Science for Communities

NOTIFIABLE DISEASES IN NEW ZEALAND ANNUAL REPORT 2017

PREPARED FOR:	**Ministry of Health**
CLIENT REPORT No:	**FW18030**
PREPARED BY:	**Health Intelligence Team, Health and Environment Group** **Institute of Environmental Science and Research Limited**
PUBLISHED:	**27 March 2019**

This report is available at www.surv.esr.cri.nz

First published: 27 March 2019

Suggested citation:
The Institute of Environmental Science and Research Ltd.
Notifiable Diseases in New Zealand: Annual Report 2017
Porirua, New Zealand

ISSN: 1179-3058

Client Report FW18030

ACKNOWLEDGEMENTS

This report was prepared as part of a Ministry of Health contract for scientific services.

The report could not have been produced without the continued support of staff in the public health services in New Zealand who provide us with data from their regions.

The material presented in the report was prepared by the Health Intelligence Team and other staff from the Health and Environment Group at the Institute of Environmental Science and Research Ltd.

Disclaimer

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

This report provides a summary of the key trends in notifiable diseases for 2017.

In 2017, a total of 17,929 notifications were reported through New Zealand's notifiable disease database, EpiSurv, compared with 16,305 in 2016.

From 2016 to 2017, notifications of the following diseases increased significantly: cryptosporidiosis, hepatitis A, leptospirosis, meningococcal disease, mumps, pertussis, shigellosis, typhoid fever and verocytotoxin- or Shiga toxin-producing *Escherichia coli* (VTEC/STEC) infection (Table 1). Notifications of campylobacteriosis, chikungunya fever, acute gastroenteritis, listeriosis, measles and zika virus decreased significantly.

ENTERIC DISEASES

In 2017, 6482 cases (135.2 per 100,000) of campylobacteriosis were notified. This was a significant decrease compared with 7456 cases (158.9 per 100,000) in 2016. Campylobacteriosis remains the most commonly notified disease in New Zealand (36.2% of all notifications in 2017). A campylobacteriosis outbreak (involving 964 cases) in Hawke's Bay in August 2016 largely accounts for the high number of cases in 2016.

There were significant increases in cryptosporidiosis and VTEC/STEC notifications from 2016 to 2017. There were 1192 cases (24.9 per 100,000) of cryptosporidiosis notified in 2017 compared with 1062 in 2016 (22.6 per 100,000). However, the 2017 total is lower than the peak of 1348 cases notified in 2013. In 2017, 547 cases (11.4 per 100,000) of VTEC/STEC infection were notified, compared with 418 cases (8.9 per 100,000) in 2016. Notifications of VTEC/STEC infection have increased markedly since 2014 (187 cases, 4.1 per 100,000). Recent increases in cryptosporidiosis and VTEC/STEC notifications may be attributable to changes in laboratory testing methods and referral patterns.

In 2017, there was also a significant increase in notifications of shigellosis. There were 245 cases (5.1 per 100,000) of shigellosis notified in 2017, compared with 174 cases (3.7 per 100,000) in 2016. Over half of the cases (57.0%) had a history of overseas travel during the incubation period.

VACCINE-PREVENTABLE DISEASES

There was a significant increase in mumps notifications in 2017 (1337 cases, 27.9 per 100,000), compared with 2016 (20 cases, 0.4 per 100,000). This increase was due to a mumps outbreak which mostly affected people in Auckland.

There was also a significant increase in pertussis notifications in 2017 (2143 cases, 44.7 per 100,000), compared with 2016 (1093 cases, 23.3 per 100,000). A national pertussis outbreak was declared in November 2017. In 2017, 55.6% (1192/2143) of cases were laboratory-confirmed. The highest notification rate was for infants aged less than 1 year (213.0 per 100,000, 129 cases) and approximately 51% (66/129) of cases in this age group were hospitalised.

There were 15 confirmed cases (0.3 per 100,000) of measles in 2017, compared with 103 confirmed cases (2.2 per 100,000) in 2016. Immunisation status was known for nine (60.0%) cases, of which five (55.6%) were not immunised. In October 2017, New Zealand was verified by the World Health Organization (WHO) as having eliminated endemic measles (and rubella).

EXOTIC DISEASES

Notifications of dengue fever decreased between 2016 and 2017. In 2017, 161 cases (3.4 per 100,000) of dengue fever were notified, compared with 191 cases (4.1 per 100,000) in 2016. All cases had travelled overseas during the incubation period, Samoa (51 cases) and Fiji (30 cases) were the most commonly visited countries.

There were 11 cases (0.2 per 100,000) of Zika virus infection notified in 2017, a significant decrease from 2016 (100 cases, 2.1 per 100,000). All of the 11 cases of Zika virus infection had travelled overseas during the incubation period for the disease, with Fiji (7 cases) the most commonly visited country.

There was also a significant decrease in chikungunya fever notifications in 2017 (8 cases, 0.2 per 100,000), compared with 2016 (28 cases, 0.6 per 100,000). All cases had an overseas travel history which could account for their infection.

Table 1. Number of cases and rates per 100,000 population for selected notifiable diseases in New Zealand, 2016 and 2017

Disease	Number of notifications		Rate per 100,000		Change[d,e]
	2016	2017	2016	2017	
AIDS[a]	23	12	0.5	0.3	↓
Campylobacteriosis	7456	6482	158.9	135.2	⇓
Chikungunya fever	28	8	0.6	0.2	⇓
Cryptosporidiosis	1062	1192	22.6	24.9	⇑
Dengue fever	191	161	4.1	3.4	↓
Gastroenteritis (acute)[b]	510	325	10.9	6.8	⇓
Giardiasis	1616	1648	34.4	34.4	↑
Hepatitis A	35	58	0.7	1.2	⇑
Hepatitis B[c]	34	27	0.7	0.6	↓
Hepatitis C[c]	31	21	0.7	0.4	↓
Invasive pneumococcal disease	480	522	10.2	10.9	↑
Legionellosis	247	221	5.3	4.6	↓
Leptospirosis	85	142	1.8	3.0	⇑
Listeriosis	36	21	0.8	0.4	⇓
Malaria	26	42	0.6	0.9	↑
Measles	103	15	2.2	0.3	⇓
Meningococcal disease	75	112	1.6	2.3	⇑
Mumps	20	1337	0.4	27.9	⇑
Paratyphoid fever	32	47	0.7	1.0	↑
Pertussis	1093	2143	23.3	44.7	⇑
Rheumatic fever[f]	136	156	2.9	3.3	↑
Salmonellosis	1091	1119	23.2	23.3	↑
Shigellosis	174	245	3.7	5.1	⇑
Tuberculosis disease	294	314	6.3	6.6	↑
Typhoid fever	38	60	0.8	1.3	⇑
VTEC/STEC infection	418	547	8.9	11.4	⇑
Yersiniosis	858	918	18.3	19.2	↑
Zika virus	100	11	2.1	0.2	⇓

[a] Data source: AIDS Epidemiology Group (B Lee, personal communication, 12 April 2018).

[b] Cases of acute gastroenteritis from a common source or person in a high risk category (eg food handler or childcare worker) or foodborne intoxication, eg, staphylococcal intoxication.

[c] Only acute cases of this disease are notifiable.

[d] ⇓= significant decrease, ⇑ = significant increase, NC = no change, ↓ = non-significant decrease, ↑ = non-significant increase.

[e] Fisher's exact tests were used to determine statistical significance. Results are considered statistically significant when the *P* value is less than or equal to 0.05.

[f] Includes rheumatic fever initial attack and recurrent cases.

INTRODUCTION

The *Notifiable Diseases in New Zealand: Annual Report 2017* gives an overview of the current state of notifiable diseases in New Zealand. The report includes diseases currently notifiable under the Health Act 1956.

The data presented has been derived from surveillance systems operated by the Institute of Environmental Science and Research Ltd (ESR) and from other organisations in New Zealand.

Surveillance is "the ongoing systematic collection, analysis and interpretation of outcome-specific data for use in the planning, implementation and evaluation of public health practice".[1] A surveillance system "includes the functional capacity for data collection and analysis, as well as the timely dissemination of information derived from these data to enable effective prevention and control activities".[2]

Surveillance provides *information for action*. Specific objectives for disease surveillance may include the following:[3]

- to identify cases of disease that require immediate public health control measures
- to monitor disease incidence and distribution, and to alert health workers to changes in disease activity in their area
- to identify outbreaks and support their effective management
- to assess the impact of disease and help set priorities for prevention and control activities
- to identify risk factors for diseases so as to support their effective management
- to evaluate prevention and control activities
- to identify and predict emerging hazards
- to monitor changes in disease agents through laboratory testing
- to generate and evaluate hypotheses about disease aetiology
- to fulfil statutory and international reporting requirements.

Details about the individual surveillance systems are provided in the 'Surveillance Methods' section of this report.

The focus of this report is on diseases reported in 2017, with the aim of providing information for prevention and control measures. The report presents each notifiable disease, or disease grouping, in alphabetical order.

National data and trends over time are shown in summary tables in the Appendix. Data is also presented for specific population groups including by district health board (DHB), sex, age group and ethnic group.

Information on influenza-like illness, outbreaks and sexually transmitted infections can be found in separate annual reports at www.surv.esr.cri.nz

SURVEILLANCE METHODS

INTERPRETING DATA

Data in this report is presented by the date the case was reported to a public health unit (PHU) and not by the date of the onset of illness. In general, cases are allocated to geographic location based on where a medical practitioner first diagnosed them.

Notifiable disease data in this report may differ from that published in other reports depending on:

- the date of data extraction from EpiSurv
- the date used to aggregate data (eg, the date reported or date of onset of illness)
- whether laboratory-reported cases, notified cases or self-reported cases are used
- whether the case has been confirmed by laboratory tests.

The information in this report shows disease trends by age group, sex, ethnic group and location (usually a DHB region).

It should be noted that various factors influence disease notification and therefore the calculation of incidence rates. Where the illness is not severe, cases are less likely to consult a medical practitioner and, even if diagnosed, are less likely to be notified without laboratory confirmation.[4] Issues associated with the cost of healthcare may also determine whether people visit healthcare providers for diagnosis.[5]

The extent to which the data reflects the true incidence of a disease is affected by public awareness of the disease, access to health services, use of diagnostic facilities, case definitions and the interest, resources and priorities of local healthcare services.

This report presents the number of cases and population rates for different ethnic groups. However, caution should be exercised in the interpretation of these numbers as ethnicity information is not always provided, different ethnic groups have different patterns of access to healthcare and the numbers may not accurately reflect the true burden of disease in the population.

For different ethnic groups, numbers and disease 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 (including New Zealander) ethnic groups.

The small New Zealand population and the low number of cases for some diseases mean that the disease rates calculated in this report may be highly variable from year to year. As such, it is necessary to interpret trends with caution. The ‘Analytical Methods’ section contains more information about the calculation of population rates for diseases.

DATA SOURCES

The key sources of data used in this report are described below.

EpiSurv - the national notifiable disease surveillance system

Under the Health Act 1956, health professionals are required to inform their local medical officer of health of any notifiable disease that they suspect or diagnose. Since December 2007, laboratories have also been required to report notifiable diseases to medical officers of health. These notifications provide the basis for surveillance, and therefore control, of these diseases in New Zealand.

Notification data is entered at each PHU via a secure web-based portal into a database (EpiSurv). ESR collates and analyses the near real-time data on behalf of the Ministry of Health. The data collected depends on the specific disease, but usually includes demography, outcome, basis of diagnosis, risk factors and some clinical management information. The current schedule of notifiable diseases is available at www.health.govt.nz/our-work/diseases-and-conditions/notifiable-deseases.

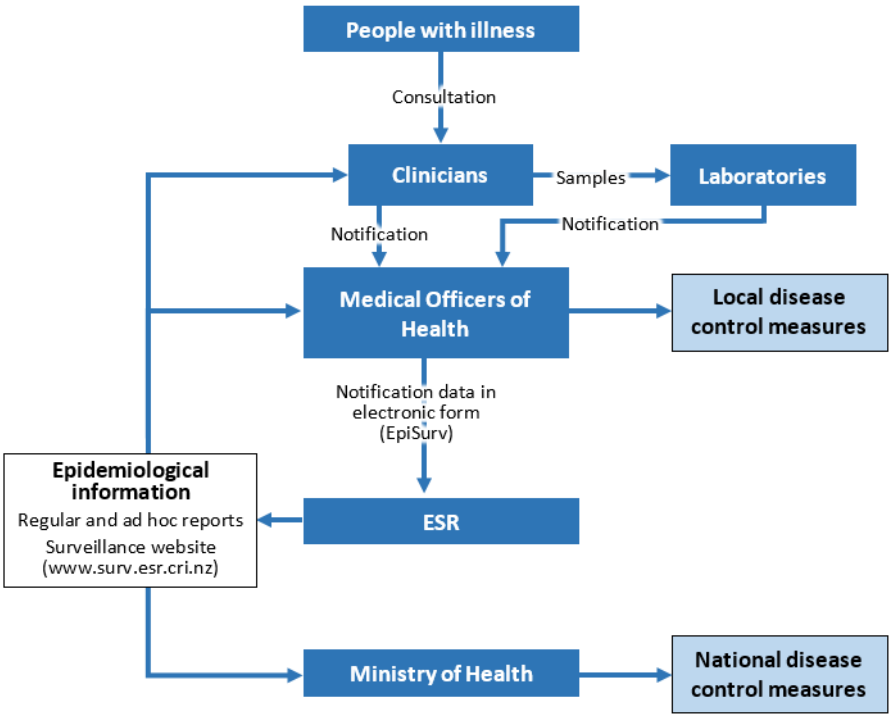
This report includes sections on all the diseases that are currently notifiable in New Zealand under the Health Act 1956, excluding lead absorption, chemical poisoning from the environment and hazardous substances. Massey University's Centre for Public Health Research is responsible for the collection and reporting of surveillance data on these three conditions.

Case definitions (including laboratory and clinical criteria) for notification of diseases and/or conditions are in the latest version of the Communicable Disease Control Manual.[6]

Information on trigger points for notification of a laboratory test result is in the 'Direct Laboratory Notification of Communicable Diseases: National Guidelines'.[7]

Figure 1 illustrates the major components and information flow of the notifiable disease surveillance system.

Figure 1. Notifiable disease surveillance system



Laboratory-based surveillance

Laboratory results for all organisms that meet the laboratory criteria for notification are reported directly to medical officers of health. Laboratory reported cases may however not meet the clinical criteria of the case definition. For this reason, the number of laboratory-reported cases may not match the number of notified cases for some diseases.

Laboratory-based surveillance may be conducted to enhance data gathered by notifiable disease surveillance. Organisms under laboratory-based surveillance include *Legionella* spp., *Leptospira*, *Neisseria meningitidis*, *Salmonella* spp. and invasive *Streptococcus pneumoniae*. For these organisms, isolates are referred to a reference laboratory for confirmation and typing.

Statistics New Zealand

Statistics New Zealand provides the denominator data used to calculate the population rates of disease. Further details are provided in the 'Analytical Methods' section.

Ministry of Health

The Ministry of Health collates national data on patients discharged from publicly funded hospitals. This data is stored as part of the National Minimum Dataset (NMDS) (see www.health.govt.nz for more information). Upon discharge, patients are assigned disease codes using the 10th revision of the International Classification of Diseases (ICD10) coding system.[8] Information provided in this report uses the principal or primary diagnosis, which is the condition that was chiefly responsible for the hospital admission. This may be different from the diagnoses for the patient on admission, while in hospital, or from the final diagnosis after discharge.

Anonymised data for selected diseases was extracted from the NMDS and sent to ESR for analysis and comparison with data from other surveillance systems.

Hospital discharge data presented in this report includes multiple records for patients with chronic notifiable diseases (eg, tuberculosis), for diseases that have long-term health impacts (eg, meningococcal disease) and may include re-admissions for acute diseases (eg, pertussis). For some diseases, the criteria for notification (clinical and laboratory or epidemiological evidence) do not match those required for diagnostic coding. For these reasons, hospitalisation and notification numbers may differ.

Surveillance of AIDS in New Zealand

Since 1989, the AIDS Epidemiology Group (AEG) at the University of Otago has been contracted to collect information about people diagnosed with AIDS through notification to medical officers of health. The use of an AIDS-specific identifier ensures that the identity of the patient is known only to the reporting doctor, but is sufficiently specific to allow detection of duplicate reports.

New Zealand Creutzfeldt-Jakob Disease Registry

The New Zealand Creutzfeldt-Jakob disease (CJD) Registry (the Registry), at the University of Otago was established in 1996 to monitor sporadic, familial, iatrogenic and variant CJD. A medical practitioner must immediately report any suspected cases of CJD directly to the Registry as well as inform the local Medical Officer of Health and the Director of Public Health at the Ministry of Health.[6]

New Zealand Paediatric Surveillance Unit

The New Zealand Paediatric Surveillance Unit (NZPSU) [9] was established in 1997 to provide active surveillance of acute flaccid paralysis (AFP) to fulfil World Health Organization (WHO) requirements for the certification of polio eradication. Since then, other conditions have been added for surveillance by the NZPSU. Conditions currently under surveillance include haemolytic uraemic syndrome (HUS),

congenital rubella syndrome (CRS) and perinatal exposure to human immunodeficiency virus (HIV) (see http://www.otago.ac.nz/nzpsu for a complete list).

Every month, participating paediatricians and other specialists in paediatric practice send a reply-paid card to the NZPSU on which they indicate whether they have seen any cases of the conditions under surveillance in the previous month. The average response rate to the monthly card/email is generally above 90%. The NZPSU then collates and analyses the data. Information from the NZPSU is used in this report to enhance notification data on polio (AFP data), VTEC/STEC infection (HUS data) and rubella (CRS data).

ANALYTICAL METHODS

Key analytical methods are provided below.

Dates

The notification data contained in this report is based on information recorded on EpiSurv as at 22 February 2018. Changes made to EpiSurv data by PHU staff after this date are largely not reflected in this report. Consequently, future analyses of data may produce revised results. Notification data published in previous annual reports has been updated to reflect cases in EpiSurv as at 22 February 2018.

Disease numbers are reported according to the date of notification. Laboratory results are reported according to the date the specimen was received.

Geographic breakdown

This report provides rates for current DHB regions. The DHB populations used are shown in Table 2. These are from the Statistics New Zealand 2017 mid-year population estimates.

Table 2. District Health Board populations, 2017

DHB	Population
Northland	175,400
Waitemata	606,000
Auckland	523,500
Counties Manukau	546,600
Waikato	408,800
Lakes	108,500
Bay of Plenty	231,900
Tairawhiti	48,500
Taranaki	118,100
Hawke's Bay	163,900
Whanganui	64,100
MidCentral	176,600
Hutt Valley	147,900
Capital & Coast	312,700
Wairarapa	44,500
Nelson Marlborough	148,800
West Coast	32,500
Canterbury	551,400
South Canterbury	59,600
Southern	324,300
Total	**4,793,600**

Map classification scheme

On the maps provided in this report, the darkest colour represents the highest disease notification rates and the lightest colour represents the lowest rates. The speckled colour shows where there was insufficient data (fewer than five cases) to calculate a rate.

Case status for notifications

All notifications recorded in EpiSurv that meet the case definitions [6], apart from cases classified as ‘not a case’, are included for analysis in this report. In some instances, the investigation of a case may not be complete and the status may be set to ‘under investigation’. These cases are included in this report. Any changes will be reflected in future surveillance reports.

Population rate calculations for diseases

The denominator data used to determine disease rates (except the data used to determine disease rates for ethnic groups) has been derived from the 2017 mid-year population estimates published by Statistics New Zealand. Denominator data used to determine disease rates for ethnic groups is based on the proportion of people in each ethnic group from the 2013 Census ‘usually resident population’ applied to the 2017 mid-year population estimates from Statistics New Zealand. Ethnicity is prioritised in the following order: Māori, Pacific peoples, Asian, MELAA, European or Other (including New Zealander) ethnic groups.

Rates are not calculated where a category has fewer than five notified cases. Calculating population rates from fewer than five cases produces unstable rates.

Percentages

Percentages are calculated using the total number of cases for which the information was known as the denominator, unless specified otherwise. Cases with ‘unknown’ information are excluded from the denominator. These percentages are usually presented with numbers in brackets that show the numerator and denominator used, eg, 49.3% (523/1061).

Risk factors and sources of infection

For many diseases, an analysis of exposure to risk factors for the cases is reported. These risk factors are those included in the current EpiSurv case report forms. More than one risk factor is often reported for each case. The reporting of exposure to a risk factor does not mean that this was the source of the infection.

Immunisation data

Data on immunisation is reported for a number of vaccine-preventable diseases. This represents the vaccination status of the case as reported in EpiSurv and has not been routinely validated against the National Immunisation Register.

Statistical tests

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

LIMITATIONS OF SURVEILLANCE DATA

Quality

Quality assurance in the collection and reporting of notifiable disease data in EpiSurv is supported by validation at the time of data entry (e.g. automated fields), regular (weekly, monthly, quarterly, annually) data quality reports run by ESR on key reporting fields, liaison with PHUs, and the epidemiological skills development programme. A data quality report was last published in 2016.[10]

Sensitivity

Sensitivity is a measure of our ability to identify the true burden of disease. Sensitivity was last assessed in 2003 using reporting on meningococcal disease.[11] This showed that the sensitivity of meningococcal disease surveillance is probably in excess of 87%. The sensitivity of surveillance for other diseases will often be less than for meningococcal disease, particularly for common enteric diseases where only a small proportion of those infected present to healthcare services. An acute gastrointestinal illness study conducted during 2005–2007 estimated that only 0.4% of community cases result in a notification.[12]

The introduction of new diagnostic methods can alter our ability to detect notifiable diseases over time. For example, diagnostic tests for enteric disease can now screen for multiple disease agents at the same time and increase their detection. Changes in test sensitivity should be considered when interpreting disease trends.

Completeness

The completeness of data recorded in EpiSurv varies among diseases. Table 3 shows the percentage of notifications for which complete data was provided for selected demographic variables from 2008 to 2017.

The completeness of date of birth, age and sex data is generally very high (>98%), with little variation over the last five years. In 2017, the completeness of date of birth, age and sex data remained high (≥99%). The completeness of ethnicity data in 2017 (96.0%) was similar to that of 2016 (96.2%).

The National Health Index (NHI) provides a unique identifier for all healthcare users and is an important link between notifiable disease, immunisation and laboratory records. Significant progress over recent years has meant a high percentage of EpiSurv records (>97% over the last five years) now record an NHI identifier. In 2017, 98.7% of notifications had NHI recorded. Laboratory reporting of notifiable diseases has improved the completion of NHI for notification records, but ethnicity is not always provided with laboratory-reported notifications. For this reason, about 20% of notifications now have ethnicity derived from the NHI database rather than directly from the EpiSurv record.

Table 3. Complete data for selected EpiSurv variables, 2008–2017

Report year	Completeness of data (%)				
	Date of birth	Age	Sex	Ethnicity	NHI
2008	99.3	99.5	99.8	70.2	84.1
2009	99.2	99.3	98.8	92.1	91.0
2010	99.7	99.8	99.5	91.5	94.9
2011	99.6	99.7	99.0	95.7	94.6
2012	99.7	99.8	100.0	95.9	96.8
2013	99.7	99.8	100.0	95.3	97.5
2014	99.8	99.9	100.0	94.6	97.0
2015	99.8	99.8	100.0	94.9	97.7
2016	99.9	100.0	100.0	96.2	98.4
2017	99.9	99.9	100.0	96.0	98.7

Accuracy

A limitation to accuracy is the identification of cases on the basis of serology, which may not be as specific as isolating the implicated organism or detecting it using polymerase chain reaction (PCR).

Timeliness

Timely receipt of information is essential for appropriate public health investigation and action.

Table 4 shows a summary of the timeliness of notifications by disease for 2017.

In 2017, 69.8% of disease notifications had an onset date recorded (compared with 69.5% in 2016). Of these, 48.9% were reported to a public health service (PHS) within one week of the onset of symptoms and 75.6% were reported within two weeks of the onset of symptoms.

For some diseases, reporting delays are related to the nature of the symptoms leading to late presentation (eg, giardiasis, pertussis, tuberculosis disease). For other diseases there may be delays in confirmation of the diagnosis due to the particular laboratory test required (eg, leptospirosis).

In 2017, 83.6% (86.7% in 2016) of the notifications were entered into EpiSurv within a day of being reported to a PHS, 99.4% were entered within one week and 99.7% were entered within two weeks.

Table 4. Timeliness of disease reporting and data entry for notifiable diseases, 2017

Disease	Onset date recorded (%)	Reporting delay (%)[a]		Entry delay (%)[b]		
		≤1 week	≤2 weeks	≤1 day	≤1 week	≤2 weeks
Campylobacteriosis	55.8	60.0	91.3	80.7	99.8	100.0
Chikungunya fever	100.0	-	37.5	100.0	100.0	100.0
Cryptosporidiosis	77.2	44.5	82.2	81.2	99.9	100.0
Dengue fever	96.9	39.7	80.8	91.3	100.0	100.0
Gastroenteritis[c]	73.9	81.1	91.6	75.8	87.6	91.6
Giardiasis	53.0	20.6	46.6	83.6	99.8	100.0
Hepatitis A	93.1	40.7	75.9	86.2	100.0	100.0
Invasive pneumococcal disease	75.5	68.3	89.6	85.1	99.0	99.2
Legionellosis	89.1	35.5	68.5	82.8	99.5	100.0
Leptospirosis	93.0	25.0	55.3	82.4	100.0	100.0
Measles	100.0	93.3	93.3	80.0	100.0	100.0
Meningococcal disease	97.3	93.6	98.2	92.9	100.0	100.0
Pertussis	93.7	23.1	46.5	88.7	99.8	100.0
Rheumatic fever - initial attack	98.7	28.6	49.4	91.7	99.4	100.0
Salmonellosis	81.4	52.5	84.9	81.4	99.8	100.0
Shigellosis	92.2	34.5	77.4	85.7	99.6	100.0
Tuberculosis disease	64.6	4.9	8.9	92.4	99.7	99.7
Typhoid fever	98.3	44.1	76.3	93.3	100.0	100.0
VTEC/STEC infection	92.0	50.3	78.3	80.6	99.8	100.0
Yersiniosis	55.6	24.5	63.5	83.0	99.7	100.0
Zika virus	100.0	-	54.5	81.8	100.0	100.0
Other	77.9	85.2	94.2	89.2	98.5	98.9
Total	**69.8**	**48.9**	**75.6**	**83.6**	**99.4**	**99.7**

[a] Percentage of notifications reported (with onset date recorded) to a public health service within 1 week and 2 weeks of the onset of symptoms.

[b] Percentage of notifications entered into EpiSurv within 1 day, 1 week and 2 weeks of being reported to a PHS.

[c] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

NOTIFIABLE DISEASES

Acquired immunodeficiency syndrome

Acquired immunodeficiency syndrome (AIDS) is a notifiable disease in New Zealand. The AIDS Epidemiology Group (AEG) within the University of Otago carries out national AIDS/HIV surveillance. More detailed information is available from the AEG website: http://dnmeds.otago.ac.nz/departments/psm/research/aids/newsletters.html.

In 2017, 12 cases of AIDS were reported to the AEG compared with 23 cases in 2016.

The 2017 AIDS notification rate (0.3 per 100,000 population) was slightly lower than the 2016 rate (0.5 per 100,000 population).

The cases ranged from ages 21 to 67 years, with a mean age of 40.7 years.

Eleven cases were male and one was female.

Seven cases were of European ethnicity, three Asian, one Māori and one Pacific.

Seven cases (58.3%) were men who had sex with other men (MSM), two men (16.7%) were infected by either sex with another man or injecting drug use, one case (8.3%) was infected heterosexually, one case had been infected perinatally (8.3%), and for one case (8.3%) the means of transmission was not reported.

Anthrax

No cases of anthrax were notified in 2017. The last case was notified in 1940. New Zealand has been considered free of anthrax since the last recorded outbreak among domestic livestock in 1954.[13]

Arboviral diseases

This section includes arboviral diseases with cases notified since 1997. Dengue fever and yellow fever are reported in separate sections later in the report.

Barmah Forest virus infection

No cases of Barmah Forest virus infection were notified in 2017. Six cases have been notified since 1997, most recently two cases in 2009, all with a history of travel to Australia.

Chikungunya fever

In 2017, eight cases of Chikungunya fever were notified compared with 28 cases in 2016. The 2017 notification rate (0.2 per 100,000) was significantly lower than the 2016 rate (0.6 per 100,000). All cases were laboratory-confirmed.

The cases were aged 40–49 (3 cases), 30–39 (2 cases), 1–4, 5–9 and 20–29 (1 case each) years. Five cases were male and three were female. Four cases were of European or Other ethnicity, three were Asian and one MELAA.

Hospitalisation status was recorded for all cases, of which three (37.5%) were hospitalised.

All eight cases had travelled overseas during the incubation period for the disease or had a prior travel history that could account for their infection. The countries visited or lived in were Bangladesh and Fiji (2 cases each), China, Guatemala, Indonesia, Malaysia and Samoa (1 case each). Some cases reported travel to more than one country.

Japanese encephalitis

No cases of Japanese encephalitis were notified in 2017. Since 1997, only one case of Japanese encephalitis has been notified (in 2004), and was overseas during the incubation period for the disease.

Ross River virus infection

Seven cases of Ross River virus infection were notified in 2017 compared with four cases in 2016. One case was laboratory-confirmed.

The cases were aged 40–49 (4 cases), 30–39, 50–59 years and 70 years and over (1 case each). Four cases were female and three were male. Six cases were of European or Other ethnicity and one was Māori.

One case was hospitalised.

Six cases had been in Australia and one case in Samoa during the incubation period for the disease.

Zika virus infection

In 2017, 11 cases of Zika virus infection were notified compared with 100 cases in 2016. The 2017 notification rate (0.2 per 100,000) was a significant decrease from the 2016 rate (2.1 per 100,000). Nine cases were laboratory-confirmed.

The cases were aged 50–59 (3 cases), 30–39, 40–49 (2 cases each), 10–14, 20–29, 60–69 years and 70 years and over (1 case each). Seven cases were female (none of whom were pregnant) and four were male. Nine cases were of European or Other ethnicity, one was Asian and one Pacific.

None of the cases were hospitalised.

All cases had travelled overseas during the incubation period for the disease. The countries visited or lived in were Fiji (7 cases), Cambodia, Philippines, Thailand, Vietnam, Singapore and Sri Lanka (1 case each). Some cases reported travel to more than one country.

Botulism

No cases of botulism were notified in 2017. The most recent case of botulism was notified in 2014. Prior to that, two cases were reported in 1985.[14]

Brucellosis

One case of brucellosis was notified in 2017. The laboratory-confirmed case was a female aged 70 years and over who had recently arrived from Syria. Since 1997, 16 cases of brucellosis have been notified. There has been no evidence of locally acquired brucellosis in humans since New Zealand's declaration of freedom from bovine brucellosis in 1996.[15]

Campylobacteriosis

In 2017, 6482 cases of campylobacteriosis were notified, compared with 7456 cases in 2016. The 2017 rate of 135.2 per 100,000 was significantly lower than the 2016 rate of 158.9 per 100,000. Campylobacteriosis is the most commonly notified disease, accounting for 36.2% of all notifications in 2017. Since 2008, the annual number of campylobacteriosis cases reported has been much lower than in the preceding decade (Figure 2).

Figure 3 shows campylobacteriosis notifications by month since 2013. There is a distinct seasonal pattern, with an early summer peak and a winter trough. However, this trend was disrupted in 2016, due to a large outbreak in Hawke's Bay in August (964 cases were linked to the outbreak). The second peak in 2016 is due to some cases with an onset date in August/September being reported late.

Figure 2. Campylobacteriosis notifications by year, 1998–2017

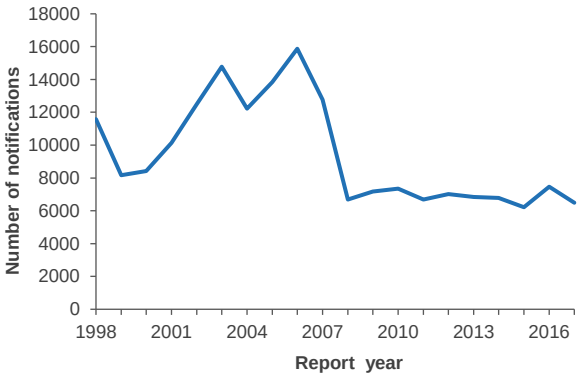
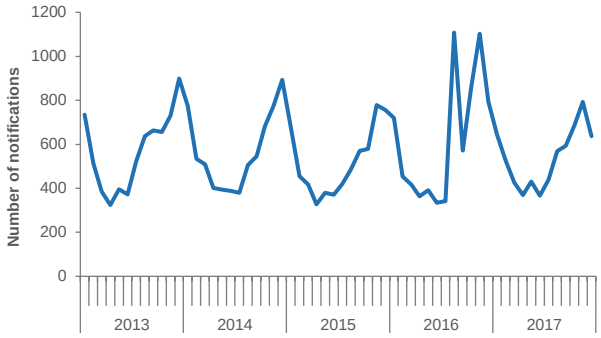
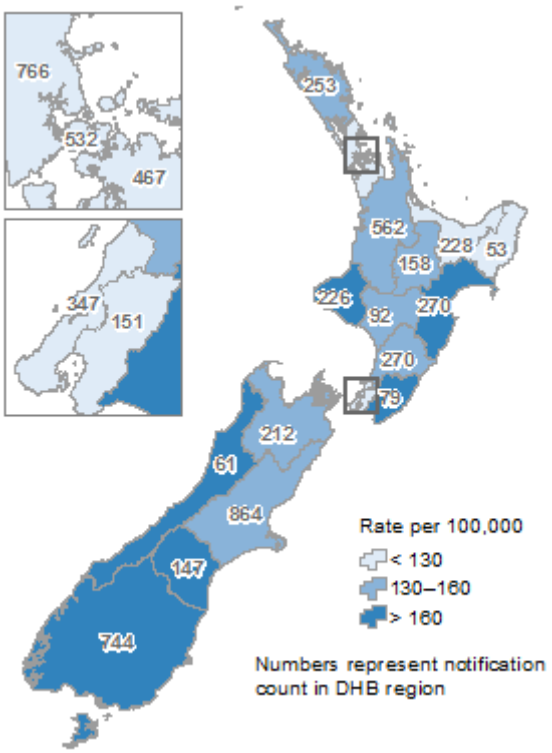


Figure 3. Campylobacteriosis notifications by month, January 2013–December 2017



The highest notification rates for campylobacteriosis were reported from South Canterbury, Southern and Taranaki DHBs (246.6, 229.4 and 191.4 per 100,000 respectively) (Figure 4).

Figure 4. Campylobacteriosis notifications by DHB, 2017



Children aged 1–4 years (257.9 per 100,000) and infants less than 1 year (241.0 per 100,000) had the highest notification rates.

Sex was recorded for all cases. Males (151.9 per 100,000) had a higher rate than females (119.0 per 100,000).

Ethnicity was recorded for 6111 (94.3%) cases. The ethnic group with the highest notification rate for campylobacteriosis was European and Other (158.1 per 100,000), followed by MELAA (117.7 per 100,000) and Māori (74.1 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 4034 (62.2%) cases, of which 510 (12.6%) cases were hospitalised.

Consumption of food from retail premises and contact with farm animals were the most common risk factors for campylobacteriosis (Table 5). Multiple risk factors are often reported for each case.

In 2017, seven outbreaks of campylobacteriosis were reported, involving 31 cases.

Cholera

No cases of cholera were notified in 2017. Since 1997, a total of 12 laboratory-confirmed cases of cholera have been notified, with the last two cases reported in 2010. All 12 cases were acquired while overseas.

Creutzfeldt-Jakob disease

The National Creutzfeldt-Jakob Disease (CJD) Registry is responsible for receiving notifications of suspected cases of CJD, undertaking a review of each notified case, and providing advice and reporting on CJD in New Zealand. This section is based on the 21st annual report of the Registry (1 January 2017 to 31 December 2017).[16]

In 2017, 16 cases of suspected sporadic CJD (sCJD) were referred to the New Zealand CJD Registry for evaluation. These cases were subsequently classified as six definite cases, seven probable cases, two cases that did not met surveillance criteria for possible CJD, and one late notification which was not able to be classified. This equates to a rate of 2.72 (probable and definite notifications) per million population per year (95% exact Poisson confidence interval (1.45, 4.65)).

The 13 definite and probable cases were aged 50–59 (2 cases), 60–69 (6 cases), and 70 years and over (5 cases).

Ten cases were male and three were female.

Since 1997, the Registry has documented 103 cases of sCJD, including 48 definite and 55 probable.

No cases of variant CJD, the form linked with bovine spongiform encephalopathy, have been identified in New Zealand to date.

Cronobacter species invasive disease

Cronobacter species invasive disease (previously known as *Enterobacter sakazakii*) has been notifiable in New Zealand since mid-2005. There were two cases of *Cronobacter* species invasive disease notified in 2017. A total of 10 cases of *Cronobacter* species invasive disease have been reported since the disease became notifiable, none of these were in neonates or infants.

The two cases reported in 2017 were a female aged 80–89 years and a male aged 60–69 years. The cases were from Bay of Plenty and Tairawhiti DHBs. No source of infection was confirmed for either case.

Table 5. Exposure to risk factors associated with campylobacteriosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Consumed food from retail premises	1016	1192	4274	46.0
Contact with farm animals	1004	1431	4047	41.2
Consumed untreated water	589	1588	4305	27.1
Recreational water contact	427	1970	4085	17.8
Contact with faecal matter	341	1904	4237	15.2
Contact with other symptomatic people	268	1900	4314	12.4
Travelled overseas during the incubation period	271	2808	3403	8.8
Contact with sick animals	171	1955	4356	8.0

[a] Percentage refers to the number of cases who answered “yes” out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Cryptosporidiosis

In 2017, 1192 cases of cryptosporidiosis were notified, compared with 1062 in 2016 (Figure 5). The 2017 notification rate (24.9 per 100,000) was significantly higher than the 2016 rate (22.6 per 100,000).

Figure 5. Cryptosporidiosis notifications by year, 1998–2017

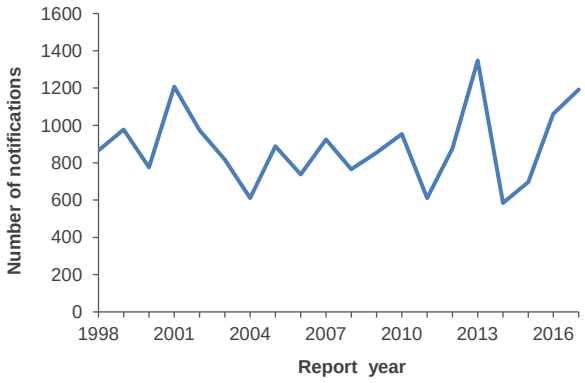
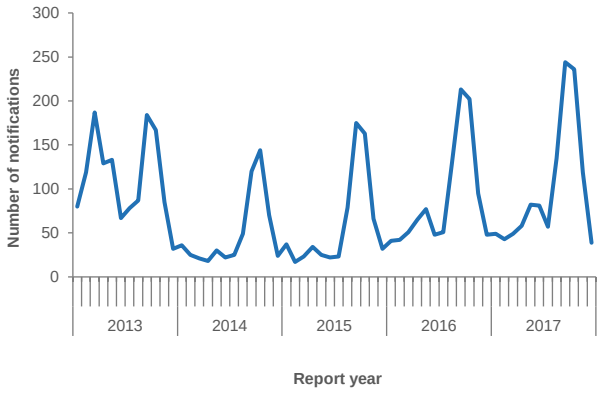


Figure 6 shows cryptosporidiosis cases by month since 2013. There is a distinct seasonal pattern, with the highest number of notifications generally reported during spring each year.

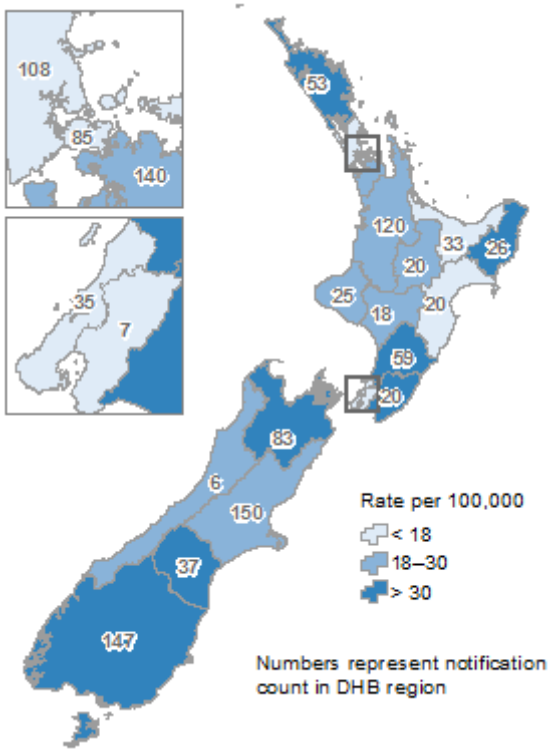
Figure 6. Cryptosporidiosis notifications by month, January 2013–December 2017



In 2017, the highest notification rates for cryptosporidiosis were reported from South Canterbury, Nelson Marlborough and Tairawhiti DHBs (62.1, 55.8 and 53.6 per 100,000 respectively) (Figure 7).

Children aged 1–4 years (130.0 per 100,000) and 5–9 years (45.7 per 100,000) had the highest notification rates. Nearly half (46.8%) of all cases were children aged less than 15 years.

Figure 7. Cryptosporidiosis notifications by DHB, 2017



Females (25.9 per 100,000) had a slightly higher notification rate than males (23.8 per 100,000).

Ethnicity was recorded for 1139 (95.6%) cases. The ethnic group with highest notification rate for cryptosporidiosis was European or Other (28.2 per 100,000), followed by MELAA (22.4 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 1024 cases (85.9%), of which 66 (6.4%) cases were hospitalised.

Contact with farm animals and consumption of untreated water were the most common risk factors associated with cryptosporidiosis cases in 2017 (Table 6).

In 2017, 27 outbreaks of cryptosporidiosis were reported, involving 184 cases.

Cysticercosis

No cases of cysticercosis were notified in 2017. Since 1997, eight cases have been notified.

Table 6. Exposure to risk factors associated with cryptosporidiosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Contact with farm animals	429	364	399	54.1
Consumed untreated water	225	498	469	31.1
Recreational water contact	219	572	401	27.7
Consumed food from retail premises	148	494	550	23.1
Contact with sick animals	159	539	494	22.8
Contact with faecal matter	155	542	495	22.2
Contact with other asymptomatic people	153	606	433	20.2
Travelled overseas during the incubation period	92	822	278	10.1

[a] Percentage refers to the number of cases who answered "yes" out of the total number of cases for which this information was known. Some cases have more than one risk factor recorded.

Decompression sickness

No cases of decompression sickness were notified in 2017.

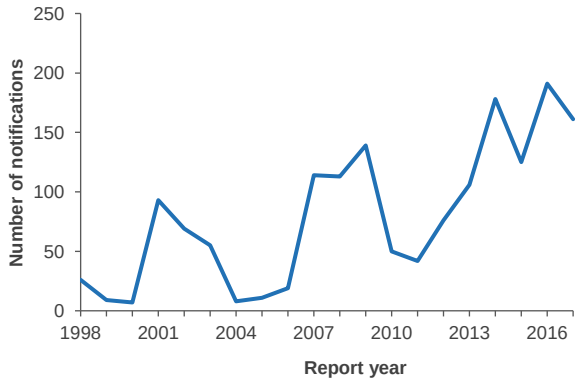
Ministry of Health hospital discharge data for 2017 included 25 hospitalisations where decompression sickness was the primary diagnosis.

Over the last five years the number of hospitalisations with decompression sickness as the principal diagnosis has ranged from 17 to 42 annually, compared with less than three notifications in EpiSurv per year, indicating consistent under-notification of this condition.

Dengue fever

In 2017, 161 cases of dengue fever were notified, compared with 191 cases in 2016 (Figure 8). The 2017 notification rate (3.4 per 100,000) was lower than the 2016 rate (4.1 per 100,000). Of the 161 cases, 158 (98.1%) were laboratory-confirmed.

Figure 8. Dengue fever notifications by year, 1998–2017



Adults aged 30–39 years (5.5 per 100,000) had the highest rate followed by those aged 50–59 years (4.5 per 100,000).

Males (3.7 per 100,000) had a similar rate to females (3.0 per 100,000).

Ethnicity was recorded for 156 (96.9%) cases. The ethnic group with the highest rate was Pacific peoples (20.4 per 100,000), followed by Asian (5.3 per 100,000) and European or Other (1.9 per 100,000).

Hospitalisation status was recorded for 154 (95.7%) cases, of which 90 (58.4%) were hospitalised.

All of the cases had travelled overseas during the incubation period for the disease. The countries most commonly visited or lived in were Samoa (51 cases), Fiji (30 cases), Thailand (17 cases) and India (16 cases). Some cases reported travel to more than one country.

Diphtheria

One confirmed case of cutaneous toxigenic diphtheria was notified in 2017. The case was aged 70 years and over and from Auckland DHB.

The last case of toxigenic respiratory diphtheria was reported in 1998.[17]

In 2017, the Special Bacteriology Laboratory at ESR received 61 isolates of *Corynebacterium diphtheriae* for toxin testing. The majority (56 isolates, 91.8%) were from cutaneous sources and five were from the throat. One isolate, from a cutaneous sample, was found to be a toxigenic strain.

Gastroenteritis (acute)

Not all cases of acute gastroenteritis are notifiable. Cases thought to be related to a common source, as well as those occurring in a person in a high-risk category (eg, food handler or early childhood service worker) are notifiable. Single cases of chemical, bacterial or toxic food poisoning are also notifiable under this category. Toxic shellfish poisoning is reported separately at

the end of this section. Diseases and conditions that are notifiable separately (eg, campylobacteriosis, giardiasis, VTEC/STEC infection and salmonellosis) are reported in their own sections.

In 2017, 319 cases of acute gastroenteritis (other than toxic shellfish poisoning) were notified. The 2017 notification rate of 6.7 per 100,000 was significantly lower than the 2016 rate of 10.9 (510 cases). A causal agent was reported for 100 (31.6%) cases. Of these, the most common pathogen recorded was norovirus (68.0%, 68 cases).

The distribution of cases by causal agent is shown in Table 7.

Table 7. Acute gastroenteritis cases by agent type, 2017

Agent type[a]	Cases	Percentage (%)
Agent identified	**100**	**31.6**
Norovirus infection	68	21.3
Rotavirus infection	18	5.6
Histamine (scombroid) poisoning	9	2.8
Sapovirus	3	0.9
Chemical food poisoning	1	0.3
Ciguatera fish poisoning	1	0.3
Agent not identified	**219**	**68.7**
Total	**319**	**100.0**

[a] Does not include diseases that are notifiable separately.

Note: there may be more cases associated with specific disease agents through outbreak reporting - please refer to the Annual Summary of Outbreaks.

The highest notification rates for acute gastroenteritis were reported from Whanganui, MidCentral, Capital & Coast and West Coast DHBs (25.0, 21.5, 16.3 and 15.4 per 100,000 respectively).

Infants aged less than 1 year (38.0 per 100,000) had the highest notification rate, followed by children aged 1–4 years (15.1 per 100,000).

Females (7.1 per 100,000) had a higher rate than males (6.1 per 100,000).

The ethnic group with the highest notification rate was European or Other (7.0 per 100,000), followed by Māori (4.8 per 100,000) and Asian (4.2 per 100,000).

Hospitalisation status was recorded for 239 (74.9%) cases, of which 34 cases (14.2%) were hospitalised.

The most common risk factor associated with acute gastroenteritis was consumption of food from retail premises (Table 8).

In 2017, 191 outbreaks of acute gastroenteritis were reported, involving 2438 cases, of which 60 cases were notified individually.

Toxic shellfish poisoning

In 2017, five cases of toxic shellfish poisoning were notified, compared with one case in 2016. One case was reported with neurologic shellfish poisoning and the poisoning type was not specified for the other four cases.

Cases were reported from Northland (4 cases) and Bay of Plenty (1 case) DHBs.

The cases were aged 20–29 (3 cases), 30–39 and 40–49 (1 case each) years. Three cases were male and two were female. Three cases were of European or Other ethnicity and two cases were Māori.

One case (20.0%) was hospitalised.

All five cases had eaten recreationally collected seafood.

Table 8. Exposure to risk factors associated with acute gastroenteritis, 2017

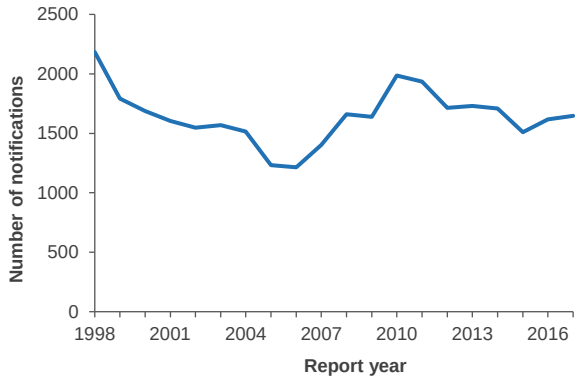
Risk factor	Yes	No	Unknown	Percentage (%) [a]
Consumed food from retail premises	145	41	133	78.0
Contact with other symptomatic people	40	146	133	21.5
Contact with faecal matter	33	143	143	18.8
Recreational water contact	16	152	153	9.5
Contact with farm animals	14	156	149	8.2
Consumed untreated water	13	147	159	8.1
Travelled overseas during the incubation period	10	178	131	5.3

[a] Percentage refers to the number of cases who answered “yes” out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Giardiasis

In 2017, 1648 cases of giardiasis were notified, compared with 1616 in 2016. The notification rate for 2017 was the same as the 2016 rate (34.4 per 100,000). Figure 9 shows giardiasis notifications by year from 1998 to 2017.

Figure 9. Giardiasis notifications by year, 1998–2017



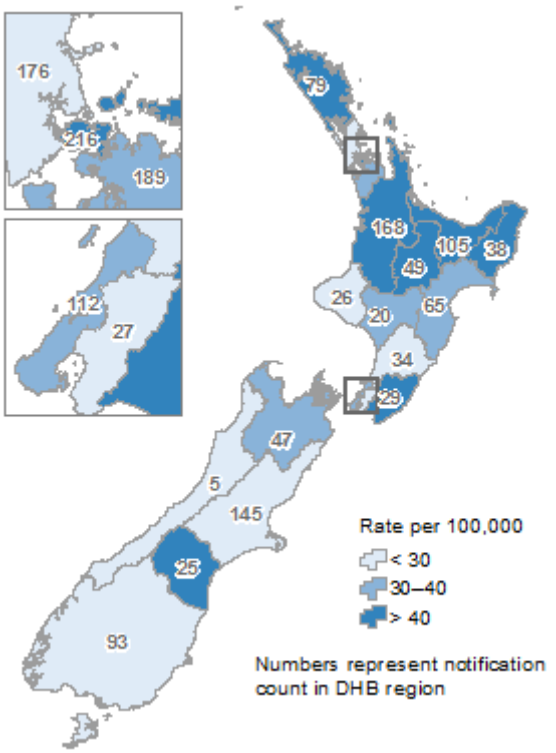
In 2017, the highest notification rates for giardiasis were reported from Tairawhiti, Wairarapa, Bay of Plenty, Lakes and Northland DHBs (78.4, 65.2, 45.3, 45.2 and 45.0 per 100,000, respectively) (Figure 10).

Children aged 1–4 years (110.0 per 100,000), adults aged 30–39 years (61.8 per 100,000) and infants aged less than 1 year (36.3 per 100,000) had the highest notification rates.

Males (35.9 per 100,000) had a slightly higher rate than females (32.9 per 100,000).

Ethnicity was recorded for 1567 (95.1%) cases. The MELAA ethnic group (61.7 per 100,000) had the highest notification rate for giardiasis, followed by European or Other (40.1 per 100,000).

Figure 10. Giardiasis notifications by DHB, 2017



Hospitalisation status was recorded for 1102 (66.9%) cases, of which 37 (3.4%) were hospitalised.

The most commonly reported risk factors for giardiasis were contact with faecal matter and contact with other symptomatic people (Table 9).

In 2017, 24 giardiasis outbreaks were reported, involving 170 cases.

Table 9. Exposure to risk factors associated with giardiasis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Contact with faecal matter	290	494	864	37.0
Contact with other symptomatic people	288	525	835	35.4
Consumed untreated water	254	521	873	32.8
Consumed food from retail premises	221	478	949	31.6
Recreational water contact	250	575	823	30.3
Contact with farm animals	214	625	809	25.5
Travelled overseas during the incubation period	228	751	669	23.3
Contact with sick animals	37	745	866	4.7

[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Haemophilus influenzae serotype b disease

In 2017, four cases of *Haemophilus influenzae* serotype b (Hib) disease were notified. All cases were laboratory-confirmed.

The cases were aged 1–4, 40–49, 50–59 years and 70 years and over (1 case each). Three cases were female and one case was male.

Two cases were of Māori ethnicity, one was Asian and one European or Other.

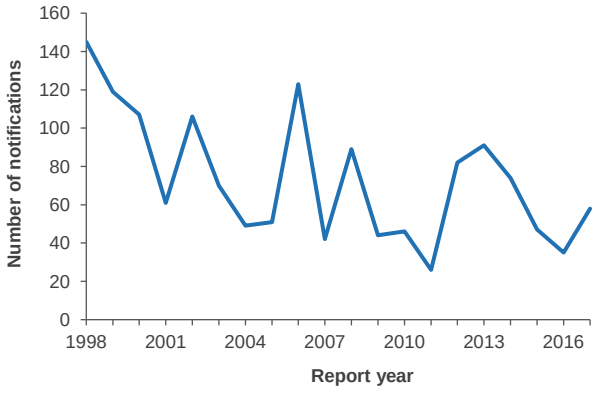
Three cases were not vaccinated and the vaccination status was unknown for one case.

A Hib vaccine was introduced in January 1994. The current immunisation schedule recommends a primary course of three doses of DTaP-IPV-HepB/Hib vaccine for infants when aged six weeks, three months and five months, and a booster of Hib vaccine when aged 15 months.[18]

Hepatitis A

In 2017, 58 cases of hepatitis A were notified, compared with 35 cases in 2016. The 2017 notification rate (1.2 per 100,000) was significantly higher than the 2016 rate (0.7 per 100,000). Since 2001, numbers have fluctuated, primarily due to outbreaks in 2002, 2006, 2008, 2012 and 2013 (Figure 11).

Figure 11. Hepatitis A notifications by year, 1998–2017



Counties Manukau (3.8 per 100,000), Waikato (1.7 per 100,000) and Waitemata (1.2 per 100,000) DHBs had the highest notification rates.

Young adults aged 15–19 years (3.2 per 100,000), and adults aged 20–29 years and 30–39 years (both 1.8 per 100,000) had the highest notification rates.

Males and females had the same rate (1.2 per 100,000).

Ethnicity was recorded for 56 cases (96.6%). Pacific peoples (6.8 per 100,000) had the highest notification rate for hepatitis A, followed by the Asian (2.2 per 100,000) and Māori (1.7 per 100,000).

Hospitalisation status was recorded for 57 cases (98.3%), of which 31 (54.4%) were hospitalised.

Overseas travel information was recorded for all cases, and 32 cases (55.2%) had travelled overseas during the incubation period for the disease. The countries most commonly visited were Samoa (9 cases), Philippines (4 cases), India and Tonga (3 cases each). Six cases reported travel to more than one country.

In 2017, five outbreaks of hepatitis A were reported, involving 20 cases.

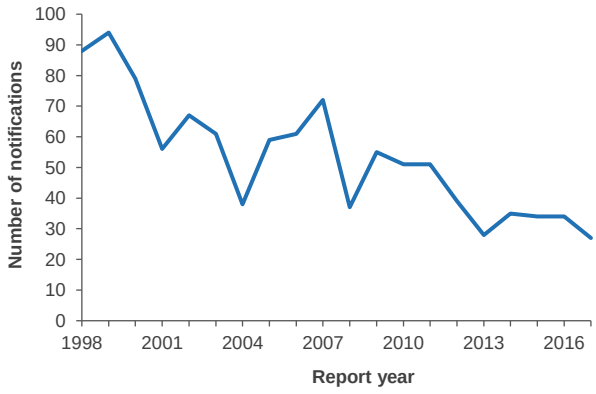
Hepatitis B

Only acute hepatitis B is notifiable, so notification rates do not give an indication of the burden of chronic hepatitis B infection.

In 2017, 27 cases of hepatitis B were notified, compared with 34 cases in 2016. The 2017 notification rate (0.6 per 100,000) was similar to the 2016 rate (0.7 per 100,000). The annual number of hepatitis B cases has ranged from 27 to 35 in the last five years (Figure 12).

There has been a decrease in the number of hepatitis B cases since 1984 when over 600 cases were notified. This decrease is primarily due to the introduction of hepatitis B vaccine to the national childhood immunisation schedule in 1988.[18]

Figure 12. Acute hepatitis B notifications by year, 1998–2017



Counties Manukau (6 cases, 1.1 per 100,000) DHB was the only DHB that reported more than five cases.

Adults aged 40–49 years (1.6 per 100,000) and 60–69 years (1.2 per 100,000) had the highest notification rates.

Males (0.9 per 100,000) had a higher rate than females (0.2 per 100,000).

Ethnicity was recorded for 26 (96.3%) cases. The ethnic group with the highest notification rate for hepatitis B was Pacific peoples (2.0 per 100,000), followed by Māori (0.8 per 100,000).

Hospitalisation status was recorded for all cases, of which 13 (48.1%) were hospitalised.

The most commonly reported risk factors for hepatitis B were overseas travel and sexual contact with a confirmed case or carrier (Table 10).

Hepatitis C

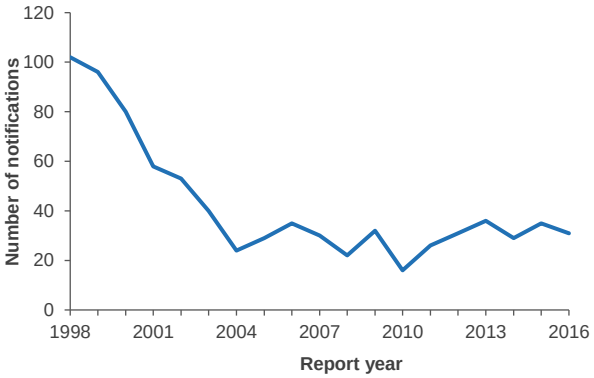
Only acute hepatitis C is notifiable, so notification rates do not give an indication of the burden of chronic hepatitis C infection.

In 2017, 21 cases of hepatitis C were notified compared with 31 cases in 2016. The 2017 notification rate (0.4 per 100,000) was similar to the 2016 rate (0.7 per 100,000).

After a peak of 102 cases in 1998, notifications steadily declined until 2004. The number of notifications has ranged from 27 to 36 in the last five years (Figure 13).

Auckland, Taranaki, Nelson Marlborough and Southern DHBs had the highest number of cases (3 cases each).

Figure 13. Acute hepatitis C notifications by year, 1998–2017



Adults aged 20–29 years (1.4 per 100,000, 10 cases) had the highest notification rate. No more than four cases were reported in any other age group.

More cases were reported among females (17 cases) than among males (4 cases).

Ethnicity was recorded for all cases. The ethnic group with the highest notification rate was European or Other (0.5 per 100,000, 16 cases). No more than three cases were reported in any other ethnic group.

Hospitalisation status was recorded for 19 (90.5%) cases, of which six (31.6%) were hospitalised.

The most commonly reported risk factors for hepatitis C were a history of injecting drug use and sexual or household contact with confirmed case or carrier (Table 11).

Table 10. Exposure to risk factors associated with acute hepatitis B, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Travelled overseas during the incubation period	9	17	1	34.6
Sexual contact with confirmed case or carrier	4	14	9	22.2
History of injecting drug use	2	24	1	7.7
Household contact with confirmed case or carrier	1	21	5	4.5

[a] Percentage refers to the number of cases who answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Table 11. Exposure to risk factors associated with acute hepatitis C, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
History of injecting drug use	15	5	1	75.0
Sexual contact with confirmed case or carrier	4	6	11	40.0
Household contact with confirmed case or carrier	3	8	10	27.3
Body piercing/tattooing in the last 12 months	3	12	6	20.0
Travelled overseas during incubation period	1	17	3	5.6

[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Hepatitis (viral) not otherwise specified

In 2017, 10 cases of hepatitis not otherwise specified (NOS) were notified, compared with eight cases in 2016. Eight cases were hepatitis D and two were hepatitis E.

Hepatitis D

The eight hepatitis D cases were aged 30–39, 50–59 (3 cases each), 40–49 and 60–69 (1 case each) years. Six cases were male and two were female.

Ethnicity was recorded for seven cases. Six cases were of Pacific ethnicity and one was European or Other.

Hospitalisation status was recorded for all cases, none of the cases were hospitalised.

Overseas travel information was recorded for five cases; no cases had travelled overseas travel during the incubation period for hepatitis D.

All cases had co-infection with hepatitis B.

Hepatitis E

The two hepatitis E cases were aged 20–29 years and 50–59 years. Both cases were Asian males.

Hospitalisation status was recorded for both cases and one case was hospitalised.

Overseas travel information was recorded for both cases; one case had travelled overseas during the incubation period.

Highly pathogenic avian influenza

Highly pathogenic avian influenza (HPAI) became a notifiable disease in New Zealand in February 2004. No human cases have been reported in New Zealand and no highly pathogenic avian influenza A(H5N1) has been reported in New Zealand animals.[19]

Hydatid disease

One probable case of hydatid disease (*Echinococcus granulosus*) was notified in 2017, compared with two cases in 2016. Since 1997, 71 cases of hydatid disease have been notified.

The case was a male aged 5–9 years who had recently travelled to, and previously lived in, Chile.

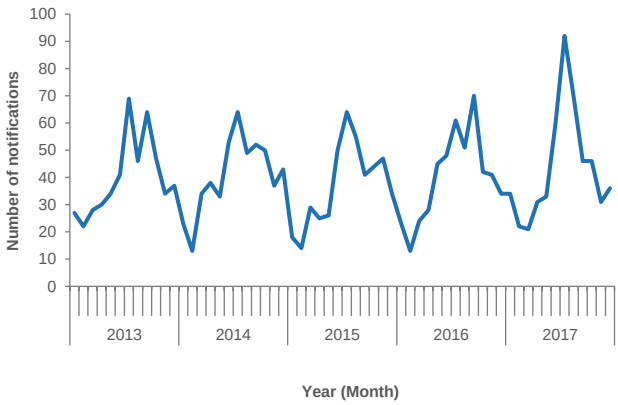
Echinococcus species are notifiable organisms under the Biosecurity Act 1993. All cases of hydatid disease are reported to the Ministry for Primary Industries for investigation of possible disease reservoirs in New Zealand animals. In September 2002, New Zealand was declared provisionally free of hydatids. Given the natural history of the disease, it is expected that cases may occur for some years.

Invasive pneumococcal disease

A full description of the epidemiology of invasive pneumococcal disease (IPD) will be reported separately in the 2017 Invasive Pneumococcal Disease in New Zealand report.

In 2017, 522 cases of IPD were notified, compared with 480 cases in 2016. The 2017 notification rate of 10.9 per 100,000 was similar to the 2016 rate of 10.2 per 100,000. There is a distinct seasonal pattern for IPD, with the highest number of notifications reported during winter, and particularly in July, each year (Figure 14).

Figure 14. Invasive pneumococcal disease notifications by month, January 2013–December 2017



In 2017, the highest notification rates for IPD were from Bay of Plenty, Whanganui, West Coast and Wairarapa DHBs (19.8, 18.7, 18.5 and 18.0 per 100,000, respectively) (Figure 15).

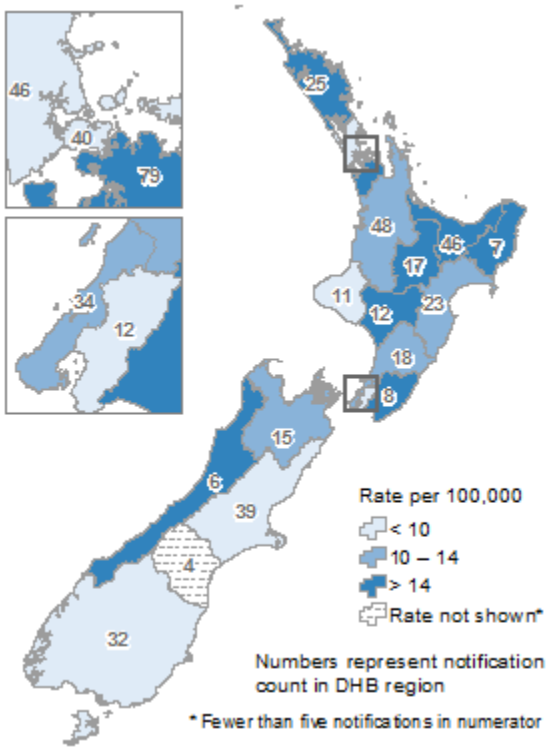
Adults aged 70 years and over (35.9 per 100,000), 60–69 years (20.6 per 100,000) and infants aged less than 1 year (18.2 per 100,000) had the highest rates of IPD.

Males (11.6 per 100,000) had a higher rate than females (10.2 per 100,000).

Ethnicity was recorded for 513 (98.3%) cases. The ethnic group with highest rate of IPD was Pacific peoples (27.9 per 100,000), followed by Māori (18.9 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Figure 15. Invasive pneumococcal disease notifications by DHB, 2017



Hospitalisation status was recorded for 518 (99.2%) cases, of which 497 (95.9%) were hospitalised.

There were 27 deaths due to IPD reported in 2017. The deaths were in a child aged 1–4 years (1 case), and adults aged 40–49 (1 case), 50–59 (3 cases), 60–69 (5 cases) years and 70 years and over (17 cases).

The risk factors recorded for IPD are shown in Table 12 and Table 13. The most commonly reported risk factors for children aged less than 5 years were attending childcare and smoking in the household. Having a chronic illness was the most common risk factor for cases aged 5 years and older.

Table 14 shows the vaccination status of cases by age group.

In 2017, one IPD outbreak was reported involving five cases.

Pneumococcal conjugate vaccine (PCV) was added to the national immunisation schedule in June 2008. The 7-valent conjugate vaccine (PCV7) was used until July 2011 when the 10-valent conjugate vaccine (PCV10) was introduced. This was in turn replaced by the 13-valent conjugate vaccine (PCV13) in July 2014. The most recent schedule change was to revert to PCV10 in July 2017.

Table 12. Exposure to risk factors associated with invasive pneumococcal disease for cases aged less than 5 years, 2017

Risk factor	Yes	No	Unknown	Percentage (%)[a]
Attends childcare	5	4	36	55.6
Smoking in the household	8	10	27	44.4
Chronic illness	8	34	3	19.0
Premature (<37 weeks gestation) [b]	1	7	3	12.5
Immunocompromised	5	38	2	11.6
Congenital or chromosomal abnormality	3	38	4	7.3

[a] Percentage refers to the percentage of cases who answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded. No cases reported asplenia, chronic lung disease or cochlear implants as risk factors.
[b] Only cases aged less than 1 year are included for reporting of this risk factor.

Table 13. Exposure to risk factors associated with invasive pneumococcal disease for cases aged 5 years and over, 2017

Risk factor	Yes	No	Unknown	Percentage (%)[a]
Chronic illness	264	175	38	60.1
Current smoker[b]	87	281	85	23.6
Immunocompromised	93	334	50	21.8
Chronic lung disease or cystic fibrosis	69	373	35	15.6
Resident in long-term or other chronic-care facility	30	401	46	7.0
Congenital or chromosomal abnormality	4	417	56	1.0
Cochlear implants	2	398	77	0.5
Anatomical or functional asplenia	1	415	61	0.2

[a] Percentage refers to the percentage of cases who answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded. No cases reported cochlear implants as a risk factor.
[b] Only cases aged 15 years and over are included in the reporting of this risk factor

Table 14. Age group and vaccination status of invasive pneumococcal disease notifications, 2017

Age group	Total cases	One dose	Two doses	Three doses	Four doses	Not vaccinated	Unknown
<6 months	6	1	1	1	0	3	0
6 months–4 years	39	0	1	6	20	6	6
5–9 years	14	0	0	2	10	2	0
10–19 years	18	2	0	1	0	7	8
20+ years	445	2	1	1	0	122	319
Total	522	5	3	11	30	140	333

The recommended schedule for PCV is four doses given to infants at age six weeks, three months, five months and 15 months. For defined groups of high risk children, the schedule also includes 23-valent pneumococcal polysaccharide vaccine (23PPV).[18]

The Invasive Pathogens Laboratory at ESR received a viable *Streptococcus pneumoniae* isolate from a normally sterile site for serotyping for 489 (93.7%) notified cases in 2017. Table 15 shows the breakdown by serotype and age group. Just over 90% (33/36) of cases aged less than five years were due to serotypes not covered by PCV10, compared with 81.5% (194/238) and 87.4% (188/215) of cases aged 5–64 years and 65 years and over, respectively.

Table 15. Invasive pneumococcal disease notifications by serotype and age group, 2017

Serotype*	<5 years	5–64 years	65+ years	Total
4	1	13	5	19
6B	0	1	0	1
9V	1	3	0	4
14	1	1	0	2
18C	0	1	0	1
19F	0	5	9	14
23F	0	0	1	1
1	0	2	0	2
5	0	0	0	0
7F	0	18	12	30
3	4	16	12	32
6A	0	0	2	2
19A	4	23	33	60
Other (non-PCV13)	25	155	141	321
Total[a]	**36**	**238**	**215**	**489**

[a] Totals are for viable isolates of culture-positive cases referred to ESR for serotyping.

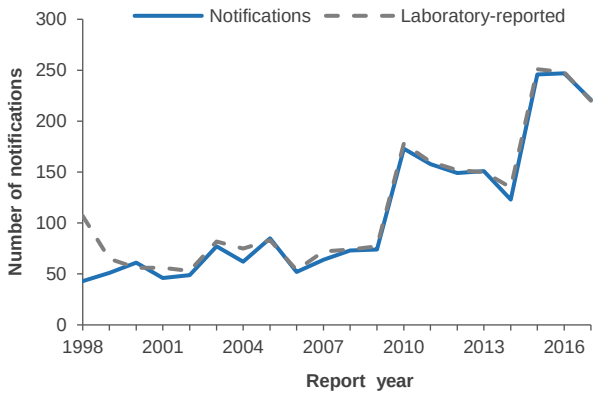
Serotype 19A, a PCV13 serotype, was the most prevalent type across all ages (60 cases). Serotype 7F, a PCV10 serotype, was the second most prevalent type in those aged 5–64 years (18 cases). Serotype 22F, a 23PPV serotype, was the second most prevalent type in those aged 65 years and over (17 cases).

Legionellosis

During 2017, 221 cases of legionellosis were notified, compared with 247 in 2016. The 2017 notification rate of 4.6 per 100,000 was similar to the 2016 rate of 5.3 per 100,000.

The annual number of cases was relatively stable between 1998 and 2009, but increased in 2010 and has remained high since (Figure 16). The increase in legionellosis notifications in 2015 and 2016 is likely due to the LegiNZ study, which involved testing hospitalised patients with suspected pneumonia for *Legionella* spp. using PCR. The study ran from May 2015 to May 2016.

Figure 16. Legionellosis notifications and laboratory-reported cases by year, 1998–2017



In 2017, the highest notification rates for legionellosiswere reported from Canterbury, Northland, Bay of Plenty and Nelson

** Note: PCV7 covers serotypes 4, 6B, 9V, 14, 18C, 19F and 23F; PCV10 covers serotypes 1, 5 and 7F in addition to the PCV7 serotypes; and PCV13 covers serotypes 3, 6A and 19A in addition to the PCV10 serotypes

Marlborough DHBs (13.1, 11.4, 7.3, and 6.7 per 100,000 respectively).

Adults aged 70 years and over (16.2 per 100,000) and 60–69 years (13.2 per 100,000) had the highest notification rates for legionellosis.

Males (5.4 per 100,000) had a higher rate than females (3.9 per 100,000).

Ethnicity was recorded for 219 (99.1%) cases. The European or Other ethnic group (5.6 per 100,000) had the highest notification rate followed by Māori (3.2 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 217 cases (98.2%), of which 191 (88.0%) were hospitalised.

Five deaths due to legionellosis were reported in 2017. Four of the deaths were in cases aged 70 years and over and one was 60–69 years.

Table 17 provides a summary of risk factors for which data was available. A total of 179 (87.3%) cases reported exposure to known environmental risk factors during the incubation period for the disease. Further details of the exposures were recorded for 175 of these 179 cases as follows: compost, potting mix or soil (146), shower or hot water system (29), spa or pool (13), air conditioning unit (9), water fountain (3), cooling towers (2), water blasting (1) and respiratory therapy device (1). Some cases reported more than one exposure to known environmental risk factors. Six people had travelled overseas during the incubation period for the disease.

No outbreaks of legionellosis were reported in 2017.

The Legionella Reference Laboratory at ESR confirmed 220 cases of legionellosis in 2017. As in previous years, the most common *Legionella* species identified were *L. longbeachae* (65.5%, 144 cases) and *L. pneumophila* (24.6%, 54 cases) (Table 16).

Table 16. *Legionella* strains for laboratory-reported cases, 2017

***Legionella* species and serogroup**	**Cases**	**Percentage (%)**
L. longbeachae	**144**	**65.5**
L. longbeachae sg 1	65	29.6
L. longbeachae sg 2	3	1.4
L. longbeachae sg not determined	76	34.6
L. pneumophila	**54**	**24.6**
L. pneumophila sg 1	36	16.4
L. pneumophila sg 2	1	0.45
L. pneumophila sg 4	1	0.4
L. pneumophila sg 5	1	0.4
L. pneumophila sg 7	8	3.2
L. pneumophila sg 8	1	0.4
L. pneumophila sg 10	1	0.4
L. pneumophila sg 12	2	0.9
L. pneumophila sg 13	1	0.4
L. pneumophila strain 91-033	1	0.4
L. pneumophila sg not determined	8	3.6
Other *Legionella* species	**22**	**10.0**
L. sainthelensi	6	2.7
L. dumoffii	3	1.3
L. bozemanae sg 1	1	0.4
L. bozemanae sg 2	1	0.4
L. gormanii	1	0.4
L. micdadei	1	0.4
L. wadsworthii	1	0.4
Legionella species unidentified	8	3.6
Total	**220**	**100**

Table 17. Exposure to risk factors associated with legionellosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%)[a]
Exposure to known environmental risk factor during the incubation period	179	26	16	87.3
Pre-existing immunosuppressive or debilitating condition	85	119	17	41.7
Smokes cigarettes	39	167	15	18.9

[a] Percentage refers to the percentage of cases who answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Leprosy

Three cases of leprosy were notified in 2017 compare to no cases in 2016. The cases were all Pacific peoples, aged 20–29 years. Two cases were female and one male.

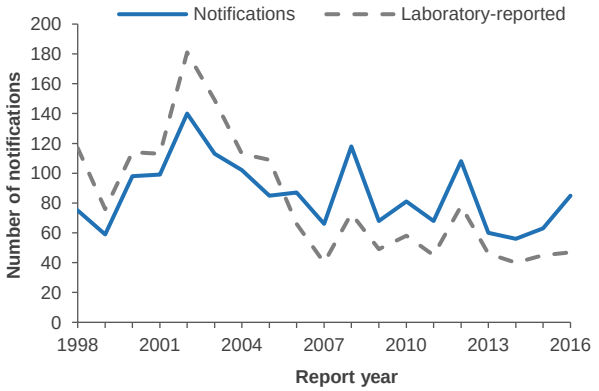
Two cases had been in Kiribati and one case in Samoa during the incubation period for the disease.

Leptospirosis

In 2017, a total of 142 cases of leptospirosis were notified. The 2017 notification rate of 3.0 cases per 100,000 was a significant increase from the 2016 rate of 1.8 per 100,000 (85 cases). Of the 142 notified cases, 139 were laboratory-confirmed by microscopic agglutination titre (MAT) (65 cases), or nucleic acid testing (NAAT) (52 cases) or both MAT and NAAT (22 cases). Three cases were not laboratory-confirmed.

Figure 17 shows the number of notified cases of leptospirosis each year since 1998.

Figure 17. Leptospirosis notifications by year, 1998–2017



The highest notification rates for leptospirosis were reported from Waikato, Whanganui, Hawke's Bay and Taranaki DHBs (13.2, 12.5, 7.9 and 4.2 per 100,000 respectively).

Adults aged 50–59 years (6.6 per 100,000), had the highest notification rates followed by those aged 40–49 (4.9, per 100,000), 60–69 (4.2 100,000) and 30–39 (4.0 per 100,000) years.

Males (5.2 per 100,000) had much higher rates than females (0.8 per 100,000).

Ethnicity was recorded for 141 (99.3%) cases. The ethnic group with the highest notification rate was European or Other (3.7 per 100,000), followed by Māori (2.7 per 100,000).

Hospitalisation status was recorded for 140 (98.6%) cases, of which 89 (63.6%) were hospitalised.

Occupation was recorded for 128 (90.1%) of the 142 cases. Of these, 91 (71.1%) were engaged in occupations previously identified as high-risk for exposure to *Leptospira* spp. in New Zealand.[20] Of the 91 cases with a high-risk occupation, 75 (82.4%) were farmers, farm workers or livestock transporters and 16 (17.6%) worked in the meat processing industry (as freezing workers, meat process workers or butchers). Of the 51 cases that did not report a high-risk occupation (or had no occupation recorded), 11 (21.6%) worked in an occupation that involved contact with animals or their environment (eg, agricultural sprayer, arborist, farrier, fencer, orchard worker), 20 reported animal/outdoor exposures, seven had exposure to lakes, rivers or streams, and three had travelled overseas during the incubation period for the disease. Five cases reported more than one risk factor.

One outbreak of leptospirosis was reported in 2017.

The Leptospira Reference Laboratory at ESR confirmed 62 cases of infection with *Leptospira* in 2017. The most common *Leptospira* serovars reported were *L. borgpetersenii* sv Hardjo (33.9%, 21 cases), *L. borgpetersenii* sv Ballum, (25.8%, 16 cases) and *L. interrogans* sv Pomona (21.0%, 13 cases) (Table 18).

Table 18. *Leptospira* species and serovars for laboratory-reported cases, 2017

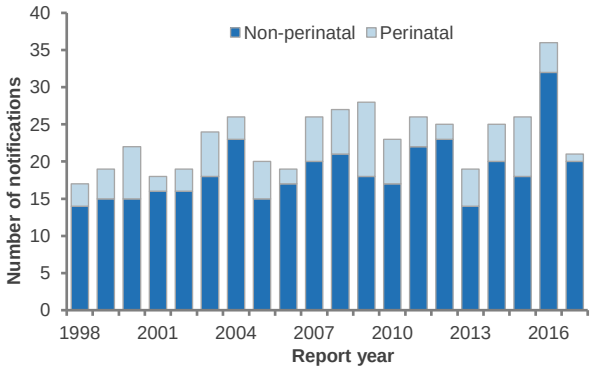
***Leptospira* species and serovar**	**Cases**	**Percentage (%)**
L. borgpetersenii	**44**	**71.0**
L. borgpetersenii sv Hardjo	21	33.9
L. borgpetersenii sv Ballum	16	25.8
L. borgpetersenii sv Tarassovi	7	11.3
L. interrogans	**15**	**24.2**
L. interrogans sv Pomona	13	21.0
L. interrogans sv Copenhageni	1	1.6
L. interrogans sv Australis	1	1.6
Serovar not identified	**3**	**4.8**
Total	**62**	**100.00**

Listeriosis

In 2017, 21 cases of listeriosis were notified compared with 36 cases in 2016. The 2017 rate of 0.4 cases per 100,000 was a significant decrease from the notification rate in 2016 (0.8 per 100,000).

Figure 18 shows listeriosis notifications (both perinatal and non-perinatal) for each year since 1998.

Figure 18. Listeriosis notifications (perinatal and non-perinatal) by year, 1998–2017



No outbreaks of *Listeria* were reported during 2017.

Perinatal

One case of perinatal listeriosis was notified in 2017. The length of gestation was 40 weeks. The case was aged 30–39 years and of European or Other ethnicity. No perinatal deaths from listeriosis occurred in 2017.

Non-perinatal

The 20 non-perinatal listeriosis cases were from 12 DHBs, with the highest number of notifications reported in Counties Manukau (4 cases) and Bay of Plenty (3 cases) DHBs.

Most (75.0%, 15 cases) were aged 60 years and over, with one case in an infant aged less than 1 year. Eleven cases were male and nine were female.

Ethnicity was recorded for all cases. Eleven cases were of European or Other ethnicity, five were Māori, three Pacific and one Asian.

Nineteen non-perinatal cases were hospitalised for listeriosis and nine were also hospitalised for the treatment of another illness.

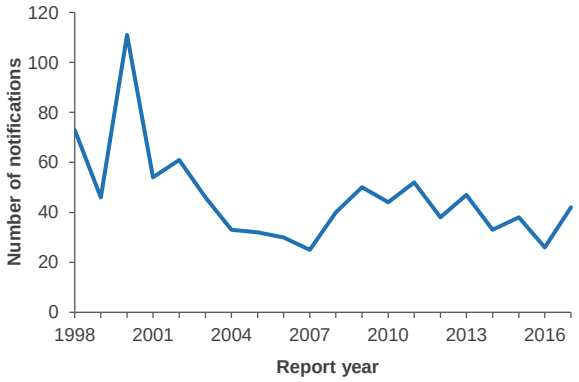
Information on underlying illness was recorded for all non-perinatal cases, of which 16 cases (80.0%) had an underlying illness such as cancer, autoimmune disease, heart disease, diabetes or another chronic illness. Ten cases were reported to be receiving immunosuppressive drugs.

The Special Bacteriology Laboratory at ESR serotyped 20 isolates of *Listeria monocytogenes* in 2017. The serotypes identified were O1/2 (13 isolates, 65.0%) and O4 (7 isolates, 35.0%).

Malaria

In 2017, 42 cases of malaria were notified compared with 26 cases in 2016 (Figure 19). The 2017 notification rate (0.9 per 100,000) was similar to the 2016 rate (0.6 per 100,000).

Figure 19. Malaria notifications by year, 1998–2017



Adults aged 20–29 and 30–39 years had the highest rates (both 1.8 per 100,000).

Males (1.1 per 100,000) had a slightly higher rate than females (0.7 per 100,000).

Ethnicity was recorded for all 42 (100%) cases. The ethnic group with the highest rate was MELAA (9.3 per 100,000), followed by the Asian (2.4 per 100,000) and Pacific peoples (2.0 per 100,000).

Hospitalisation status was recorded for 41 (97.6%) cases, of which 22 (53.7%) were hospitalised.

All cases had either lived or travelled overseas during the incubation period for the disease or had a prior history of travel to malaria-endemic areas.

Table 19 shows the region and country of overseas travel and *Plasmodium* species identified for malaria notifications in 2017. The region most commonly reported for *P. vivax* was Southern and Central Asia (8 cases) followed by South-East Asia (6 cases). For cases identified with *P. falciparum*, the region most commonly reported was Sub-Saharan Africa (8 cases).

Table 19. Region and country of overseas travel and *Plasmodium* species for malaria notifications, 2017

Region	Country resided in or visited	*Plasmodium* species						
		P. falciparum	*P. knowlesi*	*P. malariae*	*P. ovale*	*P. vivax*	Indeterminate	Indeterminate: not *P. falciparum*
North Africa and the Middle East	Sudan						1	
Sub-Saharan Africa	Central and West Africa, nfd	1						
	Congo, the Democratic Republic of the	1			1			
	Kenya	1						
	Madagascar	1						
	Nigeria	2						
	Zimbabwe	2						
Southern and Central Asia	Afghanistan					1		
	India	1				7		1
South-East Asia	Indonesia	1	1			5		1
	Laos					1		
The Americas	Guatemala			1				
	Peru						1	
Oceania	Papua New Guinea	4				3	3	
	Solomon Islands					1	1	

Note: Some cases reported travel to more than one country during the incubation period for the disease.

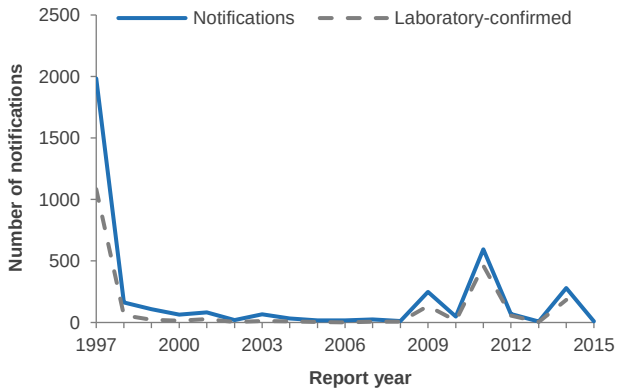
The country with the highest number of malaria cases was India (8 cases), of which 7 cases were identified with *P. vivax*. Some cases reported travel to more than one country.

Measles

Measles immunisation was introduced in 1969 [18] and measles has been a notifiable disease since June 1996.[3] The recommended measles, mumps and rubella (MMR) immunisation schedule is two doses, given at age 15 months and four years. During measles outbreaks, the first dose may be given at age 12 months, and MMR vaccine may be recommended for infants aged less than 12 months if cases are occurring in the very young.[18] In October 2017, New Zealand was verified by the WHO as having eliminated endemic measles.[21]

In 2017, 15 cases of measles (including 11 laboratory-confirmed cases) were notified. In 2016, 103 confirmed cases of measles (including 76 laboratory-confirmed cases) were notified (Figure 20). The 2017 notification rate (0.3 per 100,000) was a significant decrease from the 2016 notification rate (2.2 per 100,000).

Figure 20. Measles notifications and laboratory-confirmed cases by year, 1998–2017



Cases were reported from MidCentral (7 cases), Waitemata and Bay of Plenty (2 cases each), Auckland, Hutt Valley, Canterbury, and South Canterbury (1 case each) DHBs.

Cases ranged in age from 15 months to 52 years, with 80.0% of the cases aged 15 years and over.

Males (0.4 per 100,000) and females (0.2 per 100,000) had a similar rate.

Nine cases were of European or Other (9 cases) ethnicity and six were Asian.

Three (20.0%) cases were hospitalised.

Immunisation status was known for nine (60.0%) cases, of which five (55.6%) were not immunised. One case received one dose of the vaccine and three cases received two doses.

The source of the virus was recorded for 13 cases; four were imported and nine were import-related. The countries the imported cases had visited during the incubation period for the disease were Indonesia (3 cases) and Singapore (1 case).

Three measles outbreaks were reported in 2017, involving 11 cases.

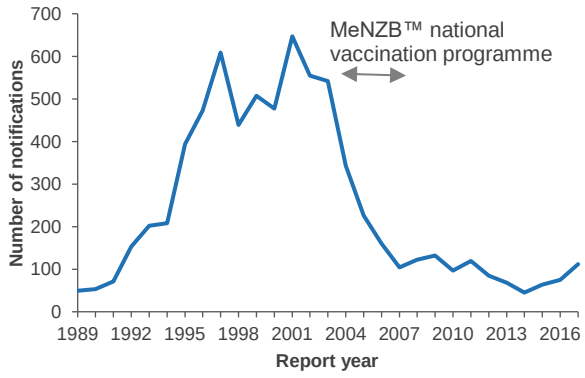
The Ministry of Health hospital discharge data for 2017 included five hospitalisations where measles was the principal diagnosis.

Meningococcal disease

In 2017, 112 cases of meningococcal disease were notified. The notification rate for 2017 (2.3 per 100,000) was higher than the 2016 rate (1.6 per 100,000, 75 cases). The rate was a significant decrease from the peak rate (16.7 per 100,000 in 2001) experienced during the New Zealand meningococcal disease epidemic driven by the B:P1.7-2,4 strain. The 2017 rate is higher than the rate of 1.5 per 100,000 observed in the immediate pre-epidemic years (1989–1990).

Figure 21 shows the number of meningococcal disease notifications from 1989 to 2017.

Figure 21. Meningococcal disease notifications by year, 1989–2017



Of the 10 DHBs that reported five or more cases in 2017, the highest rate was for Bay of Plenty (3.9 per 100,000), followed by Counties Manukau (3.8 per 100,000), Hawke's Bay (3.1 per 100,000) and Northland (2.9 per 100,000) DHBs.

The highest rate was for infants aged less than 1 year (23.1 per 100,000), followed by children aged 1–4 years (9.8 per 100,000).

Females and males had similar notification rates (2.4 and 2.2 per 100,000 respectively).

Ethnicity was recorded for all cases. The ethnic group with the highest notification rate for meningococcal disease was Māori (4.8 per 100,000), followed by Pacific peoples (4.1 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Of the 112 cases, 108 cases were hospitalised (96.4%). For the hospitalised cases, pre-hospital management information was recorded for 104 (96.3%) cases. Of these, 43 (41.3%) cases were seen by a doctor prior to hospital admission, of whom, only 10 (23.3%) were given intravenous or intramuscular antibiotics before admission. Four cases did not report seeing a doctor but were given intramuscular antibiotics prior to admission.

Nine deaths were reported during 2017 giving a case fatality rate of 8.0%. Eight cases had been admitted to hospital, three had been seen by a doctor prior to admission, but none had been given antibiotics by paramedics.

No *N. meningitidis* outbreaks were reported in 2017.

A total of 109 (97.3%) cases were laboratory-confirmed and the strain type was determined for 105 cases: group B (70 cases, including 27 B:P1.7-2,4), group W (12 cases), group C (11 cases), and group Y (11 cases) (Table 20). Of the 37 laboratory-confirmed cases in children less than 5 years of age, 35 were able to be typed and, of these, 29 (82.9%) were determined to be group B strain.

The antimicrobial susceptibility of 74 viable meningococcal isolates received by ESR from cases of invasive disease in 2017 was tested. All isolates were susceptible to ceftriaxone and rifampicin. Ten isolates (13.5%) were penicillin resistant, with minimum inhibitory concentrations (MICs) ≥0.5 mg/L. A further 30 (40.5%) isolates had intermediate resistance to penicillin (MICs 0.12-0.25 mg/L). One (1.4%) isolate was resistant to ciprofloxacin.

Table 20. Meningococcal disease strain group distribution by year, 2013–2017

	2013	2014	2015	2016	2017
Group B	**30**	**26**	**41**	**47**	**70**
B:P1.7-2,4	11	13	10	23	27
Other group B	19	13	31	24	43
Group C	**17**	**6**	**6**	**8**	**11**
C:P1.5-1,10-8	15	5	3	4	8
Other group C	2	1	3	4	3
Group W	**5**	**0**	**6**	**5**	**12**
W:P1.5,2	2	0	4	3	12
Other group W	3	0	2	2	0
Group Y	**4**	**3**	**6**	**7**	**11**
Group E	**0**	**1**	**0**	**0**	**0**
Non-groupable	**2**	**0**	**0**	**0**	**1**
Total*	**58**	**36**	**59**	**67**	**105**

*Includes total number of laboratory-confirmed cases where strain group was determined.

Middle East Respiratory Syndrome (MERS)

MERS became notifiable on 6 September 2013. Although no cases have been reported in New Zealand, worldwide 2122 laboratory-confirmed cases of human infection with MERS Coronavirus (MERS-CoV), including 740 related deaths, were reported to WHO from September 2012 to 22 December 2017.[22]

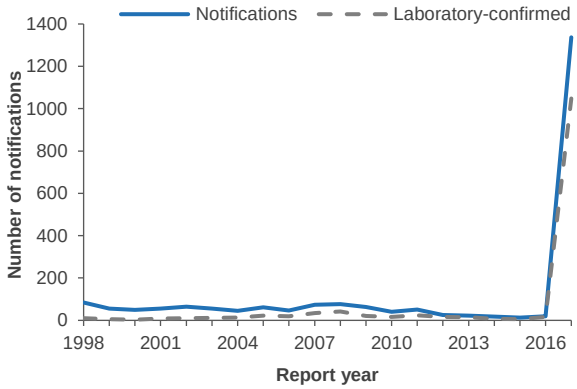
Mumps

Immunisation against mumps was introduced to the national immunisation schedule in 1990 as part of the MMR vaccine,[18] and mumps became notifiable in June 1996.[3] The recommended vaccination schedule for mumps is two doses of MMR vaccine, at ages 15 months and four years.[18] Prior to 2017, the last epidemic occurred in 1994.[18]

In 2017, 1337 cases of mumps (including 1048 laboratory-confirmed cases) were notified, compared with 20 cases in 2016 (including 16 laboratory-confirmed cases). The 2017 notification rate (27.9 per 100,000) was significantly higher than the 2016 rate (0.4 per 100,000).

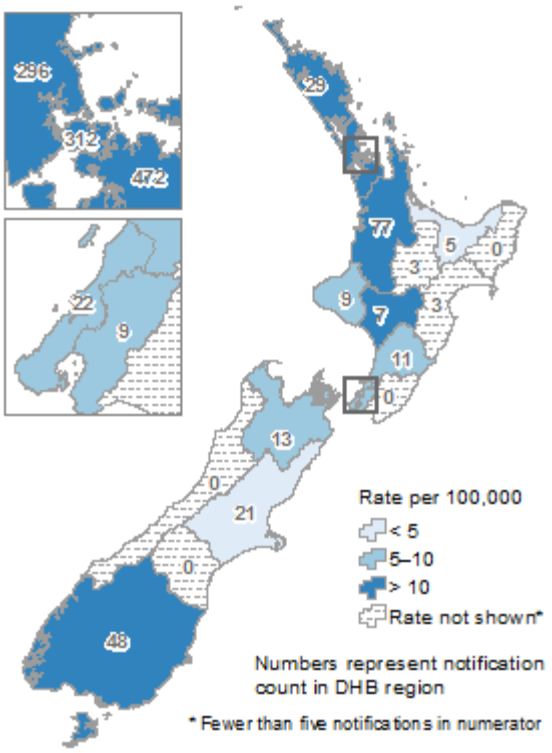
Figure 22 shows notifications and laboratory-confirmed cases from 1998 to 2017.

Figure 22. Mumps notifications and laboratory-confirmed cases by year, 1998–2017



The highest notification rate for mumps was reported from Counties Manukau DHB (86.4 per 100,000, 472 cases), followed by Auckland (59.6 per 100,000, 312 cases), and Waitemata (48.8 per 100,000, 296 cases) DHBs (Figure 23).

Figure 23. Mumps notifications by DHB, 2017



Young adults aged 15–19 years (111.5 per 100,000) had the highest notification rate, followed by adults aged 20–29 years (66.3 per 100,000) and children aged 10–14 years (55.1 per 100,000).

Males (29.9 per 100,000) had a higher rate than females (25.9 per 100,000).

Ethnicity was recorded for 1292 (96.6%) cases. The ethnic group with the highest notification rate was Pacific peoples (235.7 per 100,000), followed by Asian (26.8 per 100,000), Māori (25.2 per 100,000) and MELAA (24.3 per 100,000).

Hospitalisation status was recorded for 1335 (99.9%) cases, of which 84 (6.3%) were hospitalised.

Of the cases with risk factor information recorded, 7.8% (85/1083) had travelled overseas during the incubation period for the disease.

Fourteen mumps outbreaks were reported in 2017, involving 1190 cases.

In 2017, 802 cases (60.0%) had a known vaccination status. Of these, 329 (41.0%) were not vaccinated, 102 (12.7%) cases had received one dose of vaccine and 356 (44.4%) cases had received two doses of vaccine (Table 21).

The Ministry of Health hospital discharge data for 2017 included 112 hospitalisations where mumps was the principal diagnosis.

Non-seasonal influenza

Non-seasonal influenza became a notifiable and quarantinable disease in New Zealand in April 2009, with confirmed cases requiring evidence of influenza A(H1N1)pdm09 infection (the pandemic strain). This strain was re-classified as seasonal on 1 January 2011.

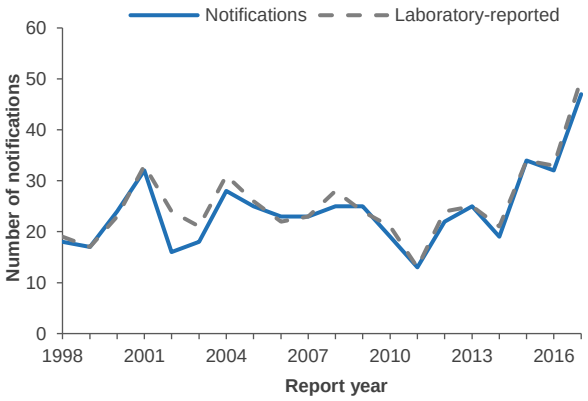
In August 2013, influenza A(H7N9) became notifiable as non-seasonal influenza. No cases have been notified to date.

Paratyphoid fever

In 2017, 47 cases of paratyphoid fever were notified compared with 32 cases in 2016. The 2017 notification rate (1.0 per 100,000) was slightly higher than the 2016 rate (0.7 per 100,000). Figure 24 shows the number of notifications and laboratory-reported cases of paratyphoid fever each year since 1998.

Adults aged 20–29 (2.6 per 100,000) had the highest notification rate, followed by young adults aged 15–19 years (1.6 per 100,000).

Figure 24. Paratyphoid fever notifications and laboratory-reported cases by year, 1998–2017



Males and females had a similar rate (1.0 and 0.9 per 100,000 respectively).

The ethnic group with the highest notification rate was Asian (2.2 per 100,000), followed by Māori (1.5 per 100,000) and European or Other (0.7 per 100,000).

Hospitalisation status was known for 46 (97.9%) cases, of which 24 (52.2%) were hospitalised.

Of the 47 cases notified in 2017, 32 (68.1%) had travelled overseas during the incubation period for the disease. Fifteen cases had not travelled overseas. The countries most commonly visited were Indonesia (13 cases), Thailand (8 cases), Australia (6 cases) and India (5 cases). Some cases reported travel to more than one country.

Two outbreaks of paratyphoid fever were reported in 2017, involving 14 cases.

The Enteric Reference Laboratory at ESR confirmed 50 isolates as *Salmonella* Paratyphi during 2017. The serotypes identified were *S*. Paratyphi B var. Java (26 isolates), *S*. Paratyphi A (23 isolates) and *S*. Paratyphi B (1 isolate). *S*. Paratyphi B var. Java was identified in two cases with no history of overseas travel.

Table 21. Age group and vaccination status of mumps notifications, 2017

Age group	Total cases	One dose	Two doses	Vaccinated (no dose info)	Not vaccinated	Unknown
<15 months[a]	9	0	0	0	9	0
15 months–3 years	37	16	4	0	11	6
4–9 years	119	10	74	1	19	15
10–19 years	527	46	181	2	126	172
20+ years	645	30	97	12	164	342
Total	**1337**	**102**	**356**	**15**	**329**	**535**

[a] Children aged less than 15 months are ineligible for vaccination.

It should be noted that until the end of 2017 isolates of *S*. Paratyphi B var. Java were notified as paratyphoid fever, however, the spectrum of illness associated with *S*. Paratyphi B var. Java infection is more consistent with non-typhoidal salmonellosis.[23].

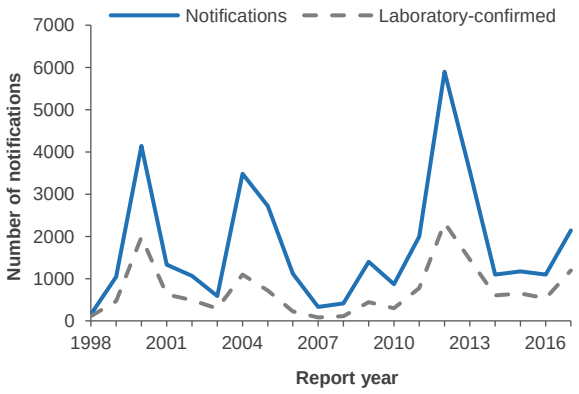
Pertussis (whooping cough)

Pertussis is a vaccine-preventable disease caused by the bacterium *Bordetella pertussis*. Epidemics occur every 2–5 years, predominantly in young children, with a periodicity that is less affected by mass immunisation than other childhood vaccine-preventable diseases.[18] The most recent national outbreak of pertussis occurred from 2011 to 2013. Pertussis vaccination has been part of the routine immunisation schedule in New Zealand since 1960. Pertussis has been notifiable since June 1996.[3]

The current immunisation schedule for pertussis is a primary course of DTaP-IPV-HepB/Hib at ages six weeks, three months and five months, followed by booster doses at ages four years (DTaP-IPV) and 11 years (Tdap). Vaccination with Tdap is also recommended for pregnant women from 28 to 38 weeks gestation.[18]

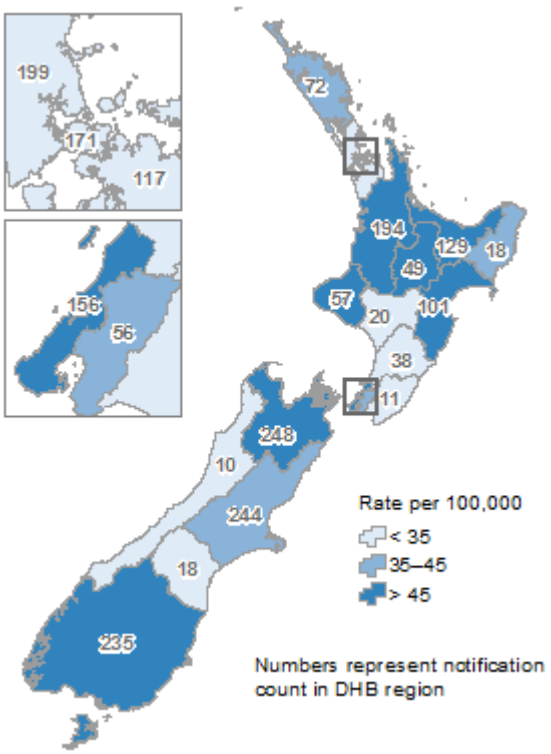
In 2017, 2143 pertussis cases were notified, of which 1192 (55.6%) were laboratory-confirmed (155 by isolation only, 870 by PCR only, and 167 by isolation and PCR). The 2017 notification rate (44.7 per 100,000) was significantly higher than the 2016 rate (23.3 per 100,000,) (Figure 25).

Figure 25. Pertussis notifications and laboratory-confirmed cases by year, 1998–2017



The highest rate for pertussis was reported from Nelson Marlborough DHB (166.7 per 100,000), followed by Southern (72.5 per 100,000), Hawke's Bay (61.6 per 100,000), and Bay of Plenty (55.6 per 100,000) DHBs (Figure 26).

Figure 26. Pertussis notifications by DHB, 2017



The highest notification rate was for infants aged less than 1 year (213.0 per 100,000) followed by children aged 1–4 (90.5 per 100,000), 5–9 (90.4 per 100,000) and 10–14 (89.3 per 100,000) years.

Females (47.8 per 100,000) had a higher notification rate than males (41.6 per 100,000).

The ethnic group with the highest notification rate for pertussis was European or Other (49.5 per 100,000), followed by MELAA (48.6 per 100,000), Pacific peoples (46.6 per 100,000), and Māori (43.4 per 100,000).

Hospitalisation status was recorded for 2090 (97.5%) cases, of which 155 (7.4%) were hospitalised. Approximately 51% (66/129) of cases aged less than 1 year were hospitalised.

The proportion of hospitalised cases (for all age groups) by ethnic group was: Pacific peoples (30.4%, 41/135), Māori (12.0%, 36/299), Asian (9.4%, 6/64), European or Other (4.5%, 69/1538), and MELAA (3.8%, 1/26).

Vaccination status was known for 1390 (64.9%) cases (Table 22). Of these, 470 (33.8%) cases were not vaccinated, including 11 infants aged under six weeks who were ineligible for vaccination. Ninety-four (6.8%) of the vaccinated cases had received one dose of pertussis vaccine, 28 (2.0%) had received two doses and 562 (40.4%) had received three or more doses.

Table 22. Age group and vaccination status of pertussis notifications, 2017

Age group	Total cases	One dose	Two doses	Three doses	Four doses	Five doses	Vaccinated (no dose info)	Not vaccinated	Unknown
0–5 weeks[a]	11	0	0	0	0	0	0	11	0
6 weeks–2 months	42	27	0	0	0	0	1	14	0
3–4 months	32	10	14	1	0	0	0	5	2
5 months–3 years	217	2	5	116	8	0	14	61	11
4–10 years	433	3	3	25	202	17	45	122	16
11+ years	1408	52	6	19	68	106	176	257	724
Total	**2143**	**94**	**28**	**161**	**278**	**123**	**236**	**470**	**753**

[a] Children aged less than six weeks are ineligible for vaccination.

A further 236 (17.0%) cases were reported as being vaccinated, but no dose information was available.

Vaccination status was known for 104 (67.1%) of the hospitalised cases. Of these, 44 (42.3%) cases had not been vaccinated (including 10 that were aged 0–5 weeks and therefore not yet eligible for vaccination), 28 (26.9%) had received one dose of pertussis vaccine, four (3.8%) had received two doses, and 21 (20.2%) had received three or more doses. A further seven (6.7%) cases were reported as being vaccinated, but no dose information was available

In 2017, 40.5% (463/1142) of cases reported contact with a laboratory-confirmed case of pertussis.

Twenty outbreaks of *Bordetella pertussis* were reported in 2016, involving 160 cases. This is likely to be an underestimate as local outbreaks are not routinely reported during a national outbreak.

Ministry of Health hospital discharge data for 2017 included 139 hospitalisations where pertussis was the principal diagnosis.

Plague

The last case of *Yersinia pestis* infection in New Zealand was reported in 1911, during the last plague pandemic that originated in Hong Kong in 1894.

From 1900 to 1911, 21 cases of plague were recorded in New Zealand, nine of which were fatal.[24]

Poliomyelitis (polio)

There were no polio notifications in 2017.

The New Zealand Paediatric Surveillance Unit carries out active surveillance of acute flaccid paralysis (AFP) to demonstrate the absence of wild polio virus. In 2017, 12 cases of AFP were notified to the Unit. All 12 cases were reviewed by the National Certification Committee for the Eradication of Polio (NCCEP) and classified as non-polio.

Since the mass oral polio vaccine (OPV) immunisation campaigns in New Zealand in 1961 and 1962, six polio cases have been reported. All were either laboratory-confirmed as vaccine-associated (4 cases) or classified as probable vaccine-associated cases (2 cases).[18] The most recent vaccine-associated case occurred in 1999.[25] No cases have been reported since the inactivated polio vaccine (IPV) replaced OPV in 2002.

In 1976, an imported case of wild polio virus infection was managed in New Zealand after a child arrived unwell from Tonga.[18]

Primary amoebic meningoencephalitis

The last case of primary amoebic meningoencephalitis (*Naegleria fowleri)* in New Zealand was notified in 2000. There were five prior cases, four of which were part of the same outbreak in 1968. All six cases to date were fatal and were linked to swimming in geothermal pools in the central North Island.[26]

Q fever

No cases of Q fever (*Coxiella burnetii*) were notified in 2017. Only three cases of Q fever have been notified in New Zealand since 1997, one case each year in 2004, 2010 and 2011. All three cases had travelled overseas during the incubation period for the disease.

Rabies and other lyssaviruses

New Zealand is classified as a rabies-free country.[27] No cases of rabies or other lyssavirus have been reported in New Zealand.

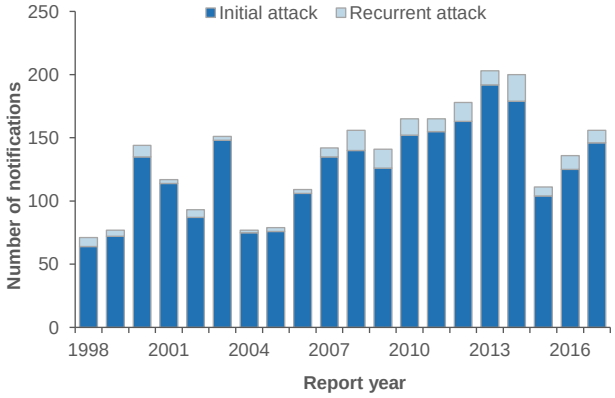
Rheumatic fever

In 2017, 156 cases of rheumatic fever were notified compared with 136 cases in 2016. The 2017 notification rate (3.3 per 100,000) was similar to the 2017 rate (2.9 per 100,000).

Of the 156 cases of rheumatic fever, 146 cases were initial episodes and 10 were recurrences. This is a rate of 3.0 per 100,000 for initial episodes and 0.2 per 100,000 for recurrences.

Figure 27 shows the number of initial episodes and recurrent cases of rheumatic fever reported each year since 1998.

Figure 27. Rheumatic fever (initial episodes and recurrent cases) by year, 1998–2017



Hospitalisation date was recorded for all of the 147 cases that were hospitalised. Of these, 101 (68.7%) cases were notified within seven days of hospital admission.

Ministry of Health hospital discharge data for 2017 included 205 hospitalisations where rheumatic fever was the principal diagnosis.

Initial episodes

Of the 146 initial episode cases notified, 130 were confirmed, eight were probable and eight were suspect cases.

Counties Manukau (8.4 per 100,000) DHB had the highest rate followed by Northland (6.3 per 100,000) and Waikato (4.9 per 100,000) DHBs.

Children aged 10–14 years (15.9 per 100,000) had the highest rate, followed those aged 5–9 years (12.9 per 100,000).

Males (3.6 per 100,000) had a higher rate than females (2.5 per 100,000).

The ethnic group with the highest rate was Pacific peoples (23.1 per 100,000), followed by Māori (10.1 per 100,000). These two ethnic groups accounted for 95.9% of initial episode cases.

Hospitalisation status was recorded for 145 (99.3%) cases, of which 138 (95.2%) were hospitalised.

Recurrences

In 2017, 10 recurrent cases were notified, from Counties Manukau (4 cases), Auckland (2 cases), Waitemata, Waikato, Tairawhiti and Bay of Plenty (1 case each) DHBs.

The age range of cases was 21 to 40 years. Six cases were male and four were female. All 10 recurrent cases were either Pacific peoples (6 cases) or Māori (4 cases).

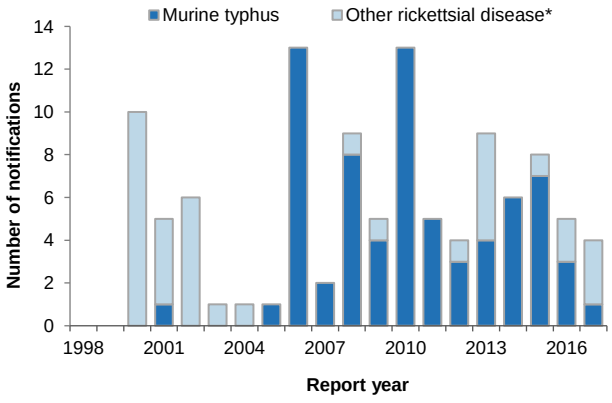
Nine (90.0%) recurrent cases were hospitalised.

Rickettsial disease

This section includes murine typhus (*Rickettsia typhi)*, typhus (*Rickettsia prowazekii*) and other rickettsial diseases caused by organisms of the *Rickettsia* genus. For Q fever, see its separate section.

Four cases of rickettsial disease were notified compared with five cases in 2016 (Figure 28).

Figure 28. Rickettsial disease notifications, 1998–2017



* Includes all other diseases caused by organisms of the *Rickettsia* genus, except typhus.

Murine typhus (*Rickettsia typhi*)

One laboratory-confirmed cases of murine typhus was notified from Auckland DHB.

The case was a male, aged 50–59 years, of European or Other ethnicity. The case was hospitalised.

The case had not travelled overseas during the incubation period for the disease and is assumed to have acquired their infection in New Zealand.

Typhus (*Rickettsia prowazekii*)

No cases of typhus have been reported from 1997 to 2017.

Other rickettsial diseases

Three laboratory-confirmed cases of other rickettsial diseases were notified, all caused by *Orientia tsutsugamushi* (scrub typhus).

The cases were males aged 60–69 (2 cases) and 30–39 (1 case) years. Two cases were of European or Other ethnicity and one was Asian. Two of the cases were hospitalised.

All three cases had travelled overseas during the incubation period for the disease. Countries visited were China, India, Taiwan, Thailand and Vietnam. Two cases reported travel to more than one country.

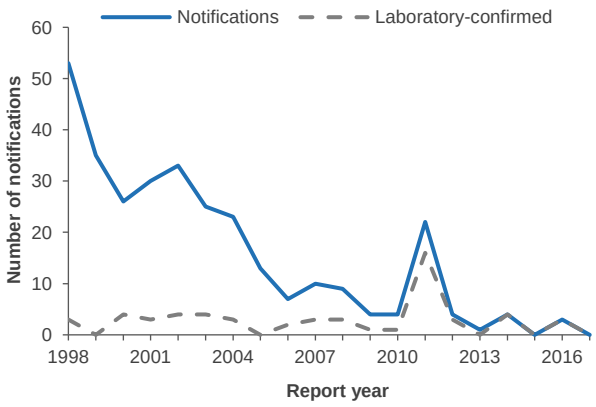
Rubella (German measles)

Rubella immunisation was introduced in 1970 for all children at age four years. In 1979 it was limited to girls at age 11 years and then extended to all children again when MMR was introduced in 1990. The recommended immunisation schedule for rubella is two doses of MMR vaccine, given at 15 months and 4 years of age.[18] Rubella has been a notifiable disease since June 1996.[18]

One confirmed rubella case was notified in 2017, compared with three cases in 2016. The case was aged 15–19 years and of Asian ethnicity. The case had not been vaccinated and was in the Philippines during the incubation period.

The last national rubella outbreak occurred in 1995.[18] The number of rubella cases since 1998 is shown in Figure 29. There was an increase in notifications in 2011 during the measles outbreak.

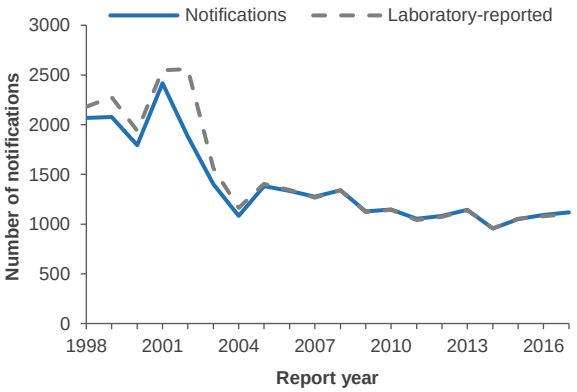
Figure 29. Rubella notifications and laboratory-confirmed cases by year, 1998–2017



Salmonellosis

In 2017, 1119 cases of salmonellosis were notified. The 2017 notification rate (23.3 per 100,000) was similar to the 2016 rate (23.2 per 100,000, 1091 cases). A large decrease in salmonellosis notifications occurred between 2001 and 2004 and numbers have remained relatively stable since 2005 (Figure 30).

Figure 30. Salmonellosis notifications and laboratory-reported cases by year, 1998–2017



The highest rate for salmonellosis was reported from in Tairawhiti (45.4 per 100,000) DHB followed by South Canterbury (36.9 per 100,000), Canterbury (36.3 per 100,000) and Northland (33.6 per 100,000) DHBs. (Figure 31).

Notification rates were highest for infants aged less than 1 year and children aged 1–4 years (113.9 and 65.6 per 100,000 respectively).

The notification rate for males (25.3 per 100,000) was slightly higher than females (21.4 per 100,000).

Ethnicity was recorded for 1089 (97.3%) cases. The ethnic group with the highest notification rate was European or Other (25.9 per 100,000), followed by MELAA (24.3 per 100,000).

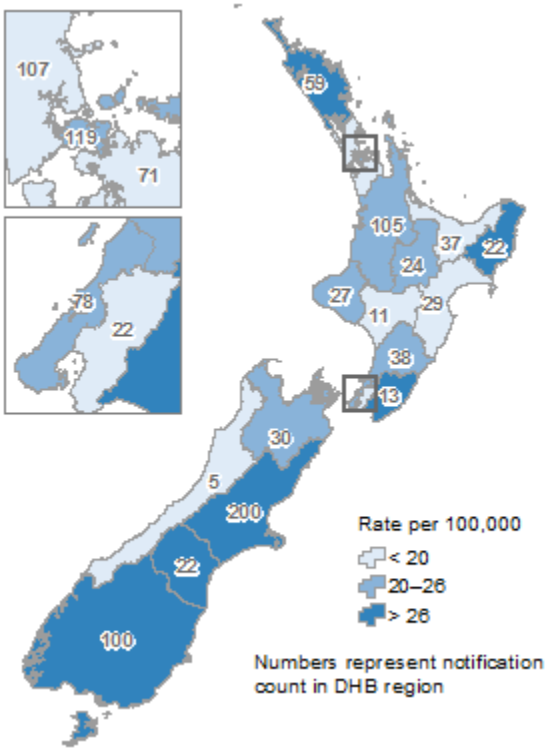
Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 1047 (93.6%) cases, of which 220 (21.0%) were hospitalised. One death due to salmonellosis was reported, aged 60-69 years.

The most common risk factors reported for salmonellosis in 2017 were consumption of food from retail premises, overseas travel and contact with farm animals (Table 23)

In 2017, 14 outbreaks of salmonellosis were reported, involving 41 cases.

Figure 31. Salmonellosis notifications by DHB, 2017



The Enteric Reference Laboratory at ESR confirmed 1103 isolates of *Salmonella* from humans (excluding *S.* Paratyphi and *S.* Typhi) in 2017. The most common serotypes identified were *S.* Typhimurium phage type 56 variant (115 isolates), *S.* Typhimurium phage type 101 (65 isolates), *S.* Enteritidis phage type 11 (55 isolates), *S.* Brandenburg (54 isolates) and *S.* Bovismorbificans (52 isolates).

The number of cases for selected *Salmonella* serotypes for the last five years is shown in Figure 32. Since 2014, the number of cases of *S.* Bovismorbificans has noticeably increased, from four cases in 2014 to 52 cases in 2017. For other serotypes, the number of cases varies from year to year.

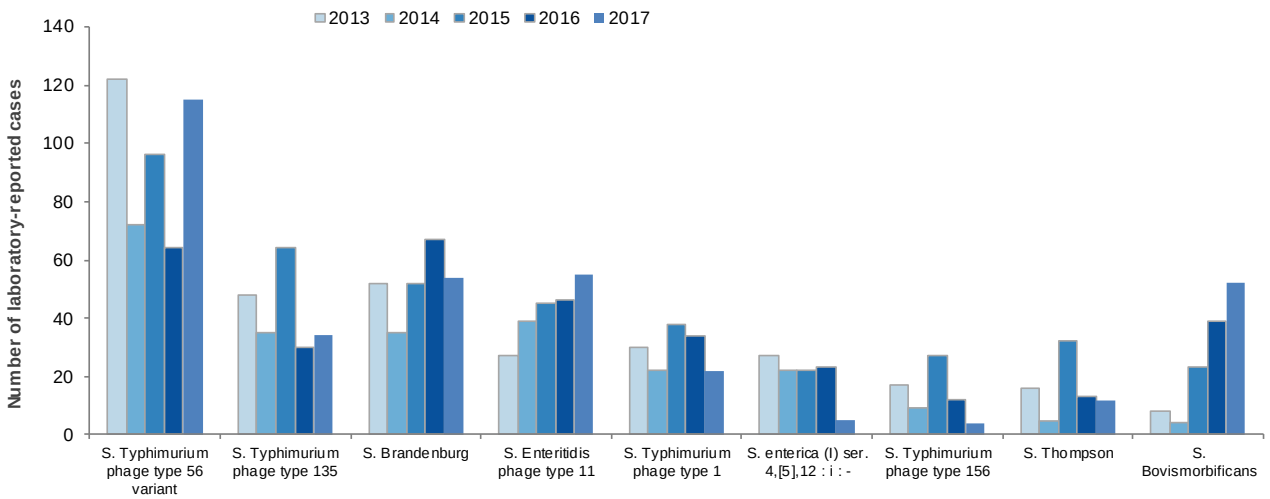
A summary of the laboratory-reported cases from 2013 to 2017 for selected *Salmonella* serotypes and phage types is provided in Table 36 in the Appendix.

Table 23. Exposure to risk factors associated with salmonellosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Consumed food from retail premises	293	344	482	46.0
Travelled overseas during the incubation period	336	623	160	35.0
Contact with farm animals	175	503	441	25.8
Contact with untreated water	150	454	515	24.8
Recreational water contact	135	523	461	20.5
Contact with faecal matter	84	500	535	14.4
Contact with other symptomatic people	79	633	407	11.1
Contact with sick animals	48	590	481	7.5

[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Figure 32. Laboratory-reported cases of selected *Salmonella* serotypes and phage types by year, 2013–2017



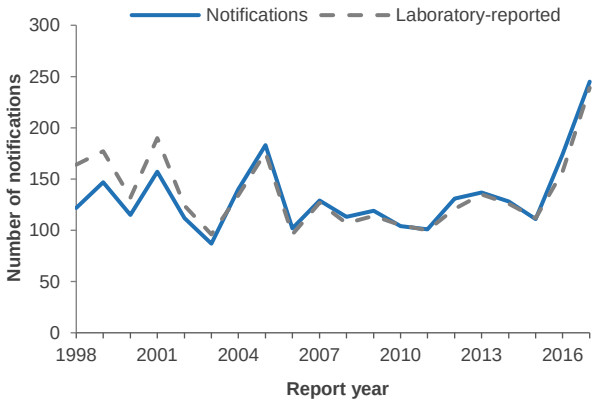
Severe acute respiratory syndrome (SARS)

No cases of SARS have been diagnosed in New Zealand since SARS emerged in Southern China in 2003.[6]

Shigellosis

In 2017, 245 cases of shigellosis were notified compared with 174 in 2016. The 2017 notification rate (5.1 per 100,000) was a significant increase from the 2016 rate (3.7 per 100,000). Figure 33 shows total cases by year between 1998 and 2017.

Figure 33. Shigellosis notifications and laboratory-reported cases by year, 1998–2017



Auckland, Counties Manukau, Hawke's Bay and Capital & Coast DHBs had the highest notification rates (11.5, 10.6, 6.7 and 6.1 per 100,000 respectively).

The highest notification rate was in children aged 1–4 years (11.4 per 100,000), followed by adults aged 20–29 (6.4 per 100,000), 30–39 and 50–59 (both 5.3 per 100,000) years.

Males (5.7 per 100,000) had a higher rate than females (4.5 per 100,000).

Ethnicity was recorded for 240 (98.0%) cases. The ethnic group with the highest notification rate was Pacific peoples (26.9 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 235 (95.9%) cases, of which 62 (26.4%) were hospitalised.

The risk factors recorded for shigellosis are shown in Table 24. Overseas travel information was recorded for 235 (95.9%) cases, of which 134 (57.0%) had lived or travelled overseas during the incubation period for the disease. Eight further cases had a prior history of travel. The countries most commonly lived in or visited were India and Samoa (34 cases each), and Tonga (12 cases). Some cases reported travel to more than one country.

Eight outbreaks of shigellosis involving 32 cases were reported in 2017.

The Enteric Reference Laboratory at ESR confirmed 239 isolates as *Shigella* during 2017. The most common species identified were *S. flexneri* (126 isolates, 52.7%) and *S. sonnei* (99 isolates, 41.4%). The most common *S. sonnei* biotypes identified were biotype g (68 isolates, 68.7%) and biotype a (30 isolates, 30.3%).

Taeniasis

Four cases of taeniasis were notified in 2017, which is the same number of cases notified in 2016.

All four cases were overseas during the incubation period for the disease. Countries lived in or visited were Ethiopia, France, Laos, Northern Europe, Thailand and Vietnam. One case had travelled to more than one country.

A total of 56 cases have been notified since 1997. Of these, 55 cases (98.2%) reported a history of overseas travel. The other case had an unknown travel history.

Table 24. Exposure to risk factors associated with shigellosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Travelled overseas during the incubation period	134	101	10	57.0
Consumed food from retail premises	39	54	152	41.9
Recreational water contact	26	95	124	21.5
Consumed untreated water	18	93	134	16.2
Contact with other symptomatic people	25	137	83	15.4
Contact with farm animals	14	82	149	14.6
Contact with faecal matter	10	116	119	7.9

[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Tetanus

No cases of tetanus were notified in 2017.

Between 1997 and 2017, a total of 33 tetanus cases were reported. Of these, four were children aged less than 10 years. None were vaccinated. Of the 33 cases, two females aged over 70 years died from tetanus (one was not vaccinated and the vaccination status of the other was unknown).

Trichinellosis

No cases of trichinellosis were notified in 2017.

Trichinellosis was added to the notifiable diseases schedule in 1988. Since then four cases have been reported with two cases reported in 2001.[28]

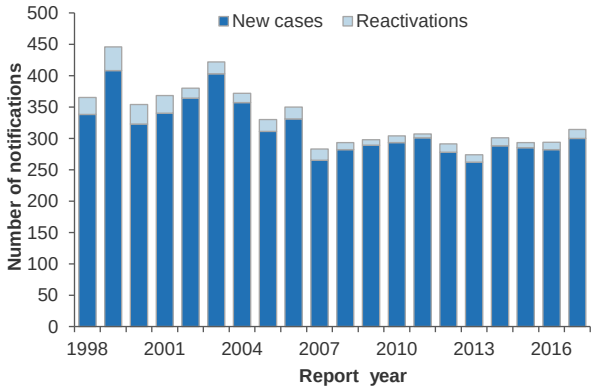
Tuberculosis disease

A full description of the epidemiology of tuberculosis and data on antimicrobial drug-resistant tuberculosis for 2017 will be reported separately in the report titled 'Tuberculosis in New Zealand: Annual Report 2017' available at www.surv.esr.cri.nz.

In 2017, a total of 314 cases of tuberculosis disease were notified, consisting of 300 (95.5%) new cases and 14 (4.5%) reactivations**. The 2017 rate was 6.6 per 100,000, similar to the 2016 rate of 6.3 per 100,000.

Figure 34 shows the total number of new tuberculosis cases and reactivations reported since 1998. The number of cases has remained fairly stable since 2007.

Figure 34. Tuberculosis notifications (new cases and reactivations) by year, 1998–2017



Laboratory information was available for 313 (99.7%) cases. Of these, 275 (87.9%) cases were reported as laboratory-confirmed.

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

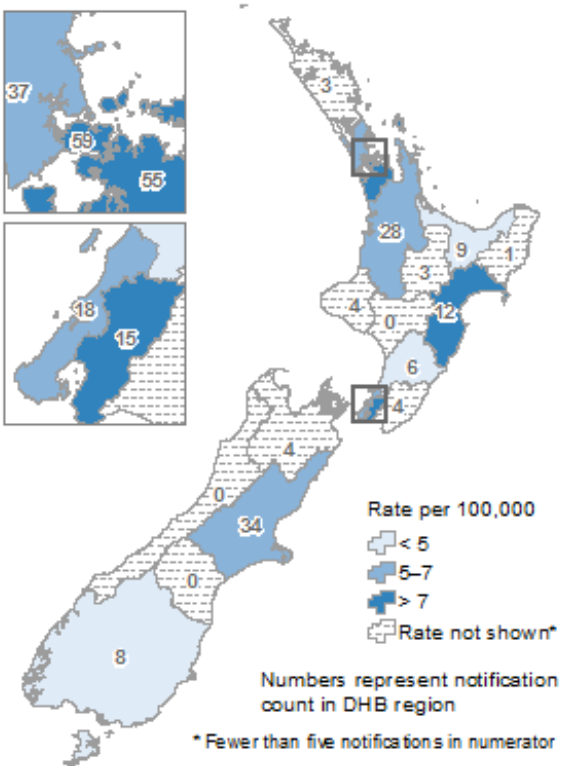
Three outbreaks of tuberculosis were reported, involving 10 cases.

Ministry of Health hospital discharge data for 2017 included 217 hospitalisations where tuberculosis was the principal diagnosis.

Tuberculosis disease - new cases

The highest notification rate for new tuberculosis cases was from Auckland DHB (11.3 per 100,000), followed by Counties Manukau (10.1 per 100,000) and Hutt Valley (10.1 per 100,000) DHBs (Figure 35).

Figure 35. Tuberculosis notifications (new cases) by DHB, 2017



New tuberculosis rates were highest for adults aged 20–29 years (13.1 per 100,000), followed by those aged 30–39 (10.5 per 100,000) and 60–69 (7.4 per 100,000) years. Three cases were in children aged less than five years.

Males and females had similar notification rates (6.3 per 100,000, and 6.2 per 100,000, respectively).

The ethnic group with the highest notification rate for new tuberculosis cases was Asian (37.4 per 100,000), followed by MELAA (13.1 per 100,000) and Pacific peoples (12.9 per 100,000).

** The term 'reactivation' refers to cases with second or subsequent episodes of tuberculosis disease.

Hospitalisation status was recorded for all new tuberculosis cases in 2017, of which 167 (55.7%) were hospitalised. One death due to tuberculosis was reported, aged 70 years and over.

Of the three children aged less than five years, with tuberculosis, none were reported as having received the BCG vaccine. None of these cases had miliary or meningeal TB.

The majority of new tuberculosis cases (248/300, 82.7%) were born overseas. Among the 52 cases born in New Zealand, nine had been, or were presently, living with a person born outside New Zealand.

A total of 60 (27.3%) new tuberculosis cases reported contact with a confirmed case of tuberculosis.

Tuberculosis disease - reactivation/relapse cases

The 14 tuberculosis reactivation or relapse cases reported in 2017 were from six DHBs: Counties Manukau (4 cases), Auckland (3 cases), Canterbury, MidCentral, Waitemata (2 cases each), and Waikato (1 case each). Cases were all aged 15 years and over, with the highest numbers of cases aged 30–39, 60–69 (4 cases each) years and 70 years and over (3 cases).

Thirteen tuberculosis reactivation/relapse cases were of Asian ethnicity and one was Māori.

Thirteen of the 14 tuberculosis reactivation/ relapse cases were born overseas, of which 12 cases were diagnosed with previous disease overseas and one in New Zealand. The one New Zealand born case was previously diagnosed in New Zealand. Treatment status was recorded for eight of the 14 cases, and all had previously been treated for the disease. Two cases, both with extra-pulmonary disease, were previously diagnosed and treated in New Zealand.

Hospitalisation status was recorded for all reactivation/relapse cases, of which nine were hospitalised.

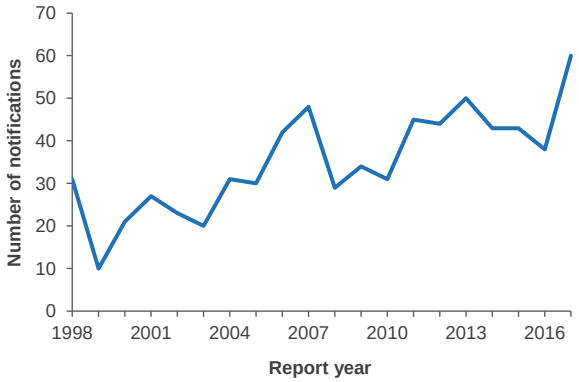
No deaths were reported among the reactivation/relapse cases.

Typhoid fever

In 2017, 60 cases of typhoid fever were notified compared with 38 cases in 2016. The 2017 notification rate (1.3 per 100,000) was a significant increase from the 2016 rate (0.8 per 100,000).

Figure 36 shows an increasing trend in the number of typhoid fever notifications from 1998 to 2013. From 2011 to 2017 the number of notified cases per year has ranged from 38 to 60.

Figure 36. Typhoid fever notifications by year, 1998–2017



Nearly two-thirds (65.0%) of cases were reported by Counties Manukau (22 cases) and Auckland (17 cases) DHBs.

Notification rates were highest for children aged 1–4 (2.4 per 100,000) and 5–9 (2.1 per 100,000) years and adults aged 20–29 years (2.0 per 100,000).

Males (1.3 per 100,000) had a similar notification rate to females (1.2 per 100,000).

Ethnicity was recorded for all 98.3% cases. The ethnic group with the highest notification rate was Pacific peoples (11.2 per 100,000) followed by Asian (2.7 per 100,000).

Hospitalisation status was recorded for 59 cases, of which 50 (84.7%) were hospitalised. One death due to typhoid fever was reported aged 50–59 years.

Of the 60 cases notified in 2017, 33 (55.0%) had travelled overseas during the incubation period for the disease. The countries most commonly visited were India (17 cases) and Samoa (8 cases). Some cases reported travel to more than one country.

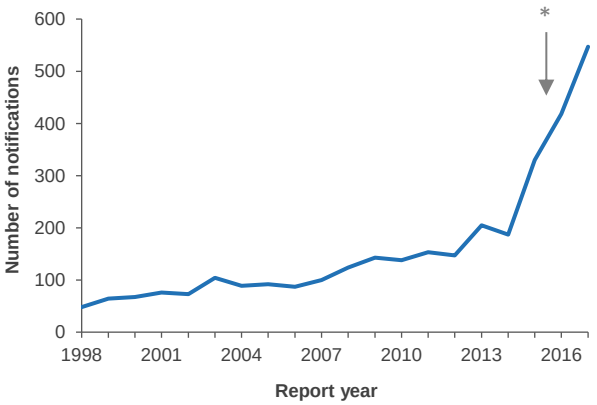
Two typhoid fever outbreaks involving 26 cases were reported in 2017.

The Enteric Reference Laboratory at ESR confirmed 61 isolates as *Salmonella* Typhi during 2017. The most common phage types identified were *S.* Typhi phage type E1a (32 isolates) and *S.* Typhi phage type E7 variant (5 isolates).

Verotoxin- or Shiga toxin-producing *Escherichia coli* infection

In 2017, 547 cases of verocytotoxin- or Shiga toxin-producing *Escherichia coli* (VTEC/STEC) infection were notified, compared with 418 cases in 2016. The 2017 notification rate (11.4 per 100,000) was significantly higher than the 2016 rate (8.9 per 100,000). The introduction of enteric PCR panels in an Auckland laboratory in July 2015 and a Dunedin laboratory in January 2017 has, in part, resulted in increased VTEC/STEC detection and contributed to an increased notification rate since mid-2015. The number of notifications of VTEC/STEC infection has been gradually increasing since 1997 (Figure 37).

Figure 37. VTEC/STEC notifications by year, 1998–2017

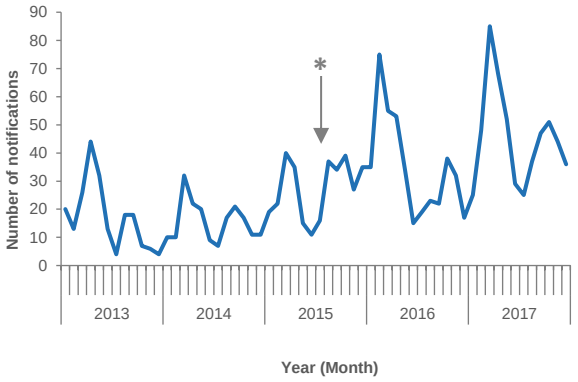


* Introduction of screening of all faecal specimens using PCR in an Auckland laboratory.

Twelve paediatric cases of haemolytic uraemic syndrome (HUS) were reported to the New Zealand Paediatric Surveillance Unit (NZPSU) in 2017. Nine cases were confirmed to be VTEC/STEC-associated.

VTEC/STEC infection notifications follow a seasonal pattern, with peaks occurring during autumn and spring each year (Figure 38).

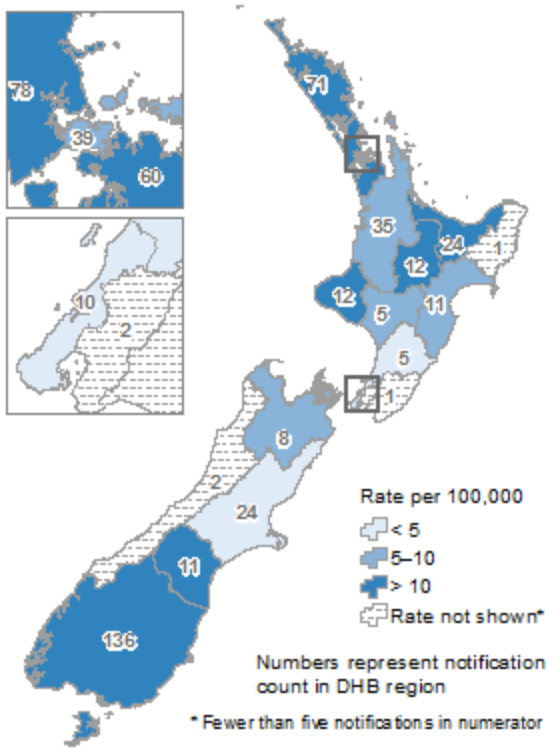
Figure 38. VTEC/STEC infection notifications by month, January 2013–December 2017



* Introduction of screening of all faecal specimens using PCR in an Auckland laboratory.

The highest rate for VTEC/STEC infection notifications was from Southern (41.9 cases per 100,000) DHB, followed by Northland (40.5 per 100,000) and Waitemata (12.9 per 100,000) DHBs (Figure 39). A statistically significant increase in rates from 2016 to 2017 was detected for Northland and Southern DHBs.

Figure 39. VTEC/STEC infection notifications by DHB, 2017



Infants aged less than 1 year had the highest notification rate (59.4 per 100,000), followed by children aged 1–4 years (48.9 per 100,000).

Females had a similar notification rate (11.8 per 100,000) to males (11.1 per 100,000).

Ethnicity was recorded for 527 (96.3%) cases. The ethnic group with the highest notification rate was MELAA (22.4 per 100,000), followed by European or Other (12.6 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 543 (99.3%) cases, of which 123 (22.7%) were hospitalised. Of the 123 hospitalised cases, 11 had HUS. No deaths due to VTEC/STEC infection were reported in 2017.

The most common risk factors reported for VTEC/STEC infection cases in 2017 were contact with pets, farm animals and animal manure (Table 25).

The most common foods consumed were raw fruit or vegetables, chicken or poultry and dairy products (Table 26).

In 2017, 11 outbreaks of VTEC/STEC infection were reported involving 197 cases.

Ministry of Health hospital discharge data for 2017 included 11 hospitalisations where VTEC/STEC infection was the primary diagnosis.

The Enteric Reference Laboratory at ESR confirmed 528 isolates of VTEC/STEC in 2017. Of these, 196 (37.1%) were identified as *E. coli* O157:H7 and 226 (42.8%) as *E. coli* non-O157 serotypes. The serotype was undetermined in 106 (20.1%) cases, but verocytotoxin-producing genes were detected by PCR.

Viral haemorrhagic fevers

No cases of viral haemorrhagic fever (including Ebola) have ever been reported in New Zealand.[6]

Yellow fever

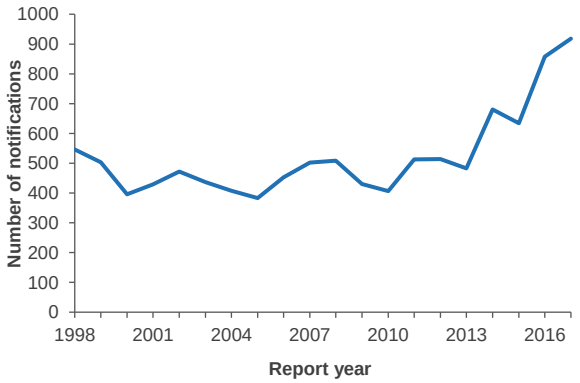
No cases of yellow fever have been notified in New Zealand since at least 1996.

Yersiniosis

In 2017, 918 cases of yersiniosis were notified. The 2017 notification rate (19.2 per 100,000) was higher than the 2016 rate (18.3 per 100,000, 858 cases).

The number of notifications for yersiniosis has been steadily increasing since 2010 (Figure 40).

Figure 40. Yersiniosis notifications by year, 1998–2017



Wairarapa (33.7 per 100,000), Canterbury and South Canterbury (both 28.5 per 100,000) DHBs had the highest notification rates for yersiniosis (Figure 41).

Table 25. Exposure to risk factors associated with VTEC/STEC infection, 2017

Risk factor	Yes	No	Unknown	Percentage (%)[a]
Contact with pets	251	35	261	87.8
Contact with farm animals	123	129	295	48.8
Contact with animal manure	79	131	337	37.6
Contact with children in nappies	80	300	167	21.1
Contact with recreational water	88	358	101	19.7
Contact with other animals	40	171	336	19.0
Contact with a person with similar symptoms	70	409	68	14.6
Travelled overseas during the incubation period	52	465	30	10.1

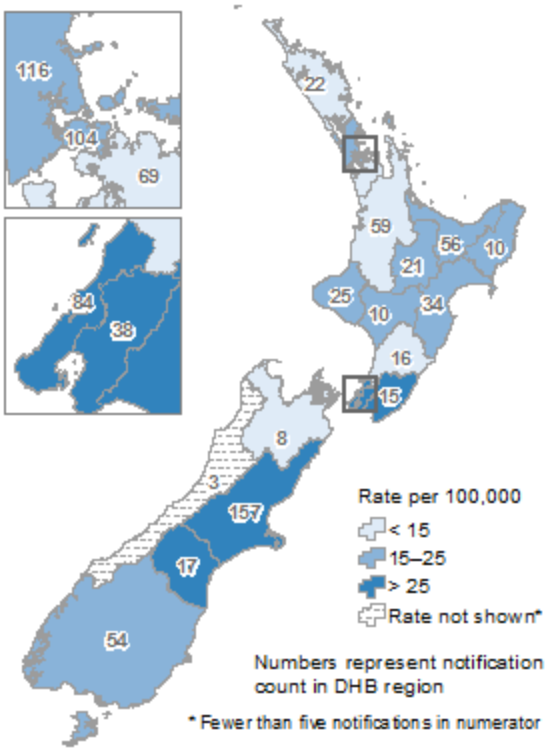
[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

Table 26. Foods consumed by VTEC/STEC infection cases, 2017

Foods consumed	Yes	No	Unknown	Percentage (%)[a]
Raw fruit or vegetables	253	70	224	78.3
Dairy products	253	81	213	75.7
Chicken or poultry products	258	83	206	75.7
Beef or beef products	238	113	196	67.8
Processed meat	166	172	209	49.1
Lamb or hogget or mutton	118	217	212	35.2
Fruit or vegetable juice	104	202	241	34.0
Home kill meat	82	278	187	22.8
Pink or undercooked meat	38	304	205	11.1
Unpasteurised milk or milk products	16	360	171	4.3

[a] Percentage refers to the number of cases that answered "yes" out of the total number of cases for which this information was known.

Figure 41. Yersiniosis notifications by DHB, 2017



Infants aged less than 1 year and children aged 1–4 years had the highest notification rates (102.4 and 57.5 per 100,000, respectively).

Males (19.8 per 100,000) had a slightly higher notification rate than females (18.5 per 100,000).

Ethnicity was recorded for 888 (96.7%) cases. The ethnic group with the highest notification rate was MELAA (33.6 per 100,000), followed by Asian (29.7 per 100,000), and European or Other (18.0 per 100,000).

Further information by DHB, sex, age and ethnic group is in Table 31 to Table 34 in the Appendix.

Hospitalisation status was recorded for 622 (67.8%) cases, of which 84 (13.5%) were hospitalised.

The most common risk factors reported were consumption of food from retail premises and contact with farm animals (Table 27).

One outbreak due to *Yersinia/Campylobacter* was reported in 2017, involving five cases.

The Enteric Reference Laboratory at ESR confirmed 822 isolates as *Yersinia enterocolitica* and 12 isolates as *Y. pseudotuberculosis* during 2017. The most common *Y. enterocolitica* biotypes identified were biotype 2 (354 isolates, 43.1%), biotype 1A (178 isolates, 21.7%), biotype 3 (101 isolates, 12.3%) and biotype 2/3 serotype O:9 (99 isolates, 12.0%).

Table 27. Exposure to risk factors associated with yersiniosis, 2017

Risk factor	Yes	No	Unknown	Percentage (%) [a]
Consumed food from retail premises	172	237	509	42.1
Contact with farm animals	120	351	447	25.5
Contact with faecal matter	83	345	490	19.4
Recreational water contact	75	384	459	16.3
Consumed untreated water	68	362	488	15.8
Contact with other symptomatic people	41	377	500	9.8
Travelled overseas during the incubation period	40	497	381	7.4
Contact with sick animals	26	403	489	6.1

[a] Percentage refers to the number of cases that answered “yes” out of the total number of cases for which this information was known. Some cases had more than one risk factor recorded.

APPENDIX: NATIONAL DATA AND TRENDS

Comparison of notifiable disease cases and rates for 2016 and 2017

Table 28. Numbers of cases for rare notifiable diseases in New Zealand, 2016 and 2017

Disease[a]	2016	2017
Brucellosis	0	1
Creutzfeldt-Jakob disease[b]	9	13
Cronobacter species invasive disease	0	2
Diphtheria	1	1
Haemophilus influenzae type b disease	2	4
Hepatitis NOS	8	10
Hydatid disease	2	1
Leprosy	0	3
Rickettsial disease	5	4
Ross River virus infection	4	7
Rubella	3	1
Taeniasis	4	4
Tetanus	1	0

[a] No cases of the following notifiable diseases were reported in 2016 or 2017: anthrax, Barmah Forest virus infection, botulism, cholera, congenital rubella, cysticercosis, decompression sickness, highly pathogenic avian influenza, Japanese encephalitis, Middle East respiratory syndrome (MERS), non-seasonal influenza, plague, poliomyelitis, primary amoebic meningo-encephalitis, Q fever, rabies, severe acute respiratory syndrome (SARS), trichinellosis, viral haemorrhagic fever and yellow fever.

[b] Creutzfeldt-Jakob disease data is provided by the National CJD Registry, University of Otago.

Deaths due to notifiable diseases, as recorded in EpiSurv, 1998–2017

Table 29. Deaths due to notifiable diseases, as recorded in EpiSurv, 1998–2017

Disease	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AIDS [a]	19	18	19	14	11	10	14	15	15	11	8	9	15	5	9	8	7	7	3	7
Campylobacteriosis	2	1	3	1	1	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0
Creutzfeldt-Jakob disease[b]	0	2	3	1	3	4	3	0	5	0	0	0	0	0	8	6	6	6	9	13
Gastroenteritis[c]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
Giardiasis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haemophilus influenza type b	0	0	0	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Hepatitis B	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	1	1	0	0
Hydatid disease	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Invasive pneumococcal disease[d]											8	35	27	32	32	18	22	26	22	27
Legionellosis[e]	1	1	5	2	3	1	1	4	3	1	4	2	5	4	6	3	1	4	1	5
Listeriosis - non-perinatal	0	1	2	1	0	2	3	1	0	2	3	2	3	1	4	2	3	1	0	0
Listeriosis - perinatal	0	2	4	1	3	2	2	4	1	2	2	2	4	0	2	3	2	3	2	0
Malaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Meningococcal disease	23	23	17	26	18	13	8	14	7	7	8	5	6	13	6	4	3	4	2	9
Non seasonal influenza A (H1N1)[f]												36	17	0	0	0	0	0	0	0
Pertussis	0	0	1	0	1	1	1	0	0	0	0	0	0	1	2	1	0	0	0	0
Primary amoebic meningoencephalitis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheumatic fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salmonellosis	2	1	7	2	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	1
Shigellosis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Tetanus	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Tuberculosis disease	8	14	8	2	6	6	6	4	6	3	4	4	9	3	5	2	4	6	5	1
Typhoid fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
VTEC/STEC infection	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Yersiniosis	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Data source: AIDS Epidemiology Group.

[b] Data source: CJD Registry.[16]

[c] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

[d] Invasive pneumococcal disease became notifiable on 17 October 2008.

[e] One further legionellosis death occurred in a laboratory-reported but non-notified case in 2002.

[f] Non-seasonal influenza became notifiable on 26 April 2009. Deaths recorded in 2009 and 2010 were due to influenza A(H1N1)pdm09. Influenza A(H1N1)pdm09 virus was re-classified as seasonal influenza from 1 January 2011.

Note: The numbers in this table are those recorded in EpiSurv where the notifiable disease was the primary cause of death. Information on a death is most likely to be reported by public health services when it occurs close to the time of notification and investigation.

Morbidity data for selected notifiable diseases, 2015–2017 (Ministry of Health)

Table 30. Hospital admissions for selected notifiable diseases, 2015–2017

Disease	ICD 10 codes	2015		2016		2017	
		Prin [a]	Oth [b]	Prin [a]	Oth [b]	Prin [a]	Oth [b]
AIDS	B20-B24	7	279	9	240	6	259
Arboviral diseases	A83, A84, A85.2, A92, A93, A94, B33.1	17	7	11	11	5	
Brucellosis	A23	1					1
Campylobacteriosis	A04.5	574	117	608	124	576	136
Cholera	A00		1	1		1	
Creutzfeldt-Jakob disease	A81.0	6	1	6	2	17	6
Cryptosporidiosis	A07.2	22	9	39	11	46	21
Cysticercosis	B69					1	
Decompression sickness	T70.3	25	5	17	6	25	1
Dengue fever	A90, A91	54	4	63	5	80	4
Diphtheria	A36	1	1	1	1	2	3
Giardiasis	A07.1	34	21	29	22	37	32
Hepatitis A	B15	27	39	19	65	40	41
Hepatitis B	B16	20	27	19	33	9	20
Hepatitis C	B17.1	4	9	7	8	6	10
Hydatid disease	B67	20	11	4	4	7	5
Legionellosis	A48.1	49	85	70	82	76	86
Leprosy	A30	4	2	1	1		1
Leptospirosis	A27	52	16	70	17	99	16
Listeriosis	A32	19	14	21	22	6	12
Malaria	B50-B54	36	1	20	1	32	3
Measles	B05	5	2	33	3	5	
Meningococcal disease	A39	76	16	92	27	111	33
Mumps	B26	9	4	10	4	112	10
Paratyphoid	A01.1-A01.4	4		6		14	5
Pertussis	A37	112	53	75	27	139	38
Q fever	A78						
Rheumatic fever	I00, I01, I02	149	32	187	37	205	24
Rickettsial diseases	A75, A77, A79	5		5		4	
Rubella	B06				3	1	
Salmonellosis	A02	148	33	159	53	174	40
Shigellosis	A03	10	10	21	10	34	12
Taeniasis	B689						
Tetanus	A33-A35		1	3	1	3	3
Tuberculosis	A15-A19, P37.0	231	118	207	127	217	117
Typhoid	A01.0	49	4	39	6	64	4
Viral haemorrhagic fevers	A95, A98, A99	1		1		1	
VTEC/STEC infection	A04.3	14	6	10	6	11	9
Yellow fever	A95						
Yersiniosis	A04.6	38	24	41	26	53	34

[a] Principal diagnosis.

[b] Other relevant diagnosis.

Note: Hospital admission data may include multiple admissions (to the same or different hospitals) for the same case, and admissions may relate to cases first diagnosed in previous years.

Notifiable disease cases and rates by District Health Board, 2017

Table 31. Number of cases and rate per 100,000 population of notifiable diseases by DHB, 2017

Disease	District Health Board [a]																			
	Northland		Waitemata		Auckland		Counties Manukau		Waikato		Lakes		Bay of Plenty		Tairawhiti		Taranaki		Hawke's Bay	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	253	144.2	766	126.4	532	101.6	467	85.4	562	137.5	158	145.6	228	98.3	53	109.3	226	191.4	270	164.7
Cryptosporidiosis	53	30.2	108	17.8	85	16.2	140	25.6	120	29.4	20	18.4	33	14.2	26	53.6	25	21.2	20	12.2
Dengue fever	2		19	3.1	32	6.1	44	8.0	9	2.2	3		5	2.2	1		3		2	
Gastroenteritis[b]	17	9.7	23	3.8	50	9.6	20	3.7	7	1.7	9	8.3	10	4.3	1				2	
Giardiasis	79	45.0	176	29.0	216	41.3	189	34.6	168	41.1	49	45.2	105	45.3	38	78.4	26	22.0	65	39.7
Hepatitis A	3		7	1.2	6	1.1	21	3.8	7	1.7										
Hepatitis B[c]	1		2		3		6	1.1	2						1		1		2	
Hepatitis C[c]	2		1		3												3		1	
Invasive pneumococcal disease	25	14.3	46	7.6	40	7.6	79	14.5	48	11.7	17	15.7	46	19.8	7	14.4	11	9.3	23	14.0
Legionellosis	20	11.4	21	3.5	9	1.7	19	3.5	7	1.7	5	4.6	17	7.3			2		2	
Leptospirosis	7	4.0	7	1.2	1				54	13.2	2		5	2.2	1		5	4.2	13	7.9
Listeriosis	2		1		3		4		1				3						1	
Malaria	4		5	0.8	7	1.3	4		3		1		1				2		1	
Measles			2		1								2							
Meningococcal disease	5	2.9	13	2.1	8	1.5	21	3.8	10	2.4	2		9	3.9	1		1		5	3.1
Mumps	29	16.5	296	48.8	312	59.6	472	86.4	77	18.8	3		5	2.2			9	7.6	3	
Paratyphoid fever			8	1.3	12	2.3	4		1				2		2		1		10	6.1
Pertussis	72	41.0	199	32.8	171	32.7	117	21.4	194	47.5	49	45.2	129	55.6	18	37.1	57	48.3	101	61.6
Rheumatic fever[d]	11	6.3	14	2.3	23	4.4	50	9.1	21	5.1	3		7	3.0	3				5	3.1
Salmonellosis	59	33.6	107	17.7	119	22.7	71	13.0	105	25.7	24	22.1	37	16.0	22	45.4	27	22.9	29	17.7
Shigellosis	8	4.6	32	5.3	60	11.5	58	10.6	6	1.5	4		4		1		2		11	6.7
Tuberculosis disease	3		39	6.4	62	11.8	59	10.8	29	7.1	3		9	3.9	1		4		12	7.3
Typhoid fever			6	1.0	17	3.2	22	4.0	2		2								1	
VTEC/STEC infection	71	40.5	78	12.9	39	7.4	60	11.0	35	8.6	12	11.1	24	10.3	1		12	10.2	11	6.7
Yersiniosis	22	12.5	116	19.1	104	19.9	69	12.6	59	14.4	21	19.4	56	24.1	10	20.6	25	21.2	34	20.7
Zika virus					1				1				1				1			

[a] Table is continued on the following page.

[b] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

[c] Only acute cases of this disease are notifiable.

[d] Includes rheumatic fever initial attack and recurrent cases.

Note: Where fewer than five cases have been notified a rate has not been calculated and the cell has been left blank.

Notifiable disease cases and rates by District Health Board, 2017

Table 31. Number of cases and rate per 100,000 population of notifiable diseases by DHB, 2017 (continued)

Disease	District Health Board [a]																			
	Whanganui		MidCentral		Hutt Valley		Capital & Coast		Wairarapa		Nelson Marlborough		West Coast		Canterbury		South Canterbury		Southern	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	92	143.5	270	152.9	151	102.1	347	111	79	177.5	212	142.5	61	187.7	864	156.7	147	246.6	744	229.4
Cryptosporidiosis	18	28.1	59	33.4	7	4.7	35	11.2	20	44.9	83	55.8	6	18.5	150	27.2	37	62.1	147	45.3
Dengue fever	2		4		3		9	2.9			3				17	3.1	1		2	
Gastroenteritis[b]	16	25.0	38	21.5	21	14.2	51	16.3	1		1		5	15.4	36	6.5	2		14	4.3
Giardiasis	20	31.2	34	19.3	27	18.3	112	35.8	29	65.2	47	31.6	5	15.4	145	26.3	25	41.9	93	28.7
Hepatitis A			4				3								5	0.9			2	
Hepatitis B[c]							2				2				2				3	
Hepatitis C[c]			1				2				3				2				3	
Invasive pneumococcal disease	12	18.7	18	10.2	12	8.1	34	10.9	8	18.0	15	10.1	6	18.5	39	7.1	4		32	9.9
Legionellosis			3		6	4.1	2				10	6.7	4		72	13.1	4		18	5.6
Leptospirosis	8	12.5	7	4.0	2				4		6	4.0	3		8	1.5	3		6	1.9
Listeriosis	1		1								2				1		1			
Malaria					1		5	1.6			3				3				2	
Measles			7	4.0	1										1		1			
Meningococcal disease	3		2		2		8	2.6	1				3		11	2.0			7	2.2
Mumps	7	10.9	11	6.2	9	6.1	22	7.0			13	8.7			21	3.8			48	14.8
Paratyphoid fever			2				3				1				1					
Pertussis	20	31.2	38	21.5	56	37.9	156	49.9	11	24.7	248	166.7	10	30.8	244	44.3	18	30.2	235	72.5
Rheumatic fever[d]	1		2		5	3.4	4				1				4				2	
Salmonellosis	11	17.2	38	21.5	22	14.9	78	24.9	13	29.2	30	20.2	5	15.4	200	36.3	22	36.9	100	30.8
Shigellosis	2		3		3		19	6.1			1		1		15	2.7			15	4.6
Tuberculosis disease			8	4.5	15	10.1	18	5.8	4		4				36	6.5			8	2.5
Typhoid fever	1		2		1						1				1				4	
VTEC/STEC infection	5	7.8	5	2.8	2		10	3.2	1		8	5.4	2		24	4.4	11	18.5	136	41.9
Yersiniosis	10	15.6	16	9.1	38	25.7	84	26.9	15	33.7	8	5.4	3		157	28.5	17	28.5	54	16.7
Zika virus			2								1				2				2	

[a] Table is continued from the previous page.

[b] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

Note: Where fewer than five cases have been notified a rate has not been calculated and the cell has been left blank.

[c] Only acute cases of this disease are notifiable.

[d] Includes rheumatic fever initial attack and recurrent cases.

Notifiable disease cases and rates by sex, 2017

Table 32. Number of cases and rate per 100,000 population of notifiable diseases by sex, 2017

Disease	Sex					
	Male		Female		Total [a]	
	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	3586	151.9	2896	119.0	6482	135.2
Cryptosporidiosis	561	23.8	631	25.9	1192	24.9
Dengue fever	88	3.7	73	3.0	161	3.4
Gastroenteritis (acute)[b]	148	6.3	174	7.2	324	6.8
Giardiasis	847	35.9	801	32.9	1648	34.4
Hepatitis A	29	1.2	29	1.2	58	1.2
Hepatitis B[c]	22	0.9	5	0.2	27	0.6
Hepatitis C[c]	4		17	0.7	21	0.4
Invasive pneumococcal disease	273	11.6	249	10.2	522	10.9
Legionellosis	127	5.4	94	3.9	221	4.6
Leptospirosis	122	5.2	20	0.8	142	3.0
Listeriosis	11	0.5	10	0.4	21	0.4
Malaria	25	1.1	17	0.7	42	0.9
Measles	9	0.4	6	0.2	15	0.3
Meningococcal disease	53	2.2	59	2.4	112	2.3
Mumps	706	29.9	631	25.9	1337	27.9
Paratyphoid fever	24	1.0	23	0.9	47	1.0
Pertussis	981	41.6	1162	47.8	2143	44.7
Rheumatic fever[d]	91	3.9	65	2.7	156	3.3
Salmonellosis	597	25.3	521	21.4	1119	23.3
Shigellosis	135	5.7	110	4.5	245	5.1
Tuberculosis disease	156	6.8	158	6.5	314	6.6
Typhoid fever	31	1.3	29	1.2	60	1.3
VTEC/STEC infection	261	11.1	286	11.8	547	11.4
Yersiniosis	468	19.8	450	18.5	918	19.2
Zika virus	4		7	0.3	11	0.2

[a] Total includes cases where sex was unknown.

[b] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

[c] Only acute cases of this disease are notifiable.

[d] Includes rheumatic fever initial attack and recurrent cases.

Notifiable disease cases and rates by age group, 2017

Table 33. Number of cases and rate per 100,000 population of notifiable diseases by age group, 2017

Disease	<1 year		1–4 years		5–9 years		10–14 years		15–19 years		20–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70+ years		Total[a]	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	146	241.0	633	257.9	320	98.1	243	80.6	380	120.1	979	136.4	682	113.5	672	108.7	856	138.3	772	154.4	796	163.3	6482	135.2
Cryptosporidiosis	20	33.0	319	130.0	149	45.7	70	23.2	71	22.4	215	30.0	146	24.3	84	13.6	58	9.4	39	7.8	21	4.3	1192	24.9
Dengue fever			3		5	1.5	1		8	2.5	29	4.0	33	5.5	25	4.0	28	4.5	20	4.0	9	1.8	161	3.4
Gastroenteritis[b]	23	38.0	37	15.1	11	3.4	7	2.3	14	4.4	36	5.0	45	7.5	42	6.8	39	6.3	24	4.8	39	8.2	324	6.8
Giardiasis	22	36.3	270	110.0	104	31.9	47	15.6	44	13.9	209	29.1	371	61.8	204	33.0	175	28.3	145	29.0	57	11.7	1648	34.4
Hepatitis A			5	2.0	4		4		10	3.2	13	1.8	11	1.8	5	0.8	1		3		2		58	1.2
Hepatitis B[c]											2		4		10	1.6	5	0.8	6	1.2			27	0.6
Hepatitis C[c]									1		10	1.4	4		4		1				1		21	0.4
Invasive pneumococcal disease	11	18.2	34	13.9	14	4.3	10	3.3	8	2.5	20	2.8	24	4.0	44	7.1	79	12.8	103	20.6	175	35.9	522	10.9
Legionellosis	1				1		1						9	1.5	22	3.6	42	6.8	66	13.2	79	16.2	221	4.6
Leptospirosis									2		18	2.5	24	4.0	30	4.9	41	6.6	21	4.2	6	1.2	142	3.0
Listeriosis	1												1		1		3		5	1.0	10	2.1	21	0.4
Malaria			1		2				4		13	1.8	11	1.8	2		5	0.8	3		1		42	0.9
Measles			2		1				4		5	0.7	2				1						15	0.3
Meningococcal disease	14	23.1	24	9.8	5	1.5	3		17	5.4	13	1.8			5	0.8	14	2.3	6	1.2	11	2.3	112	2.3
Mumps	8	13.2	49	20.0	106	32.5	166	55.1	353	111.5	476	66.3	87	14.5	47	7.6	32	5.2	11	2.2	2		1337	27.9
Paratyphoid fever			3		2		1		5	1.6	19	2.6	5	0.8	3		7	1.1	2				47	1.0
Pertussis	129	213.0	222	90.5	295	90.4	269	89.3	202	63.8	151	21.0	199	33.1	269	43.5	198	32.0	120	24.0	89	18.3	2143	44.7
Rheumatic fever[d]			2		42	12.9	48	15.9	25	7.9	30	4.2	7	1.2	1		1						156	3.3
Salmonellosis	69	113.9	161	65.6	53	16.2	42	13.9	54	17.1	165	23.0	119	19.8	106	17.1	156	25.2	115	23.0	79	16.2	1119	23.3
Shigellosis	1		28	11.4	13	4.0	4		15	4.7	46	6.4	32	5.3	31	5.0	33	5.3	22	4.4	20	4.1	245	5.1
Tuberculosis disease			3		3				17	5.4	95	13.2	67	11.2	28	4.5	25	4.0	41	8.2	35	7.2	314	6.6
Typhoid fever			6	2.4	7	2.1	5	1.7	6	1.9	14	2.0	9	1.5	8	1.3	3		1		1		60	1.3
VTEC/STEC infection	36	59.4	120	48.9	31	9.5	28	9.3	23	7.3	59	8.2	44	7.3	36	5.8	47	7.6	48	9.6	75	15.4	547	11.4
Yersiniosis	62	102.4	141	57.5	33	10.1	38	12.6	32	10.1	118	16.4	103	17.1	96	15.5	111	17.9	102	20.4	82	16.8	918	19.2
Zika virus							1				1		2		2		3		1		1		11	0.2

[a] Total includes cases where age was unknown.

[b] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

[c] Only acute cases of this disease are notifiable.

[d] Includes rheumatic fever initial attack and recurrent cases.

Note: For fewer than five cases notified, a rate is not calculated and the cell is blank.

Notifiable disease cases and rates by ethnic group, 2017

Table 34. Number of cases and rate per 100,000 population of notifiable diseases by ethnic group, 2017

Disease	Ethnic group											
	Māori		Pacific peoples		Asian		MELAA[a]		European or Other		Total[b]	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	526	74.1	141	48.0	346	62.8	63	117.7	5035	158.1	6482	135.2
Cryptosporidiosis	137	19.3	46	15.6	47	8.5	12	22.4	897	28.2	1192	24.9
Dengue fever	2		60	20.4	29	5.3	4		61	1.9	161	3.4
Gastroenteritis[c]	36	5.1	10	3.4	23	4.2	2		227	7.2	324	6.8
Giardiasis	130	18.3	28	9.5	98	17.8	33	61.7	1278	40.1	1648	34.4
Hepatitis A	12	1.7	20	6.8	12	2.2	1		11	0.3	58	1.2
Hepatitis B[d]	6	0.8	6	2.0	3		0		11	0.3	27	0.6
Hepatitis C[d]	3		0		1		0		16	0.5	21	0.4
Invasive pneumococcal disease	134	18.9	82	27.9	27	4.9	4		266	8.4	522	10.9
Legionellosis	23	3.2	7	2.4	6	1.1	4		179	5.6	221	4.6
Leptospirosis	19	2.7	2		2		0		118	3.7	142	3.0
Listeriosis	5	0.7	3		1		0		12	0.4	21	0.4
Malaria	1		6	2.0	13	2.4	5	9.3	17	0.5	42	0.9
Measles	0		0		6	1.1	0		9	0.3	15	0.3
Meningococcal disease	34	4.8	12	4.1	5	0.9	4		57	1.8	112	2.3
Mumps	179	25.2	693	235.7	148	26.8	13	24.3	259	8.1	1337	27.9
Paratyphoid fever	11	1.5	0		12	2.2	0		23	0.7	47	1.0
Pertussis	308	43.4	137	46.6	67	12.2	26	48.6	1577	49.5	2143	44.7
Rheumatic fever[e]	76	10.7	74	25.2	3		0		3		156	3.3
Salmonellosis	111	15.6	49	16.7	91	16.5	13	24.3	825	25.9	1119	23.3
Shigellosis	14	2.0	79	26.9	24	4.4	5	9.3	118	3.7	245	5.1
Tuberculosis disease	25	3.5	38	12.9	219	39.7	7	13.1	24	0.8	314	6.6
Typhoid fever	6	0.8	33	11.2	15	2.7	0		5	0.2	60	1.3
VTEC/STEC infection	70	9.9	17	5.8	28	5.1	12	22.4	400	12.6	547	11.4
Yersiniosis	101	14.2	33	11.2	164	29.7	18	33.6	572	18.0	918	19.2
Zika virus	0		1		1		0		9	0.3	11	0.2

[a] Middle Eastern/Latin American/African.
[b] Total includes cases where ethnicity was unknown.
[c] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.
[d] Only acute cases of this disease are notifiable.
[e] Includes rheumatic fever initial attack and recurrent cases.

Note: Denominator data used to determine disease rates for ethnic groups is based on the proportion of people in each ethnic group from the estimated resident 2013 census population applied to the 2017 mid-year population estimates from Statistics New Zealand. Ethnicity is prioritised in the following order: Māori, Pacific peoples, Asian, MELAA and European or Other (including New Zealander) ethnic groups. For fewer than five cases notified, a rate is not calculated and the cell is blank.

Notifiable disease cases by year and source, 2008–2017

Table 35. Number of notifiable disease cases by year and source, 2008–2017

Disease	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AIDS	48	28	39	24	20	25	19	9	23	12
Campylobacteriosis	6694	7177	7346	6686	7016	6837	6782	6218	7456	6482
Cholera	0	0	2	0	0	0	0	0	0	0
Creutzfeldt-Jakob disease	5	8	5	4	9	6	6	6	9	13
Cryptosporidiosis	764	854	954	610	877	1348	584	696	1062	1192
Dengue fever	113	139	50	42	76	106	178	125	191	161
Gastroenteritis [a]	687	713	502	570	765	558	756	503	510	324
Giardiasis	1660	1639	1985	1934	1714	1729	1709	1510	1616	1648
Haemophilus influenzae type b	9	10	8	8	4	2	5	3	2	4
Hepatitis A	89	44	46	26	82	91	74	47	35	58
Hepatitis B	37	55	51	51	39	28	35	34	34	27
Hepatitis C [b]	22	32	16	26	31	36	29	35	31	21
Hydatid disease	7	2	4	6	1	7	4	4	2	1
Invasive pneumococcal disease [c]	-	697	535	552	489	479	489	447	480	522
Legionellosis	73	74	173	158	149	151	123	246	247	221
Leprosy	5	3	3	1	2	7	4	5	0	3
Leptospirosis	118	69	81	68	108	60	56	63	85	142
Listeriosis	27	28	23	26	25	19	25	26	36	20
Malaria	40	50	44	52	38	47	33	38	26	42
Measles	12	248	48	596	68	8	280	10	103	15
Meningococcal disease	122	132	97	119	85	68	45	64	75	112
Mumps	76	63	41	51	26	23	18	13	20	1337
Paratyphoid fever	25	25	19	13	22	25	19	34	32	47
Pertussis	417	1398	872	1996	5897	3540	1099	1168	1093	2143
Rheumatic fever - initial attack	140	126	153	155	163	191	179	104	125	146
Rubella	9	4	4	22	4	1	4	0	3	1
Salmonellosis	1339	1128	1146	1055	1081	1143	955	1051	1091	1119
Shigellosis	113	119	104	101	131	137	128	111	174	245
Tetanus	0	1	7	0	2	1	0	1	1	0
Tuberculosis disease	293	298	304	306	293	274	302	293	294	314
Typhoid fever	29	34	31	45	44	50	43	43	38	60
VTEC/STEC infection	124	143	138	153	147	205	187	330	418	547
Yersiniosis	508	430	406	513	514	483	680	634	858	918
Zika virus [d]							57	9	100	11

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication, eg, staphylococcal intoxication.

[b] Only acute cases of this disease are notifiable.

[c] Invasive pneumococcal disease became notifiable on 17 October 2008.

[d] Prior to 2014 only one case (in 2002) had been notified.

Laboratory-reported cases of salmonellosis, 2013–2017

Table 36. Number of laboratory-reported cases of salmonellosis for selected *Salmonella* serotypes and phage types, 2013–2017

Serotype[a]	2013	2014	2015	2016	2017
S. Typhimurium	**481**	**392**	**447**	**389**	**429**
1	30	22	38	34	22
9	13	17	27	42	14
12[a]	15	20	18	6	7
56 variant[b]	122	72	96	64	115
101	26	41	56	47	65
135	48	35	64	30	34
156	17	9	27	12	4
160	69	27	9	6	5
Other phage types or unidentified	141	149	112	148	163
S. Enteritidis	**137**	**116**	**110**	**114**	**151**
1b	14	5	4	8	7
11[c]	27	39	45	46	55
Other phage types or unidentified	96	72	61	60	89
Other serotypes	**523**	**450**	**496**	**570**	**523**
S. Agona	11	15	12	18	16
S. Bovismorbificans	8	4	23	39	52
S. Brandenburg	52	35	52	67	54
S. Infantis	70	56	52	14	18
S. Mississippi	20	21	16	21	15
S. Montevideo	11	7	3	2	2
S. Saintpaul	43	26	37	35	27
S. Stanley	31	34	25	60	39
S. Thompson	16	5	32	13	12
S. Virchow	15	5	16	10	7
S. Weltevreden	28	31	18	18	21
S. enterica (I) ser. 4,[5],12 : i : -	27	27	22	23	28
Other serotypes or unidentified	191	184	188	250	232
Total	**1141**	**958**	**1053**	**1073**	**1103**

[a] Excludes *S.* Paratyphi and *S.* Typhi.

[b] Prior to 2013, *S.* Typhimurium phage type 56 variant was known as *S.* Typhimurium RDNC-May 06.

[c] Prior to 2012, *S.* Enteritidis phage type 11 was known as a 9a. Further typing was performed on isolates previously confirmed as *S.* Enteritidis phage type 9a. However, typing results revealed that some isolates previously reported as *S.* Enteritidis phage type 9a were phage type 11

REFERENCES

1. Thacker SB, Berkelman RL. Public Health Surveillance in the United States. *Epidemiologic Reviews* 1988; 10: 164-90.
2. Thacker SB. 2000. Historical Development, in Principles and Practice of Public Health Surveillance. Teutsch SM, Churchill RE (eds). New York: Oxford University Press.
3. Baker M, Roberts A. A new schedule of notifiable diseases for New Zealand. *New Zealand Public Health Report* 1996; 3(5): 33–7.
4. Perera S, Adlam B. 2007. *Acute Gastrointestinal Illness (AGI) Study: General Practice Study.* Wellington. Institute of Environmental Science and Research Ltd (ESR). http://www.foodsafety.govt.nz/elibrary/industry/acute-illness-study-gastrointestinal-report/GP_Survey_Report.pdf
5. Scott K, Marwick J, Crampton P. Utilization of general practitioner services in New Zealand and its relationship with income, ethnicity and government subsidy. *Health Services Management Research* 2003; 16(1): 45.
6. Ministry of Health. 2012. *Communicable Disease Control Manual.* Wellington: Ministry of Health.
7. Ministry of Health. 2007. *Direct Laboratory Notification of Communicable Diseases: National Guidelines.* Wellington: Ministry of Health.
8. National Casemix & Classification Centre. 2013. *International statistical classification of diseases and related health problems, 10th revision, Australian modification (ICD-10-AM), 8th edition.* Wollongong, Australia: National Casemix & Classification Centre, Australian Health Services Research Institute.
9. Dow N, Dickson N, Taylor B. The New Zealand Paediatric Surveillance Unit: Establishment and first year of operation. *New Zealand Public Health Report* 1999; 6(6): 41–4.
10. Institute of Environmental Science and Research Limited (ESR). 2016. *EpiSurv Data Quality Report 2015.* Porirua.
11. Sneyd E, Baker M. 2003. *Infectious Diseases in New Zealand: 2002 Annual Surveillance Summary.* Wellington. Institute of Environmental Science and Research Ltd (ESR).
12. Lake R, Adlam B, Perera S. 2009. *Acute Gastrointestinal Illness (AGI) Study: Final Study Report.* Christchurch. Institute of Environmental Science and Research Ltd (ESR). http://www.foodsafety.govt.nz/elibrary/industry/acute-illness-study-gastrointestinal-report/Final_Report.pdf
13. Khan R, Baker M, Thornley C. Intentional release of biologic agents. *New Zealand Public Health Report* 2001; 8(11): 84–5.
14. Flack L. Botulism in New Zealand. *New Zealand Medical Journal* 1985; 98: 892–3.
15. O'Neill B. New Zealand declares itself free from bovine brucellosis. *Bulletin, Office International des Epizooties* 1996; 108: 264–5.
16. Cutfield N, Priest P, Chancellor A. 2018. *Twenty-first Annual Report, Creutzfeldt-Jakob Disease Surveillance in New Zealand, 1 January 2017–31 December 2017.* Dunedin. NZ Creutzfeldt-Jacob Registry, University of Otago.
17. Baker M, Taylor P, Wilson E, et al. A case of diphtheria in Auckland - implications for disease control. *New Zealand Public Health Report* 1998; 5(10): 73–5.
18. Ministry of Health. 2017. *Immunisation Handbook 2017.* Wellington: Ministry of Health.
19. Biosecurity New Zealand. 2018. *The absence of specified animal diseases from New Zealand.* Available from: http://www.mpi.govt.nz/protection-and-response/finding-and-reporting-pests-and-diseases/registers-and-lists/. Accessed 6 July 2018.
20. Thornley C, Baker M, Weinstein P, et al. Changing epidemiology of human leptospirosis in New Zealand. *Epidemiology and Infection* 2002; 128: 29–36.
21. World Health Organization. 2017. *Regional health leaders target elimination of: measles and rubella; HIV, hepatitis B and syphilis in babies* [Press release]. Available from: https://www.who.int/westernpacific/news/detail/10-10-2017-regional-health-leaders-target-elimination-of-measles-and-rubella-hiv-hepatitis-b-and-syphilis-in-babies.
22. World Health Organization. 2017. *Middle East respiratory syndrome coronavirus (MERS-CoV) -Saudi Arabia.* Available from: http://www.who.int/csr/don/19-december-2016-2-mers-saudi-arabia/en/. Accessed 15 March 2017.
23. Chart H. The pathogenicity of strains of *Salmonella* Paratyphi B and *Salmonella* Java. *Journal of Applied Microbiology* 2003; 94: 340–8.
24. Maclean FS. 1964. *Challenge for Health. A history of public health in New Zealand.* Wellington: Government Print.
25. Kieft C, Perks M, Baker M, et al. 2000. *Annual Surveillance Summary 1999.* Wellington. Institute of Environmental Science and Research Ltd (ESR). www.surv.esr.cri.nz

26. Hill P, Calder L. First case of primary amoebic meningoencephalitis in over 20 years. *New Zealand Public Health Report* 2000; 7: 43.
27. World Health Organization. 2002. *World Survey for Rabies No. 35 for the Year 1999.* Geneva. World Health Organization.
28. Lush D, Stone M, Hood D. Trichinellosis and homekill pork. *New Zealand Public Health Report* 2002; 9(2): 11–13.

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Description
AEG	AIDS Epidemiology Group
AFP	Acute flaccid paralysis
AIDS	Acquired immunodeficiency syndrome
BCG	Bacillus Calmette-Guérin
CJD	Creutzfeldt-Jakob disease
CRS	Congenital rubella syndrome
DHB	District Health Board
DTaP-IPV-HepB/Hib	Diphtheria, tetanus, acellular pertussis, inactivated polio, hepatitis B and *Haemophilus influenzae* type b vaccine
ESR	Institute of Environmental Science and Research Limited
Hib	*Haemophilus influenzae* serotype b
HIV	Human immunodeficiency virus
HPAI	Highly pathogenic avian influenza
HUS	Haemolytic uraemic syndrome
ICD	International Classification of Diseases
IPD	Invasive pneumococcal disease
IPV	Inactivated polio vaccine
MAT	Microscopic agglutination titre
MELAA	Middle Eastern/Latin American/African
MeNZB™	Meningococcal B outer membrane vesicle vaccine
MERS-CoV	Middle East respiratory syndrome Coronavirus
MMR	Measles, mumps and rubella
NAAT	Nucleic acid amplification test
NCCEP	National Certification Committee for the Eradication of Polio
NHI	National Health Index
NMDS	National Minimum Dataset
NOS	Not otherwise specified
OPV	Oral polio vaccine
NZPSU	New Zealand Paediatric Surveillance Unit
PCR	Polymerase chain reaction
PCV7	7-valent pneumococcal conjugate vaccine
PCV10	10-valent pneumococcal conjugate vaccine
PCV13	13-valent pneumococcal conjugate vaccine
PHU	Public health unit
PHS	Public health service
RDNC	Reacts but does not conform to a known phage type pattern
SARS	Severe acute respiratory syndrome
sv	Serovar
STEC	Shiga toxin-producing *Escherichia coli*
Tdap	Tetanus, diphtheria and acellular pertussis vaccine
VTEC	Verotoxin-producing *Escherichia coli*
WHO	World Health Organization
23PPV	23-valent pneumococcal polysaccharide vaccine

INSTITUTE OF ENVIRONMENTAL SCIENCE AND RESEARCH LIMITED

Kenepuru Science Centre
34 Kenepuru Drive, Kenepuru, Porirua 5022
PO Box 50348, Porirua 5240
New Zealand
T: +64 4 914 0700 **F:** +64 4 914 0770

Mt Albert Science Centre
120 Mt Albert Road, Sandringham, Auckland 1025
Private Bag 92021, Auckland 1142
New Zealand
T: +64 9 815 3670 **F:** +64 9 849 6046

NCBID – Wallaceville
66 Ward Street, Wallaceville, Upper Hutt 5018
PO Box 40158, Upper Hutt 5140
New Zealand
T: +64 4 529 0600 **F:** +64 4 529 0601

Christchurch Science Centre
27 Creyke Road, Ilam, Christchurch 8041
PO Box 29181, Christchurch 8540
New Zealand
T: +64 3 351 6019 **F:** +64 3 351 0010

www.esr.cri.nz