans (2.1%). A similar pattern was seen for gonorrhoea (1.6% for Maori, 1.9% for Pacific Islands people and 0.2% for Europeans). Rates of genital warts were similar in the three main ethnic groups, whereas rates of genital herpes were highest in Europeans.

Table 2: Sexually transmitted infections by sexual health clinic, 1998

Number of new cases¹ Percent patient visits²

Disease	Cases ¹ and current rates ² by clinic																									Total
	Whangarei	Auckland ⁵	Hamilton/Tokoroa	Tauranga	Rotorua	Whakatane	Taupo	New Plymouth	Gisborne	Napier	Hastings	Wanganui	Palm North/Levin	Wellington ⁶	Lower Hutt	Porirua	Nelson	Blenheim	Greymouth	Christchurch	Ashburton	Timaru	Dunedin	Invercargill/Gore		
<i>Chlamydia</i> ³	53 4.0	523 2.6	346 4.6	111 3.3	97 7.1	45 5.7	48 6.7	142 5.9	46 3.8	52 5.5	35 5.4	31 3.4	127 3.4	208 1.7	39 3.5	56 7.8	19 1.7	10 2.1	6 1.8	161 1.9	7 3.0	21 5.0	51 1.6	34 3.1	2268 3.0	
Gonorrhoea ³	4 0.3	137 0.7	25 0.3	2 0.1	37 2.7	12 1.5	3 0.4	1 0.1	16 1.3	5 0.5	12 1.9	5 0.6	2 0.1	39 0.3	3 0.3	5 0.7	1 0.1	0 0	0 0	11 0.1	0 0	2 0.5	6 0.2	1 0.1	329 0.4	
Genital herpes	11 0.8	160 0.8	88 1.2	27 0.8	26 1.9	6 0.8	17 2.4	24 1.0	5 0.4	16 1.7	6 0.9	15 1.7	45 1.2	130 1.1	13 1.2	7 1.0	16 1.4	1 0.2	3 0.9	68 0.8	1 0.4	15 3.6	20 0.6	11 1.0	731 1.0	
Syphilis	0 0	8 0	3 0	1 0	1 0.1	0 0	0 0	0 0	0 0	2 0.2	0 0	0 0	0 0	5 0	2 0.2	0 0	0 0	0 0	0 0	0 0	1 0	0 0	0 0	0 0.1	24 0	
Genital warts	64 4.8	996 4.9	372 5.0	117 3.5	93 6.8	40 5.0	21 2.9	139 5.8	28 2.3	58 6.2	56 8.7	43 4.8	176 4.7	389 3.2	74 6.7	37 5.1	78 8.6	41 3.4	11 3.0	416 5.0	7 3.4	34 8.1	135 4.2	54 4.9	3479 4.7	
Total patient visits ⁴	1336	20452	7454	3360	1360	794	716	2390	1216	942	644	902	3780	12260	1102	722	1116	476	328	8398	234	418	3222	1094	74716	

Notes: 1 Data are based on the diagnoses made at sexual health clinics
 2 Based on cases diagnosed, expressed as a percentage of all patient visits
 3 Confirmed cases only
 4 Number of patient visits for any reason July-December 1998, multiplied by two
 5 Based on data from three Auckland clinics
 6 Based on data from two Wellington clinics

Surveillance data

National surveillance data - January 2000

Disease ¹	Current year - 2000 ²			Previous year - 1999			Trends - January 2000
	Jan 2000 cases	Cumulative total year-to-date	Current rate ³	Jan 1999 cases	Cumulative total year-to-date	Previous rate ³	
AIDS	0	0	0.9	0	0	0.7	
Acute gastroenteritis ⁴	40	40	16.5	45	45	13.8	**
Campylobacteriosis	1002	1002	229.0	880	880	314.5	***
Cholera	0	0	0	0	0	0	
Creutzfeldt-Jakob disease	0	0	0	0	0	0	
Cryptosporidiosis	19	19	25.9	57	57	25.1	
Dengue fever	0	0	0.2	2	2	0.7	***
Giardiasis	120	120	49.1	140	140	59.9	***
<i>H influenzae</i> type b disease	2	2	0.3	0	0	0.3	
Hepatitis A	3	3	3.0	13	13	4.2	**
Hepatitis B (acute) ⁵	15	15	2.8	5	5	2.4	
Hepatitis C (acute) ⁵	8	8	2.7	5	5	2.7	
Hydatid disease	0	0	0.2	0	0	0.1	300
Influenza ⁶	1	1	22.0	2	2	12.2	***
Lead absorption	8	8	4.2	9	9	2.3	***
Legionellosis ⁶	5	5	1.9	4	4	2.8	*
Leprosy	0	0	0.2	0	0	0.1	250
Leptospirosis	9	9	1.7	1	1	2.0	
Listeriosis	4	4	0.6	0	0	0.4	
Malaria	4	4	1.2	5	5	2.0	**
Measles	10	10	3.0	8	8	3.8	
Meningococcal disease	25	25	14.0	25	25	11.9	*
Mumps	3	3	1.5	5	5	2.3	*
Paratyphoid	0	0	0.2	3	3	0.5	
Pertussis	233	233	35.1	7	7	4.0	776
Rheumatic fever	4	4	1.7	7	7	2.0	
Rubella	2	2	1.1	1	1	1.5	
Salmonellosis	99	99	53.3	250	250	59.5	***
Shigellosis	10	10	3.8	18	18	3.6	
Tetanus	0	0	0.1	1	1	0.1	
Tuberculosis	25	25	12.2	36	36	10.4	*
Typhoid	2	2	0.3	1	1	0.8	**
VTEC/STEC infection	3	3	1.8	1	1	1.4	
Yersiniosis	54	54	13.2	78	78	14.5	

Notes: 1 No cases of the following notifiable diseases were reported in January: anthrax, brucellosis, cysticercosis, diphtheria, meningoencephalitis - primary amoebic, plague, poliomyelitis, rabies, rickettsial diseases, trichinosis, viral haemorrhagic fever, or yellow fever
2 These data are provisional
3 Rate is based on the cumulative total for the current year (12 months to January 2000) or the previous year (12 months to January 1999), expressed as cases per 100 000
4 Cases with suspected common source, person in a high risk category (eg foodhandler, childcare worker, healthcare worker)
5 Only acute cases of this disease are currently notifiable
6 Surveillance data based on laboratory-reported cases only
7 Percentage change is the difference between the number of cases in the current year (12 months to January 2000) and the previous year (12 months to January 1999). This difference is expressed as a percentage of the number of cases seen in the previous year

Surveillance data

Surveillance data by health district - January 2000

Cases this month Current rate¹

Disease	Cases for January 2000, ² and current rate ^{1,2} by health district ^{3,4}																																															
	Northern				Midland						Central						Southern																															
	Northland	NW Auck	Central Auck	South Auck	Waikato	Tauranga	Eastern BOP	Gisborne	Rotorua	Taupo	Taranaki	Ruapehu	Hawkes Bay	Wanganui	Manawatu	Wairarapa	Wellington	Hutt	Nelson-Marl	West Coast	Canterbury	South Cant	Otago	Southland																								
AIDS ³	0				0						0						0																															
	1.4				0.4						1.2						0.4																															
Acute gastroenteritis	1	5	8	7	5	1	0	1	0	0	0	0	0	0	0	2	1	0	0	9	0	0	0	14.6	20.3	27.8	14.0	8.3	2.7	0	87.4	1.5	0	9.4	0	3.5	0	0	0	8.6	3.8	5.1	6.2	57.9	7.5	0.6	4.5	
Campylobacteriosis	23	85	73	57	60	21	2	12	12	4	27	5	38	12	28	11	73	33	29	4	220	59	78	37	124.7	234.6	254.5	178.5	260.1	131.2	95.5	142.1	162.7	123.8	166.6	107.4	284.3	149.8	127.0	197.6	319.5	248.8	155.2	148.0	323.9	367.1	256.0	203.0
Cholera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Creutzfeldt-Jakob disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cryptosporidiosis	1	1	1	2	0	1	0	0	0	0	0	0	1	0	0	2	1	0	0	2	2	2	3	12.4	10.4	8.4	9.1	55.9	24.8	6.0	17.5	1.5	13.0	13.1	6.0	48.1	11.4	41.2	31.2	21.8	47.5	6.0	9.3	51.7	76.7	15.6	25.2	
Dengue fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.6	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0.6	0	
Giardiasis	3	24	19	9	12	6	0	2	2	4	0	3	6	1	0	6	1	3	2	11	2	3	1	30.6	58.3	72.6	39.2	67.1	67.4	19.9	41.5	27.9	78.2	23.4	35.8	82.2	22.8	38.6	23.4	58.9	30.9	36.9	67.8	47.3	26.4	30.1	29.6	
H influenzae type b disease	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0.5	0.6	0.6	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0
Hepatitis A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	9.5	3.8	5.5	7.0	0.7	0.9	0	6.6	3.1	0	0	0	2.1	1.6	1.3	0	4.9	1.5	1.7	0	0.8	1.3	1.2	1.8		
Hepatitis B	0	0	4	0	2	0	0	1	0	0	0	0	1	0	1	0	2	0	0	2	2	0	3.6	1.0	2.3	3.5	5.3	1.8	0	4.4	3.1	3.3	0	6.0	6.3	1.6	1.3	0	1.6	4.5	1.7	0	4.4	6.3	1.2	1.8		
Hepatitis C	0	0	0	0	0	2	0	0	2	0	0	0	2	0	1	0	0	0	0	0	0	1	2.9	0.3	1.4	0.6	0	15.1	4.0	0	15.5	0	0	0	2.8	0	1.3	0	1.6	0.8	0	6.2	8.8	6.3	2.9	0		
Hydatids	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.9	0	2.2	0	0	0	0	0	0	5.2	0.4	0	0.9	0	0	0	0	0	0.6	0	
Influenza ⁵	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1.5	18.0	29.2	35.4	31.4	0.9	33.8	10.9	4.6	3.3	10.3	0	7.0	13.0	3.3	10.4	11.1	0	18.0	9.3	62.3	22.6	13.3	8.1		
Lead absorption	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	5	1	0	2.9	0.5	2.3	0.9	6.9	0.9	2.0	4.4	6.2	0	3.7	0	10.5	0	5.3	7.8	4.5	2.3	0.9	12.3	9.6	17.6	1.7	1.8		
Legionellosis ⁵	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.7	0	1.2	0.6	6.3	0.9	2.0	0	3.3	1.9	6.0	1.4	1.6	1.3	10.4	1.6	3.8	0	4.4	0	0	1.2	0.9			
Leprosy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.9	0	0	0	0	0	0	0.7	0	0.7	0	0	0.8	0	0	0	0	0	0	0	0	0	
Leptospirosis	1	1	0	0	3	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0	7.3	0.8	0	0.3	3.3	0.9	0	4.4	1.5	3.3	3.7	0	5.6	3.3	2.7	0	0.8	0	1.7	6.2	0.8	6.3	0.6	0.9		
Listeriosis	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0.7	1.0	1.4	0.6	0.7	0.9	0	0	1.5	0	0	0	0	0.7	0	0.4	0.8	0.9	0	0.8	0	0	0	0	0	
Malaria	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2.9	0.3	1.4	0.9	1.3	0	2.0	2.2	1.5	0	0	0	0.7	4.9	1.3	0	0.4	0.8	2.6	0	2.3	0	2.3	0		
Measles	0	1	0	0	1	0	0	0	0	0	0	0	4	0	0	0	1	1	1	1	0	1	0.7	2.0	2.3	2.9	1.0	0.9	2.0	4.4	0	3.3	0	8.4	0	6.6	7.8	3.3	5.3	2.6	12.3	2.6	1.3	7.5	2.7			
Meningococcal disease	0	2	4	5	4	1	1	0	0	0	1	0	0	1	0	1	1	0	1	0	1	1	27.7	11.2	21.1	32.2	11.9	14.2	23.9	13.1	26.3	22.8	6.6	6.0	12.5	9.8	1.3	13.0	5.8	12.1	1.7	0	9.1	2.5	12.2	17.1		
Mumps	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1.5	0	1.2	2.0	0	0.9	0	0	3.1	9.8	3.7	0	4.9	1.6	2.0	2.6	2.1	1.5	0.9	3.1	1.0	0	2.9	0.9		
Paratyphoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0.3	0	0.6	0.3	0	0	0	0	0	0	0	0	1.3	0	0.4	0	0	0	0	0.3	0	0	0	0	
Pertussis	5	36	7	12	11	6	0	0	0	0	1	0	3	0	0	15	8	24	4	74	12	10	5	13.9	28.4	9.0	14.6	21.5	10.6	0	4.4	0	0	15.9	0	14.6	3.3	2.0	0	26.8	18.9	73.7	12.3	70.4	129.5	41.1	278.5	
Rheumatic fever	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8.8	0	2.0	3.8	1.7	3.5	2.0	13.1	4.6	3.3	0.9	6.0	0.7	0	2.6	1.6	1.5	0	0	0	0	0	0	0		
Rubella	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.9	1.3	0.6	0.9	0	0.9	0	0	0	0	0	0	1.4	0	0.7	2.6	1.2	0	2.6	6.2	0.3	0	5.2	0.9		
Salmonellosis	2	5	11	9	13	4	1	0	1	0	0	1	2	0	10	6	0	2	0	15	6	8	3	35.0	49.0	46.6	38.0	54.9	44.3	25.9	48.1	46.5	42.3	38.4	77.6	47.4	19.5	85.1	72.8	74.1	60.3	48.0	30.8	60.5	84.2	59.1	75.5	
Shigellosis	0	2	1	2	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	8.8	4.1	9.8	10.0	2.3	0.9	2.0	2.2	10.8	6.5	0.9	0	0	2.7	2.6	2.1	3.0	0	0	1.0	2.5	0	0	1.8		
Tetanus	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	0	0	0	0	0.7	0	2.6	0.4	0	0	0	0	0	0	0	0.6	0	
Tuberculosis	0	3	5	3	4	0	0	0	0	0	0	0	1	1	2	0	3	0	0	2	0	1	18.2	10.4	28.3	20.2	11.2	11.5	4.0	4.4	1.5	3.3	0	0	12.5	6.5	8.0	0	19.8	18.9	5.1	3.1	7.0	3.8	3.5	3.6		
Typhoid	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0.8	0.3	0.6	0	0.9	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0	
VTEC/STEC infection	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1.2	0.3	10.6	4.4	0	2.2	1.5	3.3	1.9	0	0	0.7	2.6	2.1	1.5	0	0	1.6	0	1.7	0			
Yersiniosis	1	7	12	6	3	1	0	0	1	0	0	0	4	0	0	3	4	4	1	6	1	0	0	10.2	14.2	19.1	14.9	11.9	5.3	8.0	8.7	10.8	13.0	6.6	0	14.6	3.3	4.0	2.6	16.9	18.9	5.1	30.8	20.7	27.7	1.2	6.3	

Notes: 1 Current rate is based on the cumulative total for the last 12 months expressed as cases per 100 000

2 These data are provisional

3 AIDS data given by divisions of the Health Funding Authority

4 Further data are available from the local medical officer of health

5 Surveillance data based on laboratory-reported cases only

Surveillance data

National surveillance data - February 2000

Disease ¹	Current year - 2000 ²			Previous year - 1999			Trends - February 2000
	Feb 2000 cases	Cumulative total year-to-date	Current rate ³	Feb 1999 cases	Cumulative total year-to-date	Previous rate ³	
AIDS	3	3	0.1	2	2	0.8	
Acute gastroenteritis ⁴	34	80	16.6	38	83	14.2	**
Campylobacteriosis	883	1883	232.3	762	1641	312.5	***
Cholera	0	0	0.0	0	0	0.0	
Creutzfeldt-Jakob disease	0	0	0.0	0	0	0.0	
Cryptosporidiosis	10	30	24.0	82	139	26.9	*
Dengue fever	0	0	0.1	4	6	0.8	***
Giardiasis	165	286	47.9	207	347	59.5	***
<i>H influenzae</i> type b disease	0	2	0.3	1	1	0.3	
Hepatitis A	3	6	2.5	22	35	4.0	***
Hepatitis B (acute) ⁵	5	20	2.8	7	12	2.5	
Hepatitis C (acute) ⁵	9	17	2.8	6	11	2.4	
Hydatid disease	0	0	0.1	3	3	0.1	
Influenza ⁶	5	6	22.1	4	6	12.4	***
Lead absorption	13	21	4.0	18	27	2.7	**
Legionellosis ⁶	7	12	2.0	6	10	2.3	
Leprosy	0	0	0.2	2	2	0.1	
Leptospirosis	9	17	1.8	5	6	1.9	
Listeriosis	3	7	0.7	2	2	0.4	
Malaria	7	11	1.2	7	12	2.0	*
Measles	8	17	3.1	4	12	3.5	
Meningococcal disease	24	48	14.0	23	48	12.0	*
Mumps	7	10	1.7	1	6	2.2	
Paratyphoid	1	1	0.2	1	4	0.5	
Pertussis	325	558	43.9	7	14	4.0	*** 1000
Rheumatic fever	7	11	1.8	5	12	2.1	
Rubella	0	2	1.0	1	2	1.3	
Salmonellosis	159	257	50.1	276	526	60.1	***
Shigellosis	15	26	3.8	17	35	3.7	
Tetanus	0	0	0.1	1	2	0.1	
Tuberculosis	36	61	12.0	40	76	10.8	
Typhoid	4	6	0.3	3	4	0.8	**
VTEC/STEC infection	7	10	1.7	9	10	1.4	
Yersiniosis	59	110	13.0	64	142	15.0	*

Notes: 1 No cases of the following notifiable diseases were reported in February: anthrax, brucellosis, cysticercosis, diphtheria, meningococcal disease - primary amoebic, plague, poliomyelitis, rabies, trichinosis, viral haemorrhagic fever, or yellow fever
 2 These data are provisional
 3 Rate is based on the cumulative total for the current year (12 months to February 2000) or the previous year (12 months to February 1999), expressed as cases per 100 000
 4 Cases with suspected common source, person in a high risk category (eg foodhandler, childcare worker, healthcare worker)
 5 Only acute cases of this disease are currently notifiable
 6 Surveillance data based on laboratory-reported cases only
 7 Percentage change is the difference between the number of cases in the current year (12 months to February 2000) and the previous year (12 months to February 1999). This difference is expressed as a percentage of the number of cases seen in the previous year

Surveillance data

Surveillance data by health district - February 2000

Cases this month Current rate¹

Disease	Cases for February 2000, ² and current rate ^{1,2} by health district ^{3,4}																							
	Northern				Midland						Central						Southern							
	Northland	NW Auck	Central Auck	South Auck	Waikato	Tauranga	Eastern BOP	Gisborne	Rotorua	Taupo	Taranaki	Ruapehu	Hawkes Bay	Wanganui	Manawatu	Wairarapa	Wellington	Hutt	Nelson-Marl	West Coast	Canterbury	South Cant	Otago	Southland
AIDS ³	1				0						2						0							
	1.3				0.4						1.5						0.3							
Acute gastroenteritis	0	0	2	4	2	1	0	0	0	0	0	0	0	0	0	0	4	0	0	0	20	1	0	0
	14.6	19.0	27.2	15.5	8.9	3.5	0	87.4	1.5	0	9.4	0	3.5	0	0	0	9.5	3.8	4.3	6.2	57.9	8.8	0.6	4.5
Campylobacteriosis	13	94	90	70	73	11	5	8	8	3	12	4	35	9	24	8	89	34	25	5	108	44	48	63
	127.7	242.0	264.6	185.0	264.7	130.3	79.5	150.8	164.3	130.3	162.8	125.4	284.3	159.6	133.6	210.6	329.8	244.3	164.6	151.1	305.2	384.7	248.4	235.4
Cholera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Creutzfeldt-Jakob disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptosporidiosis	0	1	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	3	2	0	0
	11.7	10.4	8.7	8.2	51.2	22.2	6.0	17.5	1.5	13.0	13.1	0	41.1	9.8	37.9	28.6	18.9	28.7	6.0	6.2	52.0	79.2	13.9	25.2
Dengue fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.3	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0
Giardiasis	3	31	33	8	17	4	0	2	0	1	2	0	11	3	3	1	18	8	0	0	14	2	3	1
	29.9	60.6	75.8	35.4	64.8	62.1	15.9	41.5	27.9	78.2	20.6	35.8	76.7	26.1	36.6	26.0	57.2	33.9	34.3	52.4	46.6	25.1	28.4	23.4
H influenzae type b disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.7	0.5	0.6	0.3	0	0.9	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0.8	0	0	0
Hepatitis A	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.2	2.8	5.8	6.1	0.3	0.9	2.0	6.6	3.1	0	0.9	0	2.1	1.6	1.3	0	4.1	0.8	1.7	0	0.8	1.3	1.2	0.9
Hepatitis B	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	4.4	0.5	2.3	3.2	5.6	2.7	0	4.4	3.1	3.3	0	6.0	6.3	1.6	0.7	0	1.6	4.5	1.7	0	4.1	6.3	1.2	1.8
Hepatitis C	1	1	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0
	3.6	0.5	1.2	0.6	0	16.0	4.0	0	13.9	0	0	0	4.9	0	1.3	0	1.6	0.8	0.9	6.2	8.3	6.3	2.9	0
Hydatids	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2.2	0	0	0	0	0	0	0	5.2	0.4	0	0	0	0	0	0.6	0
Influenza ⁵	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0
	1.5	18.3	29.2	35.4	31.1	0.9	33.8	10.9	4.6	3.3	10.3	0	6.3	13.0	3.3	10.4	10.7	0	18.0	9.3	62.3	22.6	15.1	8.1
Lead absorption	0	0	0	0	3	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	3	2	1	0
	2.9	0.5	2.0	0.3	7.6	0.9	2.0	4.4	4.6	0	4.7	0	8.4	0	6.0	7.8	4.1	0.8	1.7	12.3	9.6	17.6	2.3	0.9
Legionellosis ⁵	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
	0	0	1.2	0.3	7.3	0.9	2.0	0	0	3.3	1.9	6.0	1.4	1.6	0.7	10.4	1.6	3.8	0	0	4.7	0	1.2	0.9
Leprosy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.3	1.2	0	0	0	0	0	0	0	0.7	0	0.7	0	0	0.8	0	0	0	0	0	0	0
Leptospirosis	1	0	0	0	2	1	0	0	0	1	0	2	0	1	0	0	0	0	0	1	0	0	0	0
	8.0	0.5	0	0	3.6	1.8	0	4.4	1.5	3.3	4.7	0	6.3	3.3	3.3	0	0.4	0	1.7	6.2	1.0	5.0	0.6	0.9
Listeriosis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	0.7	1.3	1.4	0.6	0.3	0.9	0	0	1.5	0	0	0	0	0.7	0	0	0.8	0.9	0	0.8	1.3	0	0.9	
Malaria	0	0	1	2	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
	2.2	0.5	1.7	1.2	1.3	0	4.0	2.2	0	0	0	0.7	3.3	2.0	0	0.4	0.8	2.6	0	2.3	0	1.7	0	
Measles	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	2	0	0	2	0	1	1	0
	1.5	2.0	2.3	2.9	0.7	0.9	2.0	4.4	0	6.5	0	9.1	0	6.6	5.2	2.9	4.5	4.3	12.3	2.3	2.5	8.1	2.7	
Meningococcal disease	1	1	1	5	4	0	1	0	0	0	0	0	1	1	0	0	1	1	0	0	3	0	4	0
	27.7	10.4	20.8	32.5	13.2	13.3	25.9	13.1	24.8	22.8	5.6	6.0	12.5	9.8	1.3	10.4	4.9	12.1	1.7	0	9.8	2.5	13.3	16.2
Mumps	0	0	1	2	0	1	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0
	1.5	0	1.4	2.6	0	1.8	0	0	3.1	9.8	4.7	0	5.6	1.6	2.0	2.6	1.6	1.5	1.7	3.1	1.0	0	2.9	0.9
Paratyphoid	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.7	0.3	0	0.6	0.3	0	0	0	0	0	0	0	0	0	1.3	0	0.4	0	0	0	0.3	0	0	0
Pertussis	8	46	13	41	20	4	1	0	0	3	1	2	0	2	1	15	15	40	1	96	1	13	2	
	20.4	40.1	12.7	26.3	28.4	13.3	2.0	4.4	0	18.7	6.0	16.0	3.3	3.3	2.6	32.5	30.2	106.3	15.4	95.2	129.5	48.1	280.3	
Rheumatic fever	4	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	11.7	0	2.0	3.5	2.0	3.5	2.0	8.7	4.6	3.3	0.9	6.0	0.7	0	2.6	1.6	1.5	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.9	1.0	0.6	0.9	0	0.9	0	0	0	0	0	1.4	0	0.7	2.6	1.2	0	2.6	6.2	0.3	0	5.2	0.9	
Salmonellosis	2	12	10	13	12	6	2	1	5	0	0	0	3	0	10	12	7	5	6	1	25	11	10	6
	29.9	45.2	43.4	31.9	51.6	46.1	27.8	39.3	52.7	29.3	31.8	59.7	44.6	17.9	80.5	93.6	66.7	51.3	48.0	27.8	59.2	86.8	57.9	74.6
Shigellosis	0	2	2	1	1	0	1	1	0	4	0	0	0	0	0	1	1	0	0	0	0	1	0	0
	8.0	4.3	9.5	8.2	2.6	0.9	6.0	4.4	10.8	16.3	0.9	0	0	0	2.0	2.6	2.5	3.8	0	0	0.8	2.5	0.6	0.9
Tetanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2.2	0	0	0	0	0.7	0	0	2.6	0	0	0	0	0	0	0	0.6	0
Tuberculosis	1	7	5	9	2	1	0	0	1	0	0	0	0	0	0	2	3	0	0	3	0	1	1	1
	19.0	11.2	28.6	22.2	10.2	11.5	4.0	2.2	3.1	3.3	0	0	11.2	8.1	7.3	0	16.9	19.6	5.1	3.1	5.7	2.5	4.1	2.7
Typhoid	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.7	0.8	0.9	0.9	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VTEC/STEC infection	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
	0	0	0.9	0.3	9.6	3.5	0	2.2	1.5	3.3	1.9	0	0	0.7	0	2.1	1.5	0	0	2.6	0	1.7	0	
Yersiniosis	1	6	7	3	5	3	2	1	2	1	0	0	7	0	1	0	4	1	2	2	7	4	0	0
	8.0	12.9	18.5	14.0	13.2	8.0	9.9	10.9	13.9	13.0	6.6	0	18.1	3.3	4.7	2.6	16.9	18.9	6.9	33.9	17.1	27.7	1.2	6.3

Reinfection can be the major cause of recurrent tuberculosis

A study in an area of Cape Town, South Africa, with a high rate of tuberculosis (1000 cases per 100 000), found that reinfection with a second strain of *Mycobacterium tuberculosis* (exogenous reinfection), rather than reactivation of the primary infection (endogenous reactivation), was the major cause of recurrent tuberculosis. The study was conducted between 1992 and 1998, and included patients who had at least two episodes of postprimary pulmonary tuberculosis, with cultures from two episodes available for DNA fingerprinting and with cure as the outcome of the first episode. Sixteen patients were included in the study. For 12 of the 16 cases, restriction fragment length polymorphism analysis showed the isolates from the two episodes were different, indicating that reinfection was the cause of the recurrence (Van Rie A, Warren R, Richardson M, et al. Exogenous reinfection as a cause of

recurrent tuberculosis after curative treatment. *N Engl J Med* 1999; 341: 1174-9).

Editorial note: Before the availability of antituberculosis treatments, it was assumed that the recurrence of active tuberculosis in a person previously infected was usually due to reactivation rather than reinfection. In this era of effective treatment regimes, it is becoming apparent that reinfection may play a major role in recurrent tuberculosis. However, the relative roles of reinfection and reactivation probably vary depending on the prevalence of the disease. In areas of high prevalence most recurrent cases probably result from reinfection, whereas in areas of low prevalence reactivation may be the more likely cause. In 1999, 39 (8.6%) of the 451 cases of tuberculosis notified in New Zealand were recorded as 'reactivations'. These cases would include both reactivations and reinfections.

Little change in smoking trends among pregnant women in the United States

A study in the United States has found that the decline in smoking among pregnant women between 1987 to 1996 reflects the decline in smoking initiation among women of childbearing age, rather than an increase in quitting rates related to pregnancy. The smoking behaviours of pregnant women were compared with those of non-pregnant women 18-44 years old. Women were surveyed by telephone each year between 1987 and 1996. Among all the women interviewed, the proportion who had ever smoked decreased significantly ($P < 0.05$) from 44.1% in 1987 to 38.2% in 1996. The prevalence of current smoking decreased significantly among both pregnant women (16.3 to 11.8%) and non-pregnant women (26.7 to 23.6%). Throughout the 10 years, pregnant women were about half (54%) as likely as non-pregnant women to smoke. The median number of cigarettes smoked per day remained fairly stable for pregnant smokers (10), but decreased significantly for non-pregnant

smokers - from 19 in 1987 to 15 in 1996 (Ebrahim SH, Floyd RL, Merritt RK, et al. Trends in pregnancy-related smoking rates in the United States, 1987-96. *JAMA* 2000; 283: 361-6).

Editorial note: Exposure to tobacco during the prenatal period and to environmental tobacco smoke during the postnatal period are leading causes of mortality and morbidity among children. The fact that most smokers (54%) continued to smoke when they were pregnant highlights the need for further efforts to reduce the number of young women who begin smoking. While the overall prevalence of smoking in New Zealand has declined by 4 percentage points since 1985, there has been little decline in those younger than 35 years. A 1995-6 Plunket survey suggests that few women give up smoking during pregnancy. This survey reported that 26% of pregnant women (49% of pregnant Maori) smoked, compared with a 28.6% of all women 15-39 years (1996 Census).

Travel health

300 million cases of malaria a year

According to the World Health Organization (WHO), malaria is endemic in 100 countries or territories worldwide. Over the period 1982-97, an average of 25 million cases were reported to the WHO each year, with the large majority reported from Africa. The number of reported cases represents only a small proportion of the actual number of malaria cases. The WHO estimates that in 1998 there were almost 300 million cases of malaria, with over 1 million people dying from the disease. Almost 90% of these deaths occurred in Africa, south of the Sahara (Malaria, 1982-1997. *Wkly Epidemiol Rec* 1999; 74: 265-70).

Editorial note: Malaria is an important hazard for New Zealanders travelling to endemic areas. There were 46 cases notified in 1999, 21 of whom were New Zealanders travelling overseas on either business or holiday. These travellers most likely acquired their infections in Africa (6), Papua New Guinea (7), the Solomon Islands (2), India (2), and/or South East Asia (6). Based on the number of visits to these countries, the risk of acquiring malaria was highest for travel to Papua New Guinea and the Solomon Islands. Precautions against malaria are described in the Ministry of Health publication *Health advice for overseas travellers*. These precautions include malaria chemoprophylaxis and measures to avoid mosquito bites.

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