Te Whatu Ora
Health New Zealand

Auckland region - public health surveillance report

2021

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Auckland Regional Public Health Service
Ratonga Hauora-ā-Iwi o Tāmaki Makaurau

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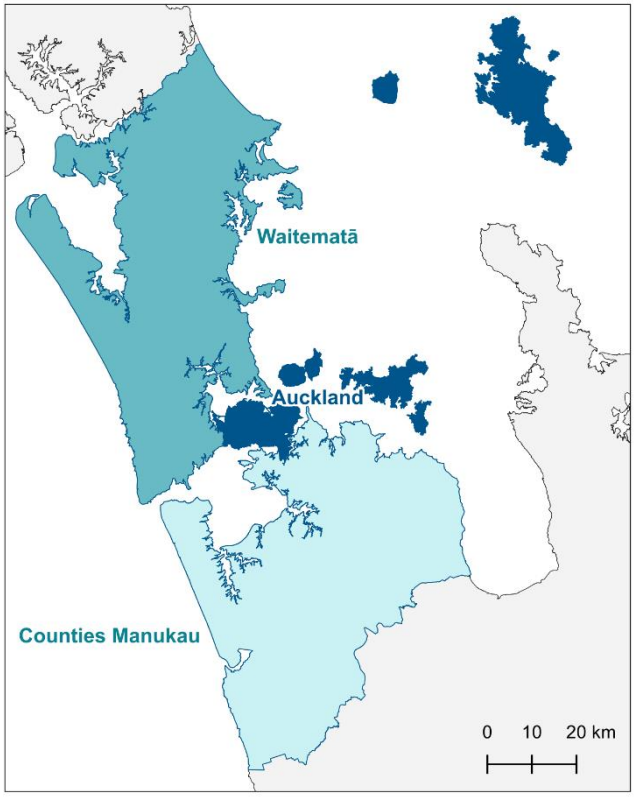
This document is available at **www.arphs.govt.nz/surveillance**.

Acknowledgements

Thank you to all Te Whatu Ora - Auckland Regional Public Health Service (ARPHS) staff who have contributed to this report.

Thank you to Labtests, LabPlus and the Institute of Environmental Science and Research (ESR) staff for their expertise in the interpretation of laboratory results and support of ARPHS, and all health practitioners who provide notifications and reports to ARPHS which make up this report.

About Auckland Regional Public Health Service



Auckland Regional Public Health Service's (ARPHS) primary role is to improve population health. We work alongside whānau, iwi, communities and organisations to create and support healthier communities and to reduce or eliminate the cause and spread of infectious diseases. This involves collective efforts to improve the wider determinants that affect people's health, like housing or transport.

Since July 2022 ARPHS has been a part of the National Public Health Service within Te Whatu Ora – Health New Zealand. Prior to this ARPHS had responsibility for public health across the Auckland region on behalf of the three regional District Health Boards (Auckland DHB, Counties Manukau DHB and Waitematā DHB).Under the **New Zealand Public Health and Disability Act 2000** ARPHS has a statutory role to improve, promote and protect the health of people and communities in the Auckland region.

The Medical Officer of Health has an enforcement and regulatory role under the **Health Act 1956** and other legislative designations to protect the health of the community.

For more information visit: **www.arphs.health.nz**

Contents

Methods

Basic statistical information about this report

- The disease notifications ARPHS receives are assessed against nationally determined surveillance case definitions published in the Ministry of Health Communicable Disease Control Manual[1]. These notifications are classified into "cases under investigation", "suspected cases", "probable cases" and "confirmed cases". After all the information has been analysed and assessed, those cases that do not meet the surveillance case definitions for a confirmed or probable case are classified as "not a case". The term "cases" in this report therefore always refers to confirmed cases, and may refer to probable cases too, depending on where this is appropriate for the disease in question. Where this occurs, it has been specified in the body of the text.
- Age groups comply with agreed national reporting age group categories. The simplified version is used, except where this obscures meaningful differences.
- Incidence is expressed as crude rates which are defined as the number of cases for a defined population based on 2021 estimated mid-year population statistics.
- Population statistics are always sourced from Statistics New Zealand or Te Whatu Ora, which publish their own sets of population estimates for each year.
- All tables in this report use only those age and ethnicity groups for which diseases are actually notified, in order to avoid tables featuring large numbers of data-obscuring zeroes. The source of each specific population statistic is identified in the table below.
- Ethnicity is prioritised as per the Ethnicity Data Protocols, September 2017, and rates are based on Ministry of Health Prioritised Population projections off a 2018 base (Source: Statistics New Zealand). Rates for ethnicity are expressed as crude rates and have not been age-standardised.

[1]Ministry of Health: Communicable Disease Control Manual. Available at: https://www.health.govt.nz/publication/communicable-disease-control-manual

Table 1: Population denominators used in this report

Denominator			Value	Source
New Zealand population			5,111,400	Stats NZ – estimated 2021 mid-year (30 June 2021) usually resident population. Accessed 22/3/23.
"Auckland", "Auckland region", "ARPHS area of responsibility", "Auckland DHBs"			1,728,200	Stats NZ – estimated 2021 mid-year usually resident population of Waitematā, Auckland and Counties Manukau DHBs. Accessed 22/3/23.
Auckland – Māori ethnicity (prioritised)			204,700	Te Whatu Ora – population projection as at 30 June 2021. Accessed 1/19/23.
Auckland – Pacific ethnicity (prioritised)			239,300	Te Whatu Ora – population projection as at 30 June 2021. Accessed 1/19/23.
Auckland – Asian ethnicity (prioritised)			487,800	Te Whatu Ora – population projection as at 30 June 2021. Accessed 1/19/23.
Auckland – New Zealand European and Other ethnicity (prioritised)			795,200	Te Whatu Ora – population projection as at 30 June 2021. Accessed 1/19/23.
Age group (years)	Total	Females	Males	
<1	21,518	10,490	11,030	Extrapolated from prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
1-4	86,072	41,960	44,120	Extrapolated from prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
5-9	114,230	55,450	58,770	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
5-14	229,140	111,000	118,140	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
10-14	114,910	55,550	59,370	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
10-19	222,040	107,590	114,450	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
15-19	107,130	52,040	55,080	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
15-24	226,360	110,390	115,950	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
20-29	258,580	127,480	131,080	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
25-44	527,230	264,600	262,630	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
30-39	274,330	138,650	135,680	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
40-49	224,790	112,940	111,860	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
45-64	414,470	211,070	203,390	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
50-59	219,900	109,250	105,250	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
60-69	160,530	82,920	77,600	Prioritised MPAO Te Whatu Ora mid-year

				population estimates. Accessed 12/8/22.
65+	223,330	119,630	103,710	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.
70+	151,530	82,410	69,130	Prioritised MPAO Te Whatu Ora mid-year population estimates. Accessed 12/8/22.

Notification process

Any disease outbreaks notified to ARPHS are promptly identified and investigated. Weekly information regarding key surveillance triggers is routinely disseminated to selected external stakeholders in the *NDCMS Weekly Surveillance Report*.

Figure 1 shows the process of disease notification. The diseases that are notifiable to the Medical Officer of Health are listed in Appendix 1.

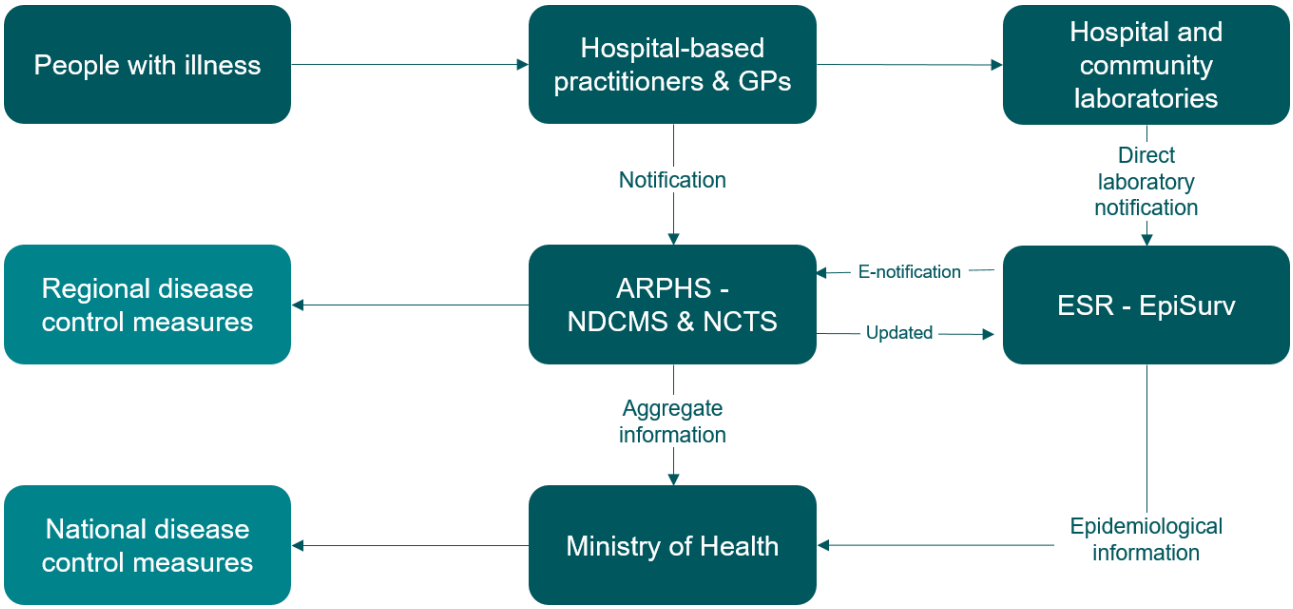


Figure 1: ARPHS' notifiable disease notification process

The disease notification process for COVID-19 was based on the same process. Direct laboratory notifications made up the bulk of COVID-19 notifications as members of the public usually presented directly to testing stations. However, the regional disease control measures for COVID-19 were by necessity much more comprehensive than those for other diseases, and included extensive contact tracing, health intelligence, and information technology inputs.

Updates to the 2021 surveillance report

A number of updates have been made to this edition of the ARPHS annual surveillance report compared to previous editions. These updates aim to improve the presentation of data, ensure greater accuracy and streamline the report. Some differences are more consequential than others.

Key changes include:

- Chapter categories have been amended to more realistically reflect clinical and epidemiological links between diseases.
- This year's report avoids speculating on the causes of patterns in the data, unless there is a good reason for doing so.
- Where there are no significant differences in case numbers based on sex, differentiation between male and female cases are not included for the sake of clarity, and male and female cases are not represented on the graphs displayed.
- To cut down on the number of tables and to make it clear how many cases were present in previous years, the number of cases are displayed as part of each graph.
- Previous editions of this report occasionally included incomplete data in a manner which suggested the data were more definitive than was warranted. Usually, this occurred in situations where the raw data were only partially collected. This report has omitted such data.
- This edition is focussed on notifiable diseases, which means that some sections, including information included previously on environmental health indicators, have been omitted.
- Sections focussing on non-notifiable diseases have generally been abbreviated. This was largely because the data from 2021 were non-existent, or prohibitively difficult to reliably obtain. One example of this is the section on Latent Tuberculosis Infections (LTBI).
- The disease descriptions have generally been shortened for clarity and to avoid repetition.
- Demographic data has been omitted for diseases with low case numbers, to avoid publishing potentially identifying personal information and protect confidentiality. In certain situations this may make this report less detailed than in previous editions.

Abbreviations

Acronym	Meaning
ARF	Acute rheumatic fever
ARPHS	Auckland Regional Public Health Service
COVID-19	Coronavirus disease 2019
CRU	COVID-19 Response Unit
DHB	District Health Board
DIY	Do it yourself (colloquial)
ECEC	Early childhood education centre
ECMO	Extracorporeal membrane oxygenation
ESR	Institute of Environmental Science and Research
GP	General Practitioner; general practice
HAV	Hepatitis A virus
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HD	Hansen's disease (leprosy)
HDV	Hepatitis D virus
Hepatitis NOS	Hepatitis Not Otherwise Specified
HEV	Hepatitis E virus
HiB	Haemophilus influenzae B
HIV/AIDS	Human immunodeficiency virus/Acquired Immune Deficiency Syndrome
HSDIRT	Hazardous Substances Disease and Injury Reporting Tool
HUS	Haemolytic uraemic syndrome
ICU	Intensive care unit

ILI	Influenza-like illness
IPD	Invasive pneumococcal disease
LTBI	Latent tuberculosis infection
MIQ	Managed isolation and quarantine
MPI	Ministry for Primary Industries
MPOA	Māori, Pacific, Other, Asian
NDCMS	Notifiable Diseases and Case Management System
NEC	Not elsewhere classified
NFD	Not further defined
NZDep 2018	New Zealand Deprivation Index 2018
POAL	Ports of Auckland Limited
PCR	Polymerase chain reaction
RSV	Respiratory syncytial virus
SARI	Severe acute respiratory infection
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
Stats NZ	Statistics New Zealand
TB	Tuberculosis
TTP	Thrombotic thrombocytopenic purpura
VTEC/STEC	Verotoxin-producing Escherichia coli / Shiga toxin-producing Escherichia coli
WHO	World Health Organisation

Foreword

The COVID-19 pandemic further impacted Tāmaki Makaurau in 2021. The public health response to COVID-19, including decisions made in Auckland and nationally by the government, dominated every aspect of the Auckland Regional Public Health Service's (ARPHS) year.

ARPHS' response to the COVID-19 pandemic began in late January 2020 with ARPHS' presence at the air border, and continued in an expanded form in 2021. ARPHS' dedicated COVID-19 Response Unit (CRU) led Auckland's response to the pandemic and its approach adapted as the pandemic evolved.

Each individual COVID-19 case required extensive public health input, as all new cases needed to be identified, engaged with and contact traced. This activity was necessary to prevent spread of the disease, and to keep as many people healthy for as long as it took to roll out the COVID-19 vaccines. This immense effort, which was heightened even further during community outbreaks of disease, often saw ARPHS staff working seven day rosters. The number of people employed by ARPHS grew significantly as we dealt with the challenges COVID-19 presented.

Key data collected from the COVID-19 pandemic is presented in Section 2 to provide the context in which ARPHS performed not only its pandemic work, but also its usual workload in 2021.

The COVID-19 Alert System was in place throughout 2021, and then replaced by the COVID-19 Protection Framework on 2 December 2021. The alert levels were determined by the Government and specified the public health and social measures to be taken in the fight against COVID-19. The Auckland region spent the longest amount of time with the higher Level 3 "restrict" and Level 4 "lockdown" restrictions. The limited travel, shopping, school attendance and socialising altered the pattern and volume of disease notifications.

In addition to COVID-19, ARPHS also recorded:

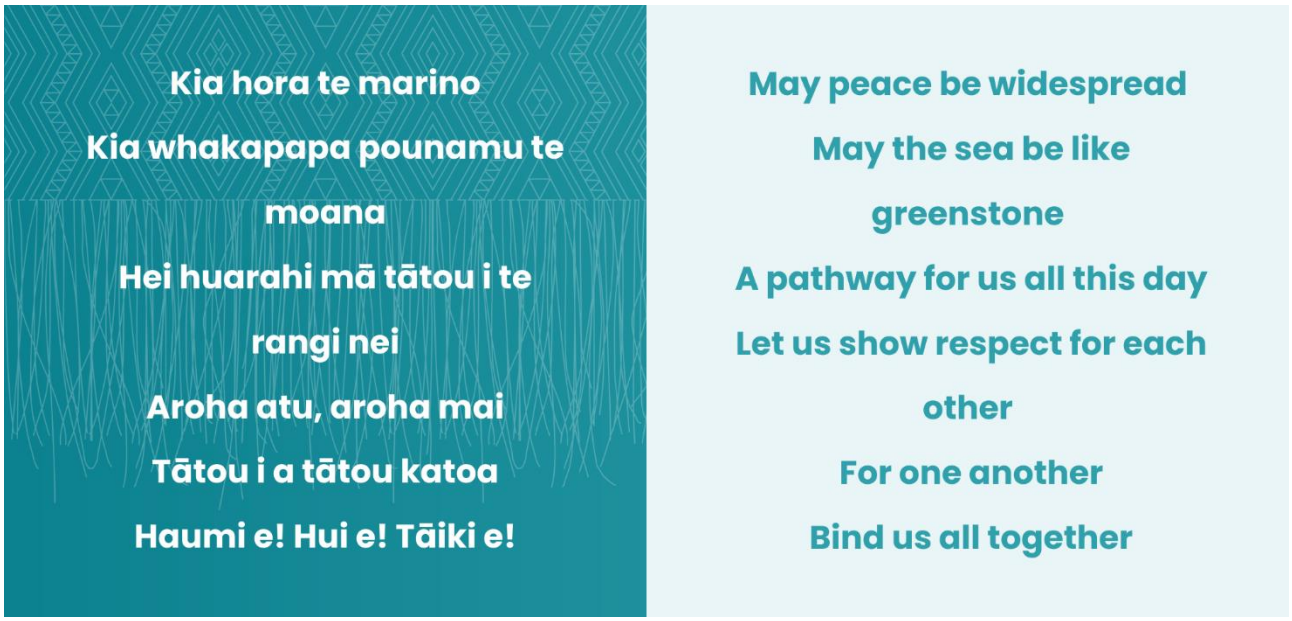
- a steady workload related to tuberculosis (TB);
- increased numbers of some enteric infections (even as other enterics declined in number);
- numerous respiratory outbreaks;
- a norovirus outbreak which caused more than a hundred cases among people celebrating two separate weddings.

Otherwise, notifications for diseases that are typically imported into the country from overseas all but disappeared in 2021.

The tireless efforts of all ARPHS staff throughout 2021, including surge staff from other parts of the healthcare system, are gratefully acknowledged. Your professionalism, dedication, and ability to remain nimble made an immense difference, saving countless lives.

ARPHS is immensely proud of all we accomplished in 2021, with good reason. We hope this report gives a good account of what we achieved.

With respect for what occurred in 2021, we wish to offer the reader the immensely appropriate words of the ARPHS karakia.



1 Notifiable diseases overview

Burden of disease

In 2021, ARPHS was notified of 13,915 cases of disease (confirmed and probable cases). The breakdown of cases by notifiable disease is as follows:

- COVID-19: 10,473
- Campylobacteriosis: 1,567
- Yersiniosis: 517
- Giardiasis: 266
- Salmonellosis: 178
- VTEC/STEC: 168
- Tuberculosis (TB): 146
- Cryptosporidiosis: 140
- Lead absorption: 129
- Invasive pneumococcal disease (IPD): 126
- Legionellosis: 60
- Acute rheumatic fever: 30
- Other (all other diseases with less than 30 notifications combined): 115

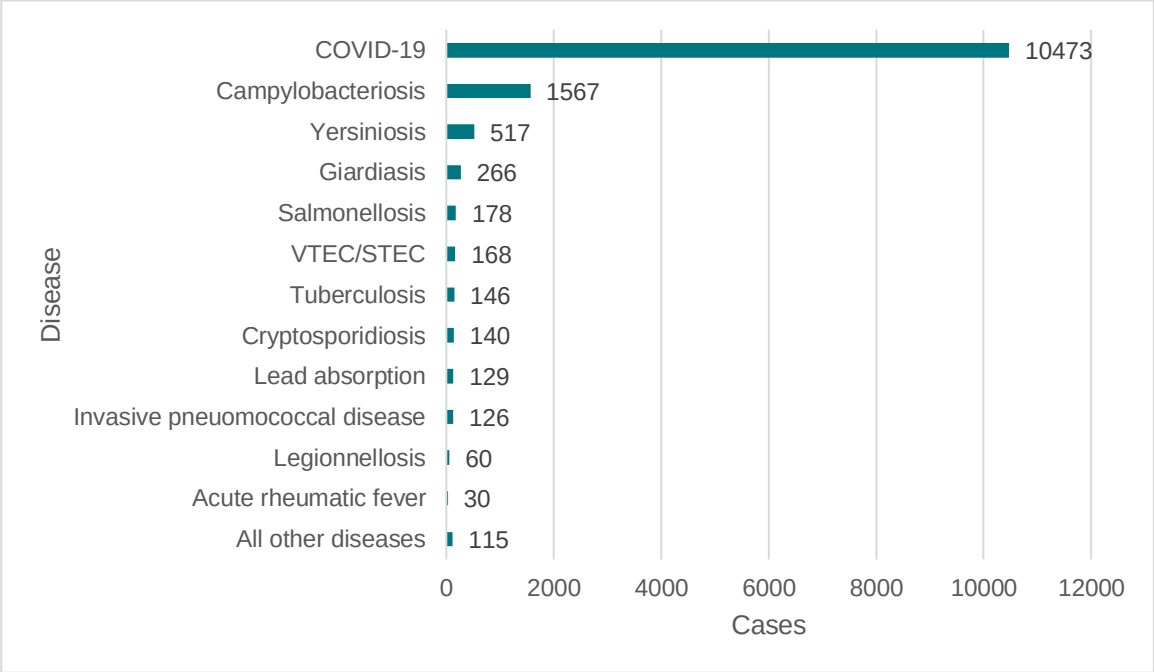


Figure 2: Notifiable disease cases in 2021 (for diseases with more than 30 notifications)

COVID-19 cases made up the bulk of notifiable disease in 2021, as well as the majority of ARPHS' workload. The disease disproportionately impacted Pasifika and Māori communities in Auckland, as well as those living in greater socio-economic deprivation. This can be seen in the socio-demographic data for cases, hospitalisations and deaths from COVID-19.

Six of the seven next most common diseases after COVID-19 were enteric diseases:

- Campylobacteriosis was the leading cause of gastroenteritis notified to ARPHS in 2021, with 1,567 cases.
- Yersiniosis notifications were at record levels, with 517 cases recorded.
- Giardiasis, salmonellosis, VTEC/STEC, and cryptosporidiosis also saw more than one hundred cases each (n.b. ARPHS phased out routine interviewing cases of campylobacteriosis, yersiniosis, giardiasis and cryptosporidiosis prior to 2018 in favour of targeted surveillance. Close monitoring of the epidemiology of these cases continues with targeted case interviews when outbreaks or clusters are identified).

Tuberculosis (TB) case volumes were not significantly impacted by COVID-19 restrictions. There were 146 new cases identified, along with eight relapses or reactivations. TB case numbers have now remained at consistent levels for several years.

The environmentally associated disease with the highest level of notifications was lead absorption, with 129 cases identified.

Aside from these diseases, 2021 generally saw fewer notifications for most other notifiable diseases compared to pre-pandemic case numbers. In most cases, this was due to unprecedented travel restrictions, social distancing and lockdown measures, or some combination of these. There is evidence fewer people sought health care advice from primary care so reduced testing was likely an additional factor. The most notable reductions in case volumes in 2021 were for shigellosis (three cases) and acute rheumatic fever (ARF) (30 cases). All ARF cases were Māori or Pacific individuals.

Outbreaks

121 different disease outbreaks were notified to ARPHS in 2021:

- Eight of these were COVID-19 outbreaks, and of these:
    - Five were in managed isolation and quarantine (MIQ) facilities;
    - Three expanded beyond this and became community outbreaks;
    - The Delta community outbreak of August 2021 to January 2022 created more cases for ARPHS (9,925) than every other notifiable disease combined.
- There were no TB outbreaks in 2021.

- There was increased reporting of upper respiratory tract infection (URTI) outbreaks in 2021 amongst aged residential care facilities. These were identified as part of efforts to detect potential COVID-19 cases among this vulnerable group. Reporting of these outbreaks is not currently routine in the Auckland region.

There were fewer outbreaks notified overall, due to a large fall in norovirus cases.

Morbidity, mortality and case fatality rates

The incidence, mortality, morbidity and case-fatality rates of all diseases notified in the Auckland region in 2021 are shown in Table 2.

COVID-19 by itself caused half of all notifiable deaths in the Auckland region in 2021 (35 out of 70). Beyond COVID-19, case fatality rates were highest for listeriosis (20%), invasive pneumococcal disease (IPD) (14%), and legionellosis (13%).

Table 2: Morbidity, mortality and case fatality rates of diseases notified in the Auckland region in 2021

Disease name	Cases	Incidence per 100,000	Hospitalisations	Hospitalisation Rate (%)	Deaths	Case-fatality Rate (%)
Brucellosis	1	0.06	1	100	0	-
Campylobacteriosis	1567	91	11	0.7	0	-
COVID-19	10473	606	581	5.5	35	0.3
Cryptosporidiosis	140	8.1	0	-	0	-
Dengue fever	2	0.1	1	50	0	-
Gastroenteritis / foodborne intoxication	25	1.4	6	24	0	-
Giardiasis	266	15	0	-	0	-
Hazardous substances injury	15	0.9	15	100	0	-
Hepatitis A	2	0.1	0		0	-
Hepatitis B	5	0.3	3	60	0	-
Hepatitis C	1	0.06	0	-	0	-
Hepatitis NOS	2	0.1	0	-	0	-

Invasive pneumococcal disease	126	7.3	122	97	18	14
Latent tuberculosis infection	1	0.06	0	-	0	-
Lead absorption	129	7.5	1	0.8	0	-
Legionellosis	60	3.5	58	97	8	13
Leprosy	1	0.06	0		0	-
Leptospirosis	7	0.4	4	57	0	-
Listeriosis	10	0.6	10	100	2	20
Malaria	4	0.2	4	100	0	-
Meningococcal disease	9	0.5	9	100	0	-
Paratyphoid fever	2	0.1	0	-	0	-
Pertussis	12	0.7	5	42	0	-
Rheumatic fever - initial attack	30	1.7	28	93	0	-
Rheumatic fever - recurrent attack	1	0.06	1	100	0	-
Salmonellosis	178	10	76	43	0	-
Shigellosis	3	0.2	1	33	0	-
Taeniasis	1	0.06	0	-	0	-
Tuberculosis disease - new case	146	8.4	88	60	5	3
Tuberculosis disease - relapse or reactivation	8	0.5	6	75	1	13
Typhoid fever	3	0.2	1	33	0	-
VTEC/STEC infection	168	9.7	41	24	1	0.6
Yersiniosis	517	30	2	0.3	0	-
Total	***13915***	-	***1075***	-	***70***	-

In 2021, no notifications were received for the following notifiable diseases and illnesses:

- Anthrax
- Arboviral diseases other than dengue
- Cronobacter species invasive disease

- Cysticercosis
- Decompression sickness
- Highly Pathogenic Avian Influenza (including H5N1)
- Middle East Respiratory Syndrome (MERS)
- Non-seasonal influenza
- Plague
- Poliomyelitis
- Primary amoebic meningoencephalitis
- Rabies
- Severe Acute Respiratory Syndrome (SARS)
- Tetanus
- Trichinosis
- Viral haemorrhagic fevers other than dengue

For clarity they are therefore excluded from this report.

2 COVID-19

This chapter includes information about COVID-19, the ongoing global pandemic which has resulted in significant social and economic disruption in Auckland, as well as elsewhere in New Zealand and around the world.

Key points

- ARPHS' workload in 2021 was dominated by COVID-19.
- Most of these cases were related to the large Delta variant outbreak of August 2021 – January 2022.
- Children were most likely to acquire COVID-19. However, older people were most likely to die of COVID-19.
- There were significant socio-economic and ethnic disparities in COVID-19 incidence rates, case numbers, and deaths, with Māori and Pasifika disproportionately impacted by COVID-19.

2.1 COVID-19

The COVID-19 pandemic is an on-going global pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

The virus was first identified in December 2019 in Wuhan, China. The World Health Organisation (WHO) declared a Public Health Emergency of International Concern regarding COVID-19 on 30 January 2020, and later declared a pandemic on 11 March 2020.

Symptoms of COVID-19 are mainly respiratory, although highly variable, ranging from none to life-threateningly severe. Transmission of COVID-19 occurs when people are exposed to virus-containing respiratory droplets exhaled by an infected person. People remain contagious for up to 20 days, and can spread the virus even if they do not develop any symptoms.

Recommended preventive measures include physical distancing, wearing face masks in public, ventilation and air-filtering, hand washing, covering coughs and sneezes, disinfecting surfaces, and monitoring and self-isolation for people exposed or symptomatic. Several vaccines have been developed and widely distributed since December 2020.

Authorities worldwide have responded by implementing travel restrictions, lockdowns/quarantines, workplace hazard controls, and business closures. Numerous jurisdictions, including ARPHS, have also worked to increase testing capacity and trace contacts of the infected.

- There were 10,473 COVID-19 cases in the Auckland region in 2021, compared to 1,068 cases in 2020.
- There were 12,033 cases in New Zealand as a whole in 2021.
- There were 581 hospitals and 35 deaths.
- The incidence rate for the Auckland region was 606 cases per 100,000. For the rest of New Zealand it was 46 cases per 100,000. Aucklanders were approximately 13 times more likely to contract COVID-19 than other New Zealanders.

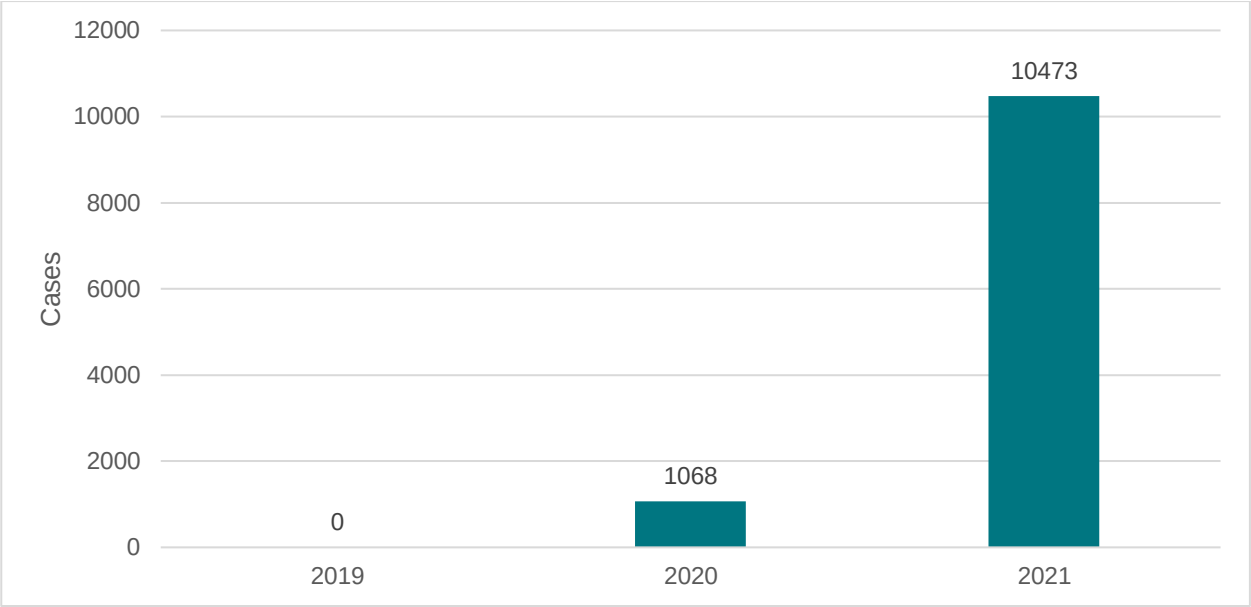


Figure 3: COVID-19 cases in the Auckland region 2019 – 2021

Most cases occurred in surveillance week 33 (mid-August) or beyond, reflecting the scale of the Delta outbreak.

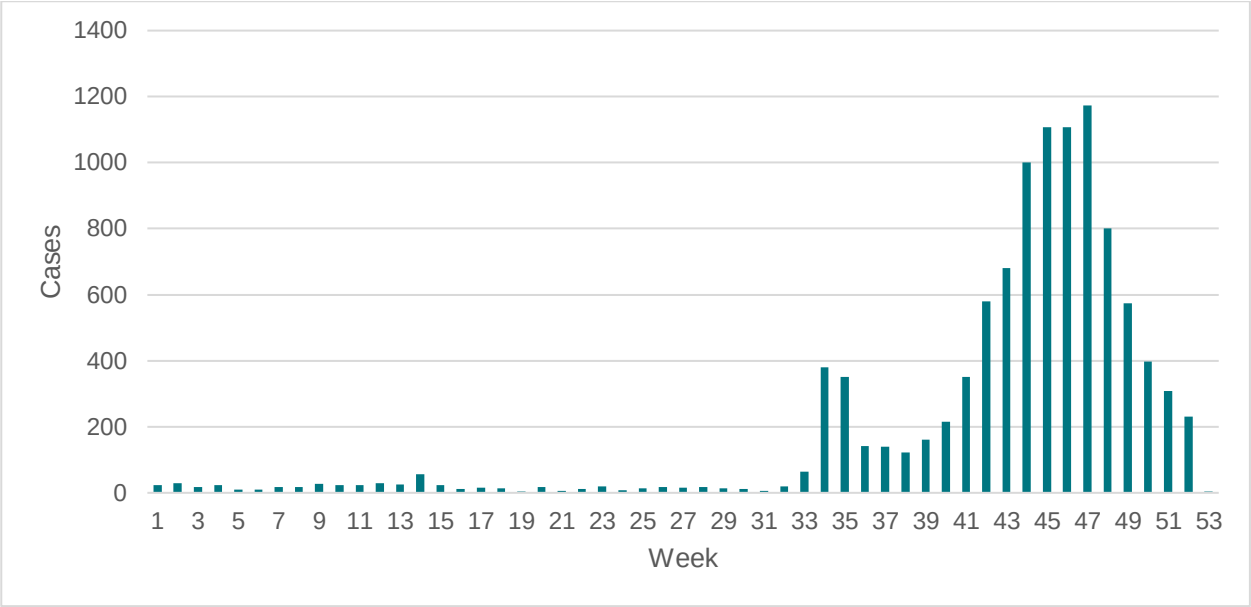


Figure 4: Cases of COVID-19 notified in the Auckland region in 2021 by surveillance week

Hospitalisations and deaths

- 581 Aucklanders (5.5%) were hospitalised with COVID-19, of whom 45 required intensive care unit (ICU) admission.
- 19 cases required ventilation and four cases required extracorporeal membrane oxygenation (ECMO).
- 35 notified cases were recorded as having died, representing a case-fatality rate of 0.3%. Those who died were more likely to be older adults. Among adults aged 70 years or older, the case-fatality rate was 5.9%.
- Of those who died, 13 had received at least one dose of COVID-19 vaccine prior to death. Eight had received two doses, and none had received three or more doses.

Table 3: Deaths and age group-specific case-fatality rates of COVID-19 in the Auckland region in 2021

Age group	Deaths among those vaccinated (with at least one dose)	Deaths among those not vaccinated	Total Deaths	Case-fatality rate (for each age group)
<1	0	1	1	0.5
20 to 29	1	0	1	0.04
30 to 39	0	2	2	0.1
40 to 49	1	4	5	0.4
50 to 59	2	6	8	0.9
60 to 69	2	4	6	1.5
70+	6	6	12	5.9
Grand Total	***12***	***22***	***35***	***0.3 (all age groups)***

Outbreaks

There were eight formal outbreaks of COVID-19 in 2021:

- Five were confined to managed isolation and quarantine (MIQ) facilities, and these resulted in a total of 19 cases.
- Three outbreaks resulted in community transmission, and one of these was the Delta outbreak.
- The vast majority of Auckland's cases (9,925) were associated with the Delta community outbreak of August 2021 to January 2022[2].
- The other community outbreaks were significantly smaller, and only resulted in a total of 20 cases.

Cross-border travel

There were 817 cases associated with international cross-border travel. Most of these cases had travelled through the major international airports of the United Arab Emirates, Malaysia, India, Australia, Singapore and Qatar (though this was not necessarily where the case acquired their infection).

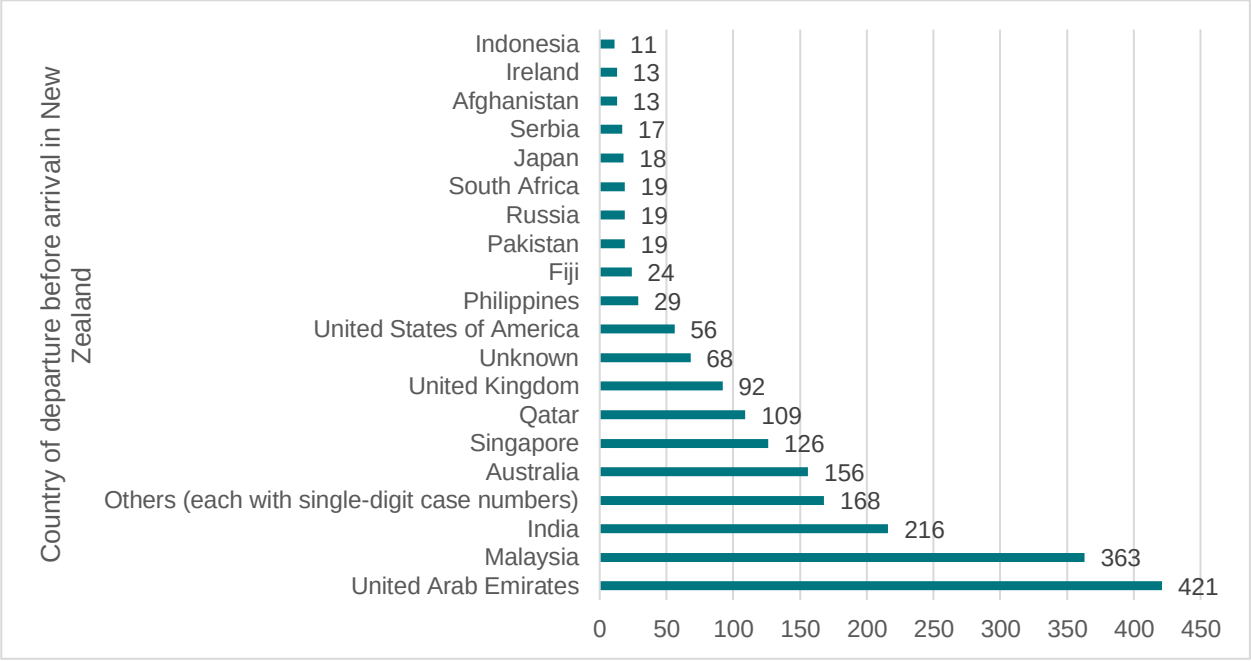


Figure 5: Country of departure before arrival in New Zealand - COVID-19 cases notified in Auckland in 2021

Socio-demographic incidence rates

Sex

[2] The case numbers for the Delta community outbreak of August 2021 – January 2022 also includes some cases who had arrived from overseas.

Cases of COVID-19 were equally distributed among males and females.

Age

Age-specific rates showed a clear gradient, with COVID-19 incidence rates more than seven times higher among children aged less than five years than among people aged over 70 years. This likely reflects lower vaccination rates in this age group (which reflects initial vaccine roll out eligibility criteria), as well as the usual epidemiological factors which aid the spread of respiratory viruses among younger people (e.g. increased socialisation).

This pattern of incidence rates is different to those observed in 2020, where cases clearly peaked among adults aged 20 to 29 (which had higher numbers due to this group being more likely to travel internationally).

Table 4: Age, sex distribution and age-specific incidence rates of COVID-19 in the Auckland region in 2021

Age group	Female	Male	Unknown	Total	Rate per 100,000
<1	98	113	0	211	981
1 to 4	420	396	3	819	952
5 to 9	494	517	5	1,016	889
10 to 14	433	441	0	874	761
15 to 19	382	428	1	811	757
20 to 29	1,152	1,089	9	2,250	870
30 to 39	899	949	4	1,852	675
40 to 49	552	588	1	1,141	508
50 to 59	437	460	1	898	408
60 to 69	198	199	0	397	247
70+	114	90	0	204	135
Grand Total	***5,179***	***5,270***	***23***	***10,473***	***606***

Socio-economic deprivation

NZDep 2018 data was recorded for 8,894 cases (85%). Among these cases, those living in areas of higher socio-economic deprivation were far more likely to be notified as a COVID-19 case.

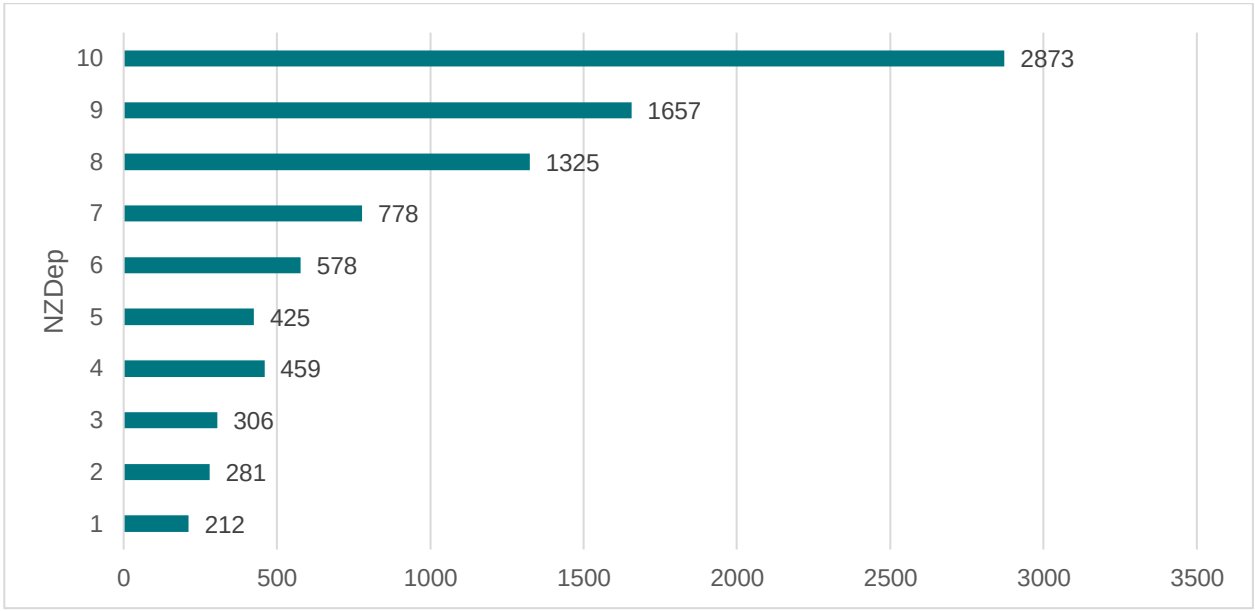


Figure 6: COVID-19 cases by NZDep 2018 in the Auckland region in 2021

Ethnicity

- COVID-19 incidence rates for Pacific people were more than five times higher than those of European or Other ethnicity. Māori incidence rates were more than eight times higher than European or Other ethnicity.
- Māori were six times more likely to die from COVID-19 infection than those of European descent.

Table 5: Ethnic group-specific incidence rates and death rates of COVID-19 in the Auckland region in 2021

Ethnic group - prioritised	Cases	Deaths	Incidence rate per 100,000 population	Death rate per 100,000 population	Case-fatality rate
Asian	1,021	3	209	0.6	0.3
European or Other	2,079	10	261	1.3	0.5
Māori	4,156	16	2,030	7.8	0.4
Pacific peoples	3,209	6	1,341	2.5	0.2
Unknown	8	0	Not calculable	Not calculable	Not calculable
Grand Total	***10,473***	***35***	***615***	***2.0***	***0.3***

3 Vector-borne diseases

This chapter includes information about the most common arboviral diseases seen in New Zealand, and malaria, another vector-borne disease. Mosquito interceptions are also covered.

Key points

- Only two cases of dengue were notified in 2021, due to vastly different patterns of international travel. No other cases of arboviral disease were notified. This represents significantly fewer notifications than in previous years.
- Malaria importations in 2021 were the lowest for 10 years, with four cases.
- A single exotic mosquito was intercepted at Auckland International Airport Limited (AIAL) in February 2021.This was a dead female *Aedes aegypti.*
- There were seven New Zealand-acquired leptospirosis cases in 2021, which was similar to previous years. However, there were no internationally-acquired cases of leptospirosis in 2021.

3.1 Arboviral Diseases

The term ‘arbovirus’ (short for arthropod-borne virus) refers to a group of viruses which are transmitted by arthropod vectors. Symptoms of arbovirus infection generally occur three to 15 days after exposure to the virus and last three or four days. The most common clinical features of infection are fever, rash, headache, and malaise. For dengue fever and Chikungunya, more serious symptoms like haemorrhagic fever and encephalitis, respectively, may also occur. Zika virus can also be transmitted sexually and can cause neurological impairment in the developing foetus.

For arboviruses, the vectors are commonly mosquitoes, ticks, sandflies and other arthropods that consume the blood of vertebrates for nutritious or developmental purposes. New Zealand does not currently have a suitable environment for sustaining populations of a competent vector for arboviral disease transmission but, as global warming progresses, mosquitoes capable of transmitting the viruses are moving further from the equator into areas that previously did not harbour the mosquito.

3.1.1 Dengue fever

Dengue fever, also known as “break-bone fever”, is a mosquito-borne tropical disease caused by the dengue virus. Symptoms include fever, headache, muscle and joint pains, and a characteristic skin rash that is similar to measles.

In a small proportion of cases the disease develops into the potentially life-threatening severe dengue, (with haemorrhagic features, previously referred to as haemorrhagic fever) characterised by bleeding, low levels of blood platelets and blood plasma leakage, or into dengue shock syndrome.

More severe illness, and dengue with haemorrhage features, is more likely in people previously infected with one of the four known serotypes of dengue virus (DEN1, DEN2, DEN3, DEN4), who are subsequently infected with a different serotype.

- There were two cases of dengue fever notified in the Auckland region in 2021, down from 24 in 2020 and 97 in 2019.
- One case was hospitalised. There were no deaths.
- The incidence rate for the Auckland region was identical to the incidence rate for New Zealand as a whole, at 0.1 cases per 100,000 people.

Most cases of dengue notified in New Zealand historically occur after travel to South Asia or the Pacific. The two cases in 2021 were acquired after travel to the Cook Islands.

One case was identified as DEN2 and the second was not typed.

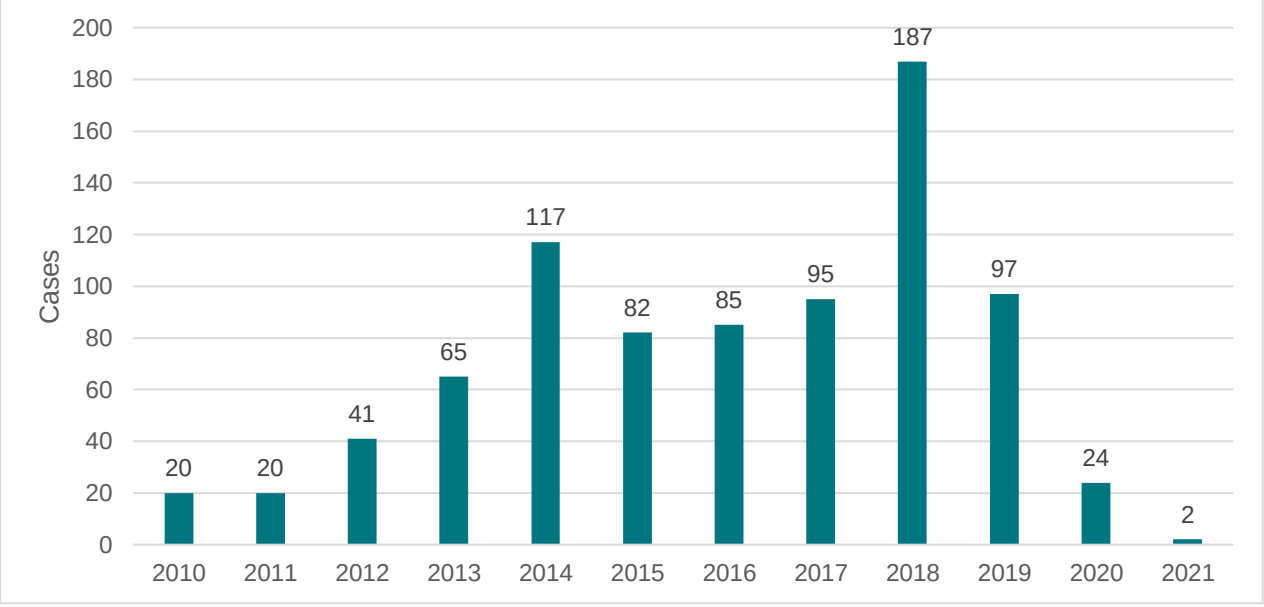


Figure 7: Dengue fever cases in the Auckland region 2010 - 2021

3.1.2 Chikungunya

Chikungunya is an infection caused by the Chikungunya virus. It features the sudden onset of fever, usually lasting two to seven days, and joint pains, typically lasting weeks or months. The mortality rate is a little less than one in 1000.

The virus is mainly passed to humans by two species of mosquito of the genus *Aedes*: *A. albopictus* and *A. aegypti*. These mosquitoes are not endemic to New Zealand, but they are widely distributed across the Pacific Islands. Animal reservoirs of the virus include monkeys, birds, cattle and rodents. This is in contrast to dengue, for which humans and primates are the only hosts.

No cases of Chikungunya were notified in 2021.

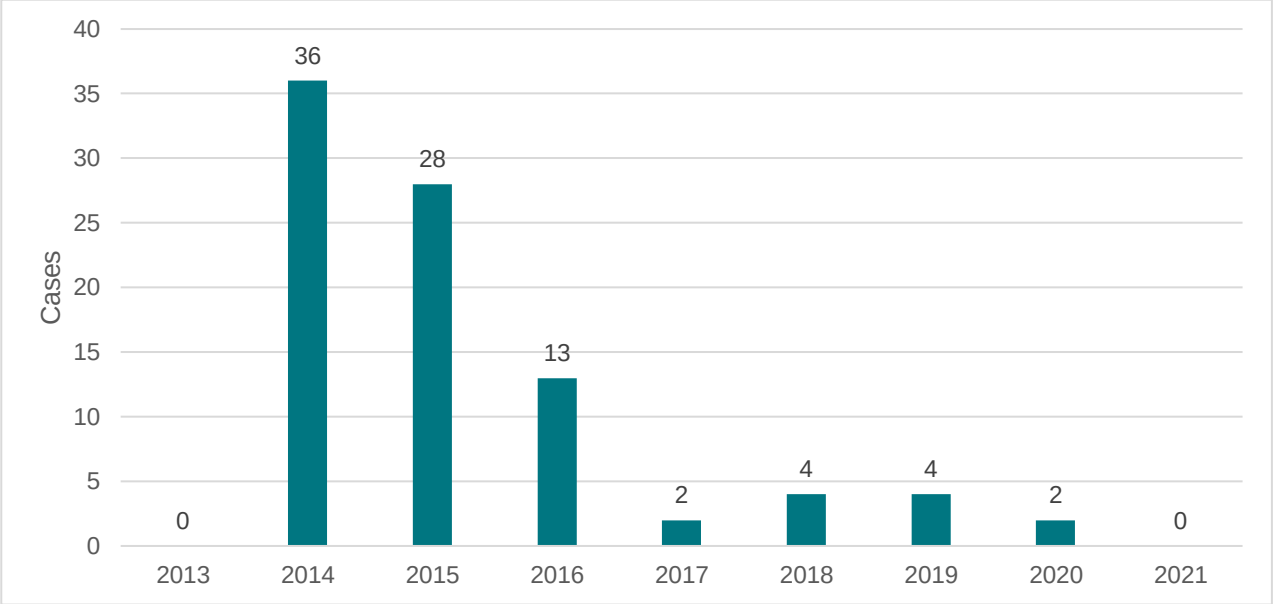


Figure 8: Chikungunya cases in the Auckland region 2013 - 2021

3.1.3 Ross River virus

Ross River virus is a small encapsulated single-strand RNA alphavirus endemic to Australia, Papua New Guinea and other South Pacific islands. It is responsible for a type of mosquito-borne non-lethal but debilitating tropical disease known as Ross River fever, previously termed "epidemic polyarthritis". The virus is suspected to be enzootic in populations of various native Australian mammals and has been found on occasion in horses.

No cases of Ross River virus were notified in 2021.

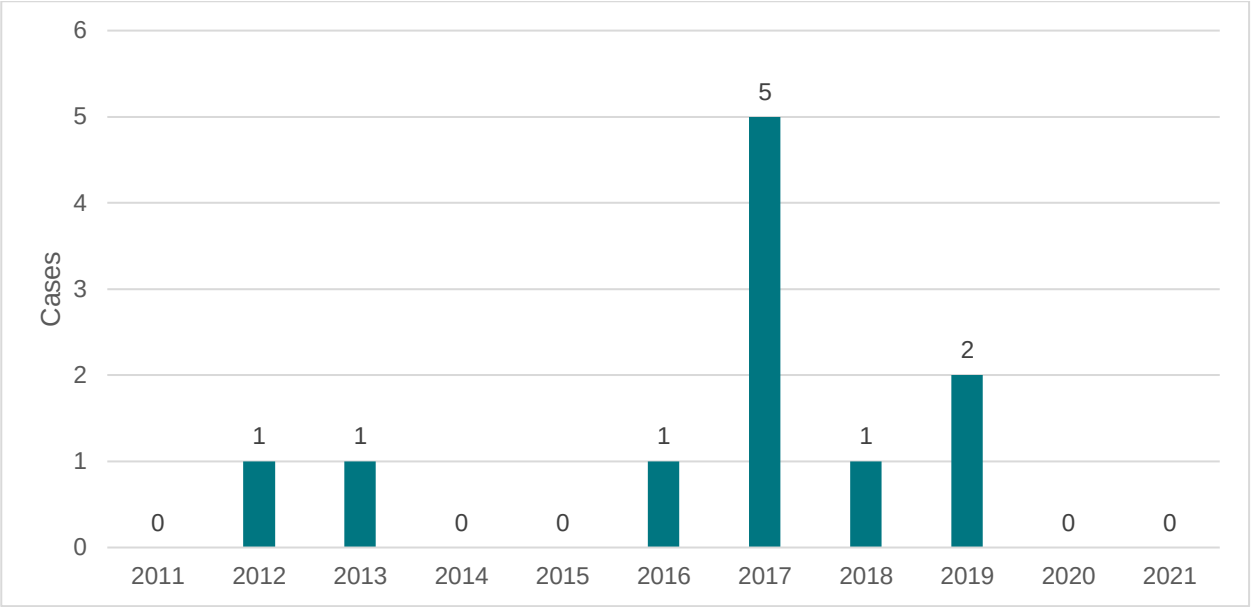


Figure 9: Ross River virus cases in the Auckland region 2011 - 2021

3.1.4 Zika virus

Zika virus is a member of the *Flaviviridae* virus family, along with dengue, yellow fever, West Nile and Japanese encephalitis viruses. In humans, it causes a disease known as Zika fever. The first outbreak of the disease outside of Africa and Asia was in April 2007, on the island of Yap in the Federated States of Micronesia. As such, it could be considered an emerging pathogen. This illness is characterised by rash, conjunctivitis, and arthralgia, and was initially mistaken for dengue.

No cases of Zika virus were notified in 2021.

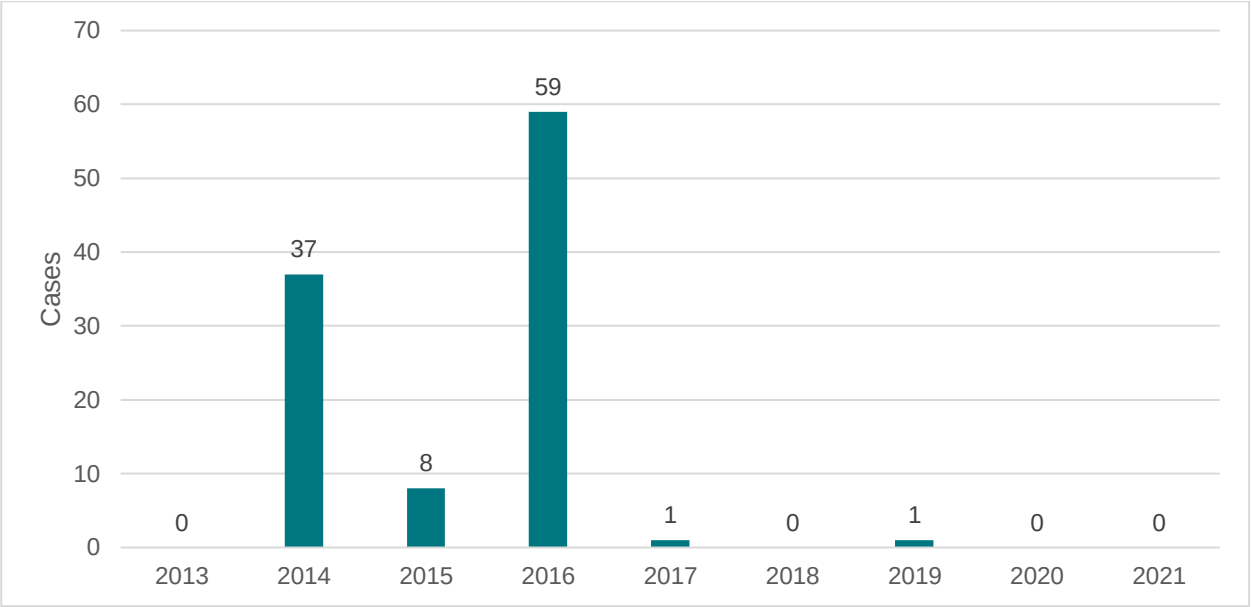


Figure 10: Zika virus cases in the Auckland region 2013 - 2021

3.2 Malaria

Malaria is a mosquito-borne infectious disease of humans and other animals caused by parasitic protozoa (a group of single-celled microorganism) belonging to the genus *Plasmodium*. The disease is transmitted by the bite of an infected female *Anopheles* mosquito. Five species of *Plasmodium* can infect and be spread by the mosquito to human route. *P. falciparum* and *P. vivax* pose the greatest threat to the health of those infected.

- There were four cases of malaria notified in 2021, down from nine cases in 2020 and 13 cases in 2019.
- All four cases were hospitalised and there were no deaths.
- The incidence rate for the Auckland region was 0.2 cases per 100,000. For the rest of New Zealand it was 0.1 cases per 100,000.

All four cases were overseas acquired. Three of the cases (all acquired in sub-Saharan Africa), had *P. falciparum*. One case (acquired in South Asia) had *P. vivax*.

The cases notified were adults of South Asian, Sub-Saharan African and New Zealand European ethnicity and spanned a wide range of ages.

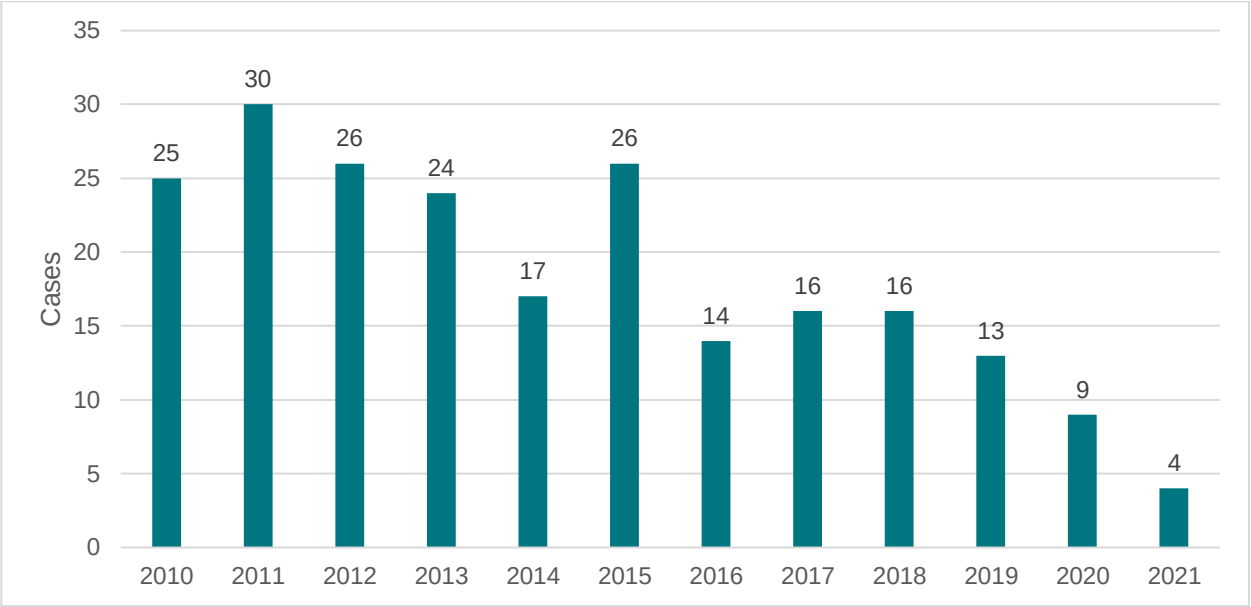


Figure 11: Malaria cases by year in the Auckland region 2010 - 2021

3.3 Exotic mosquito interceptions

Some *Aedes* and *Culex* species are mosquito vectors for the dengue, Chikungunya and Zika viruses. These specific species have not been able to establish populations in New Zealand to date, so fortunately New Zealand does not have a competent vector for autochthonous spread of arboviral disease. Unfortunately, as global warming continues, New Zealand may become a more hospitable environment for invasive mosquito species.

A single exotic mosquito was intercepted at Auckland International Airport Limited (AIAL) on 11th of February 2021. This was a dead female *Aedes aegypti.*

Routine surveillance by Ports of Auckland (POAL) detected only the established introduced species *Culex quinquefasciatus* and *Aedes notoscriptus*, and the indigenous mosquito species *Culex pervigilans*.

3.4 Leptospirosis

Leptospirosis is an infection caused by a corkscrew-shaped bacteria called *Leptospira*. Some cases are asymptomatic, while others will have symptoms ranging from mild (such as headaches, muscle pains, and fevers) to severe, with bleeding from the lungs or meningitis. If the infection causes jaundice, kidney failure and bleeding it is known as Weil's disease.

Up to 13 different genetic types of *Leptospira* may cause disease in humans. It is transmitted by both wild and domestic animals. The disease is most commonly spread by rodents. It is

often transmitted by animal urine or by water or soil containing animal urine coming into contact with breaks in the skin, eyes, mouth or nose. Outbreaks often occur after major flooding.

- There were seven cases of leptospirosis notified in 2021. In comparison there were five in 2020 and 11 in 2019.
- Four cases were hospitalised and none died.
- The incidence rate for the Auckland region was 0.4 per 100,000. For New Zealand as a whole it was 1.5 per 100,000.

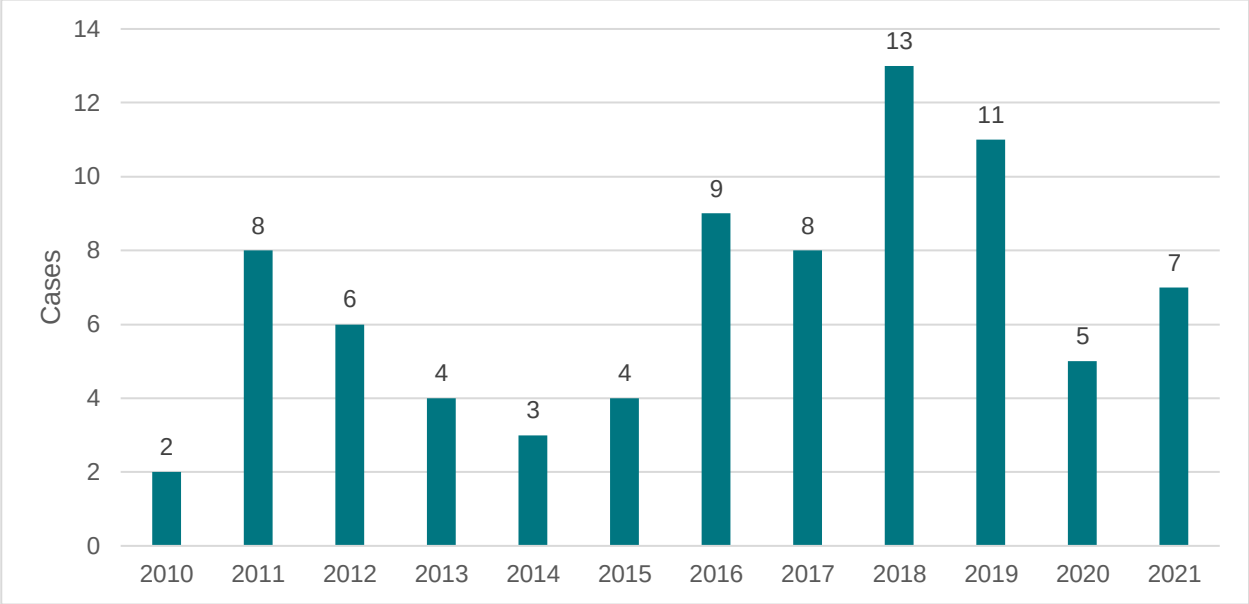


Figure 12: Leptospirosis cases by year in the Auckland region 2010 – 2021

There were no leptospirosis outbreaks in 2021.

In 2021 no cases were acquired overseas. This differs from previous years where a significant proportion usually have been.

All cases occurred in people aged 40 to 70 of European or New Zealand European ethnicity.

Of the seven cases:

- two were dairy farmers;
- four lived rurally; and
- four had obvious exposure to rats and rat droppings.

4 Enteric diseases

This chapter includes information on diseases which are usually transmitted faecal-orally, or by contaminated food or water.

Key points

- Typhoid and paratyphoid notifications were historically low in 2021 with just five cases notified.
- Shigellosis notifications were also historically low, with only three cases notified.
- VTEC/STEC case numbers were higher than in 2020, but lower than in 2019. Approximately one third of infections involved the O157 variant.
- Salmonellosis notifications were at the lowest rate recorded since 2010.
- Cases of campylobacteriosis were stable compared to previous years.
- There were fewer notifications of cryptosporidiosis and giardiasis compared to previous years.
- Yersiniosis notifications were historically high in 2021, disproportionately affecting people of Asian ethnicities.
- There were 25 notifications for gastroenteritis caused by foodborne toxins in 2021, but most cases were not linked. In most cases, the causative organism was not identified.

4.1 Enteric fevers

Enteric fevers (typhoid and paratyphoid fever) are foodborne diseases caused by the bacterium *Salmonella enterica* serotypes typhi or paratyphi. About 27 million people suffer from enteric fever each year, with about 200,000 deaths, almost exclusively in the developing world. Internationally, increasing antibiotic resistance is adding to the challenges of managing enteric fevers and they are becoming harder to treat. New Zealand generally does not have autochthonous transmission of enteric fevers but sees travel-related and food-related cases.

- There were five cases of enteric fever reported in 2021. This is significantly less than the historical average.
- Three cases were typhoid fever and two were paratyphoid fever.

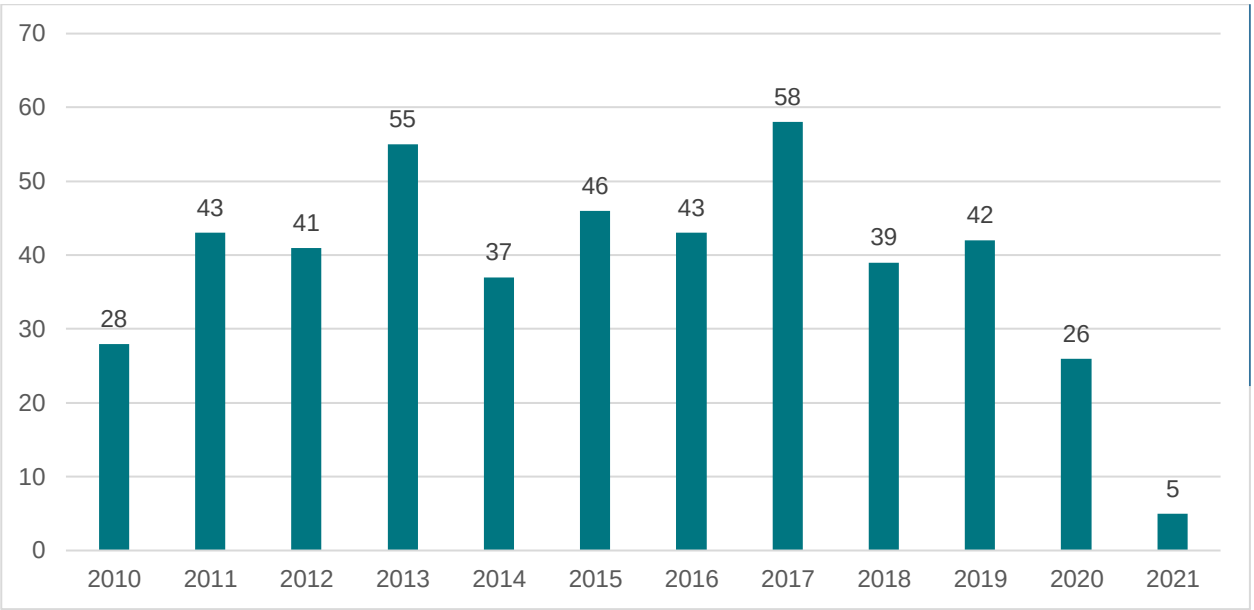


Figure 13: Enteric fever cases in the Auckland region 2010-2021

4.1.1 Typhoid fever

Typhoid fever is a common worldwide bacterial disease transmitted by the ingestion of food or water contaminated with the faeces of an infected person that contain the bacterium *Salmonella typhi*. In New Zealand, most cases acquire the infection while travelling overseas.

- There were three cases of typhoid fever in 2021.
- One case was hospitalised and there were no deaths.
- The incidence rate for the Auckland region was 0.2 cases per 100,000. There were no cases of typhoid notified elsewhere in New Zealand in 2021.

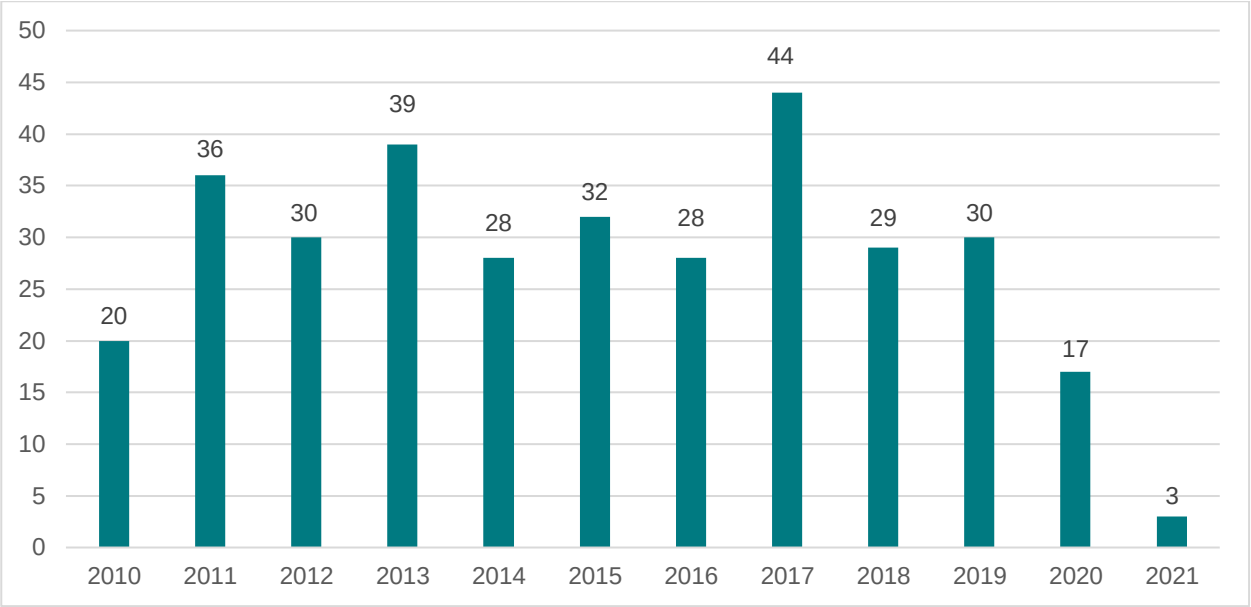


Figure 14: Typhoid fever cases in the Auckland region 2010-2021

Two cases were related to travel to India. The other was not related to travel, but reported eating food from Samoa.

The cases identified with Indian and Samoan ethnicities. One case was a child aged under five years old. The others were young women.

4.1.2 Paratyphoid fever

Paratyphoid fever is an enteric illness caused by one of three serotypes of *Salmonella enterica* subspecies *enterica A, B or C*. Like typhoid, they are transmitted by means of contaminated water or food. Paratyphoid fever bears similarities with typhoid fever and the two are referred to by the common name enteric fever, but the clinical course of paratyphoid fever is more benign. *S. Paratyphi B var Java* cases were previously classified as a paratyphoid fever notification, but these have now been reclassified and are managed as salmonellosis.

- There were two cases of paratyphoid fever in 2021.
- Neither case was hospitalised and there were no deaths.
- The incidence rate for the Auckland region was 0.1 cases per 100,000. There were no paratyphoid cases notified elsewhere in New Zealand in 2021.

One case was acquired in Serbia; the other case was not related to travel. Both cases were *paratyphi* A.

4.2 High risk enterics

4.2.1 Shigellosis

Shigellosis is also known as bacillary dysentery. It is a foodborne illness caused by bacteria of the genus *Shigella*. The causative organism is frequently found in water polluted with human faeces and is transmitted via the faecal-oral route. Shigella infection can cause serious dysentery (blood loss through diarrhoea). Most cases of shigellosis in New Zealand are related to international travel.

- There were three cases of shigellosis in the Auckland region in 2021.
- There was one hospitalisation and no deaths.
- The incidence rate for the Auckland region was 0.2 cases per 100,000. Only one case was notified in the rest of New Zealand in 2021.

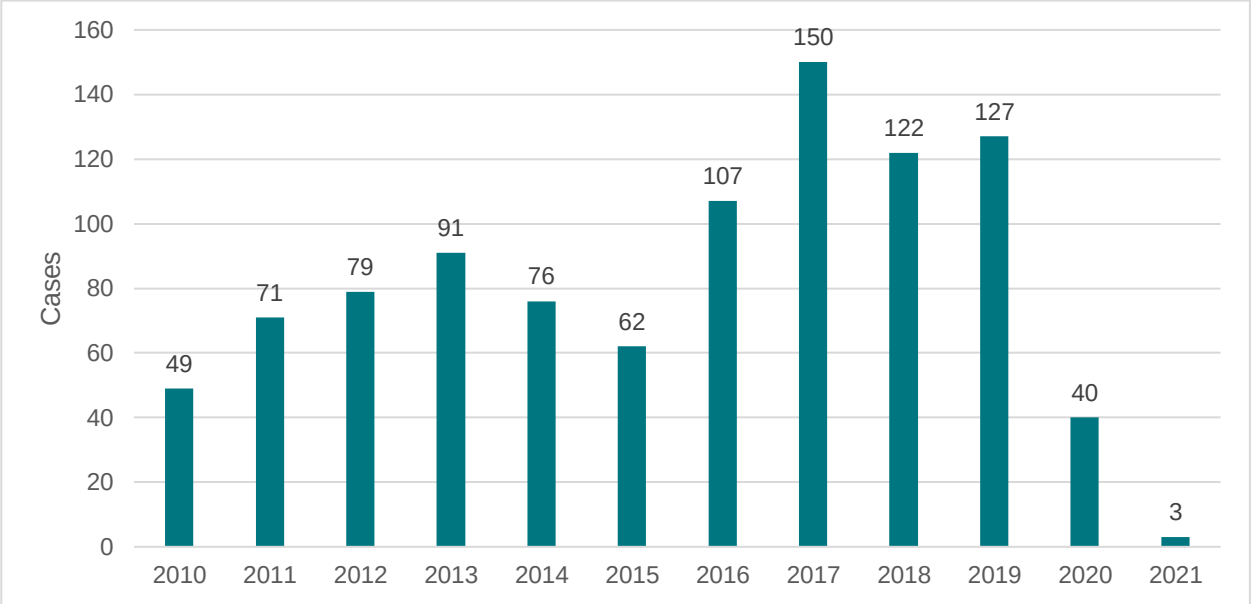


Figure 15: Shigellosis cases in the Auckland region 2010 - 2021

Two cases were *Shigella flexneri* 1c and the other was *Shigella flexneri* Xv.

None of the three cases were related to travel and the source of each case was unknown. Two of the cases were from the same small household outbreak.

4.2.2 Vero-toxigenic *E. coli* / Shiga toxin-producing *E. coli* (VTEC/STEC)

Escherichia coli (E. coli) bacteria are a normal part of the human gut flora. Some strains of *E. coli* are pathogenic; one group produces a dangerous toxin called shiga toxin. This toxin can damage the gut lining, blood cells and kidneys; five to 10 per cent of those who are diagnosed with VTEC/STEC infections, especially those infected with the O157 variant, develop the potentially life-threatening complication known as haemolytic uraemic syndrome (HUS). It predominantly, but not exclusively, affects children.

A new, more sensitive PCR test for VTEC/STEC was introduced in 2015, which resulted in the number of notified cases since then increasing significantly compared to previous years.

- There were 168 cases of VTEC/STEC in the Auckland region in 2021.
- 43 cases (25.6%) were hospitalised. There was one death. No children with HUS died.
- The incidence rate for the Auckland region was 9.7 cases per 100,000. This is approximately half the New Zealand-wide incidence rate of 17.8 cases per 100,000.

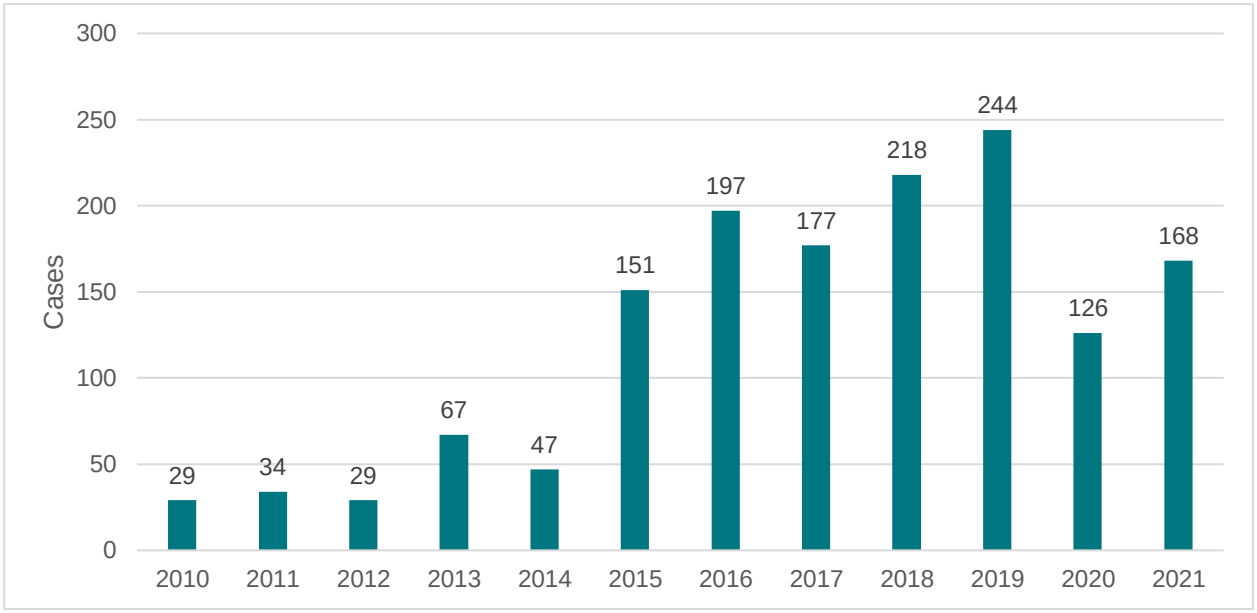


Figure 16: VTEC cases in the Auckland region 2010 – 2021

VTEC/STEC cases notified in 2021 peaked somewhat earlier than usual, in the summer month of January.

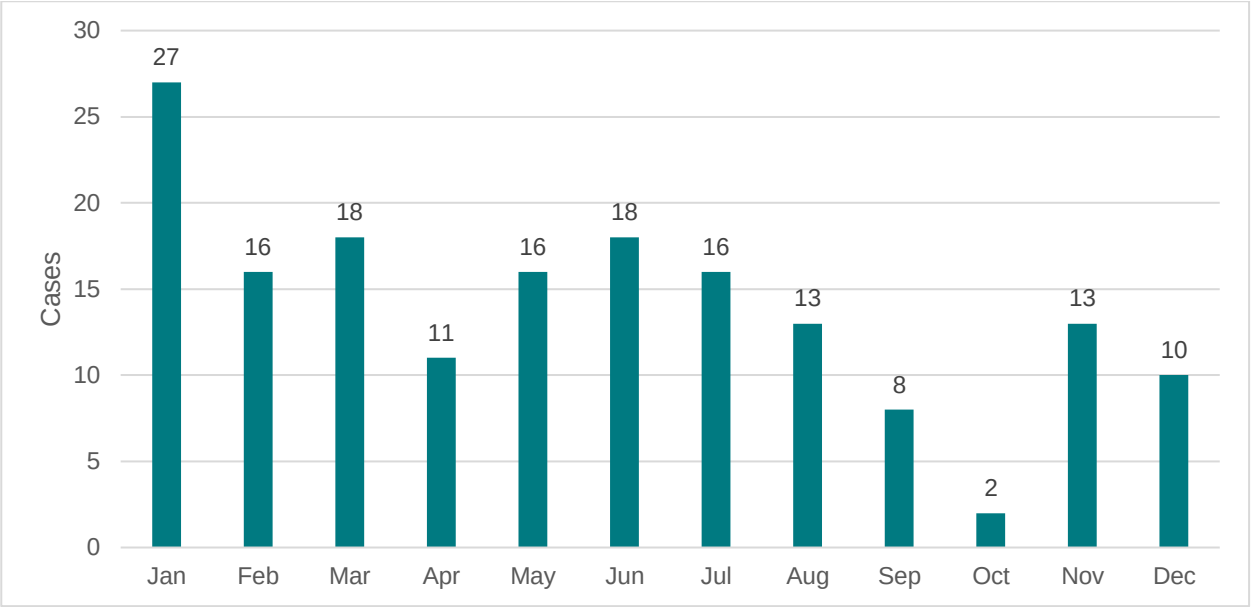


Figure 17: VTEC/STEC cases by month in the Auckland region in 2021

In 2021, of all confirmed cases, 50 cases (30%) returned positive for the VTEC/STEC O157 variant responsible for the majority of cases of HUS[3].

Table 6: Number of O157 and non-O157 VTEC/STEC cases in the Auckland region in 2021

VTEC Variant	Cases
O157	50
Other	118
Total	***168***

Among those notified with VTEC/STEC infection, there were:

- 42 reported cases with haemorrhagic colitis (25%);
- three cases with HUS (1.8%); and
- one case with thrombotic thrombocytopenic purpura (TTP) (0.6%).

As in previous years, the highest incidence rates were seen in cases younger than five years old. The incidence rate for children under a year old was 23.2 cases per 100,000; for children aged one to four years old it was 29.0 cases per 100,000.

[3] Samples which are positive for VTEC by PCR in an Auckland laboratory may be passed on to the Enteric Reference Laboratory at the Institute for Environmental and Scientific Research (ESR), a Crown Research Institute for further typing and analysis. ESR then performs further typing on these samples to determine the proportion of potentially harmful variants.

Table 7: Age-specific incidence rates of VTEC/STEC in the Auckland region in 2021

Age-group	Total	Rate per 100,000
<1	5	23.2
1 to 4	25	29.0
5 to 14	20	8.7
15 to 24	27	11.9
25 to 44	32	6.1
45 to 64	24	5.8
65+	35	29.3
Grand Total	***168***	***9.7***

Table 8: Ethnic grouping-specific incidence rates of VTEC/STEC in the Auckland region in 2021

Ethnic grouping	Total	Rate per 100,000
Asian	32	6.6
European or Other	110	13.8
Māori	13	6.4
Pacific peoples	12	5.0
Unknown	1	Not calculable
Grand Total	***168***	***9.7***

Cases with known connections to risk factors for VTEC/STEC are listed in table 9. The available data was incomplete in a number of cases. As seen previously, contact with pets is the leading risk factor for acquiring VTEC/STEC infection, followed by contact with farm animals, and contact with untreated water supply.

One case was related to travel from Pakistan. The other 167 cases were not related to international travel.

Table 9: Risk factors associated with VTEC/STEC in the Auckland region in 2021

Risk factor	Cases
Contact with domestic pets	75
Contact with farm animals	24
Untreated water supply	20
Contact with confirmed case or person with similar illness	7
Consumption of home kill meat	4
Overseas acquired	1
Contact with faeces or manure	1

4.3 Low Risk Enterics

4.3.1 Salmonellosis

Salmonellosis is an infection caused by *Salmonella* bacteria. Symptoms include diarrhoea, fever, vomiting, and abdominal cramps, which usually last four to seven days. Although most people recover without treatment, some patients' diarrhoea may be so severe that dehydration ensues, triggering hospitalisation.

- There were 178 cases of salmonellosis in the Auckland region in 2021. Cases in 2020 and 2021 were lower than pre-2020.
- There were 75 hospitalisations and no deaths.
- The incidence rate for the Auckland region was 10.3 cases per 100,000. For New Zealand as a whole it was 14.0 cases per 100,000.

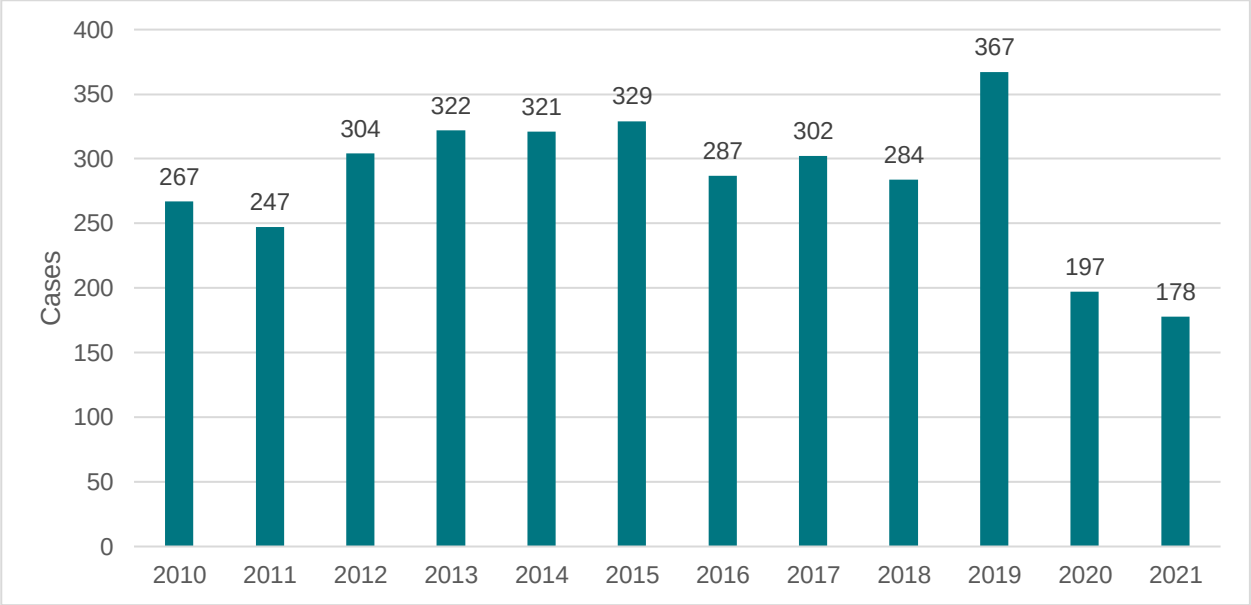


Figure 18: Salmonellosis cases in the Auckland region 2010 – 2021

Unusually, cases were relatively evenly distributed across the year. The typical peak in cases during the warmer summer months of January and February was not observed in 2021.

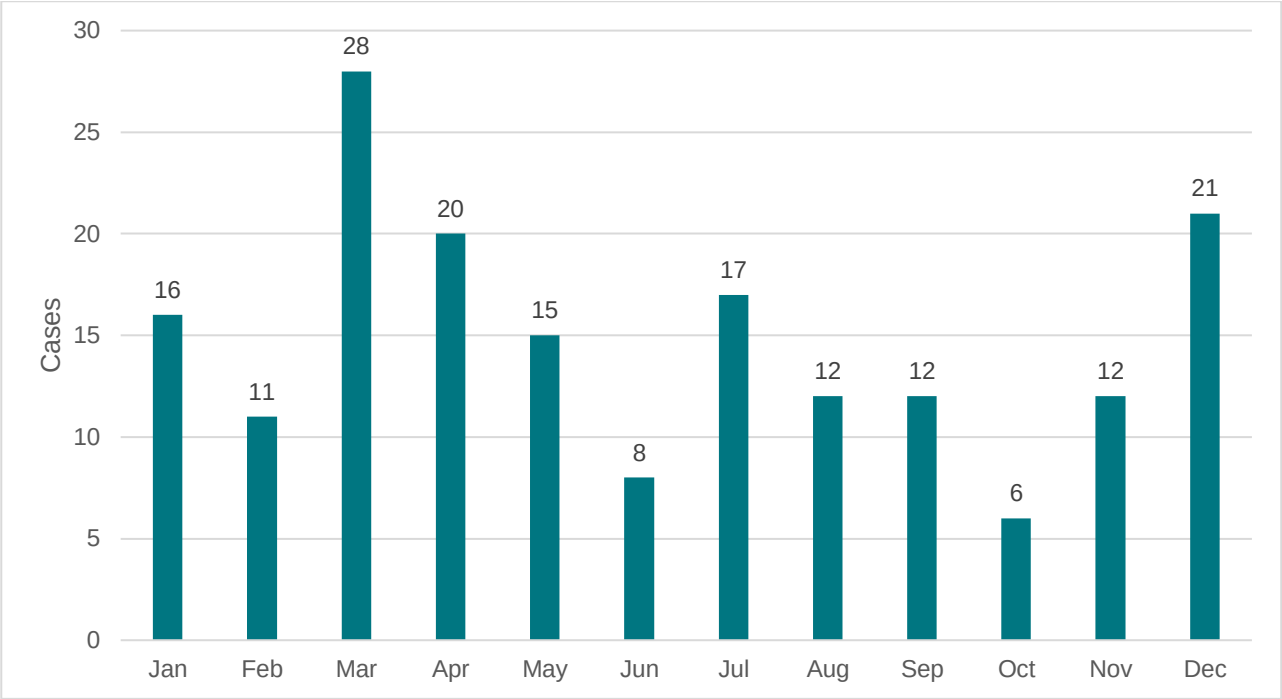


Figure 19: Monthly distribution of salmonellosis cases in the Auckland region in 2021

The incidence rate remained highest in children younger than five-years-old, and especially for those under a year old, who experienced 74.4 cases per 100,000.

Table 10: Age group-specific incidence rates of salmonellosis in the Auckland region in 2021

Age group	Total	Rate per 100,000
<1	16	74.4
1 to 4	27	31.4
5 to 14	23	10.0
15 to 24	12	5.3
25 to 44	30	5.7
45 to 64	42	10.1
65+	28	12.5
Grand Total	***178***	***10.3***

The European or Other ethnicity group had the highest incidence rate, followed by Pacific peoples.

Table 11: Ethnic distribution and sex-specific incidence rates of salmonellosis in the Auckland region

Ethnic group	Grand Total	Rate per 100,000
Asian	46	9.4
European or Other	89	11.2
Māori	15	7.3
Pacific peoples	26	10.9
Unknown	2	Not calculable
Grand Total	***178***	***10.3***

The highest number of salmonellosis notifications were caused by *Salmonella Typhimurium* strains followed by *Salmonella Enteritidis* strains. At least 20 other variants made up the remainder of the other cases.

Table 12: *Salmonella* variants detected in the Auckland region in 2021

Salmonella Serotype	Cases
Presumptive Salmonella Typhimurium	32
Salmonella Aberdeen	2
Salmonella Agona	1
Salmonella Bovismorbificans	8
Salmonella Brandenburg	7
Salmonella Chester	1
Salmonella Enteritidis	38
Salmonella Hadar	1
Salmonella Havana	1
Salmonella Hvittingfoss	3
Salmonella Infantis	3
Salmonella Kedougou	1
Salmonella Kentucky	1
Salmonella Kottbus	1
Salmonella Oslo	1
Salmonella Paratyphi B var Java	1
Salmonella Pensacola	3
Salmonella Poona	1
Salmonella Saintpaul	1
Salmonella Stanley	3
Salmonella Thompson	3
Salmonella Typhimurium	50
Salmonella Typhimurium phage type DT104	1
Salmonella Weltevreden	1
Salmonella Weltevreden var. 15+	1
Data not available	12

Suspected sources of infection, where known, were as follows:

- 39 cases (21.9%) had contact with potentially infectious recreational water (e.g. swimming pools, rivers and the ocean).
- 35 cases (19.7%) had visited a restaurant or other food service premises during their likely incubation period.
- 19 cases (10.7%) reported exposure to untreated water.
- 16 cases (9%) may have been related to farm animals, of which two cases reported their animals displaying symptoms.
- 8 cases (4.4%) had direct known contact with faeces before becoming unwell.
- One case (0.5%) drank raw milk.

No cases were related to international travel, which has been common in previous years.

4.3.2 Campylobacteriosis

Campylobacter enteritis is a zoonotic disease with clinical and epidemiological features similar to that of salmonellosis. Transmission may occur when food is cross-contaminated by raw poultry or other meat. Typical symptoms include diarrhoea which may be bloody, nausea and abdominal pain.

Routine interviews with cases of campylobacteriosis acquired in the Auckland region ceased in 2017, so data on source of infection is not available.

- There were 1567 cases of campylobacteriosis notified in the Auckland region in 2021.
- There were 11 hospitalisations and no deaths.
- The incidence rate for the Auckland region was 91 cases per 100,000. For New Zealand as a whole it was 112 per 100,000.

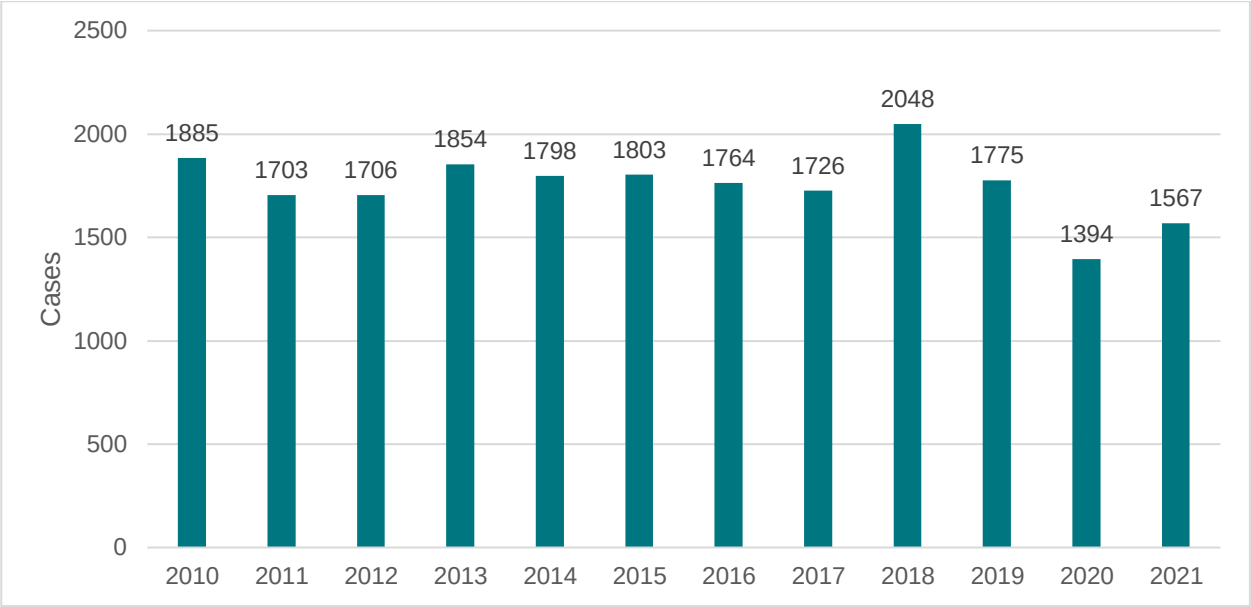


Figure 20: Campylobacteriosis cases in the Auckland region 2010 – 2021

The monthly distribution of campylobacter cases continues to show a seasonal monthly variation, with cases peaking in the summer months before reducing over winter.

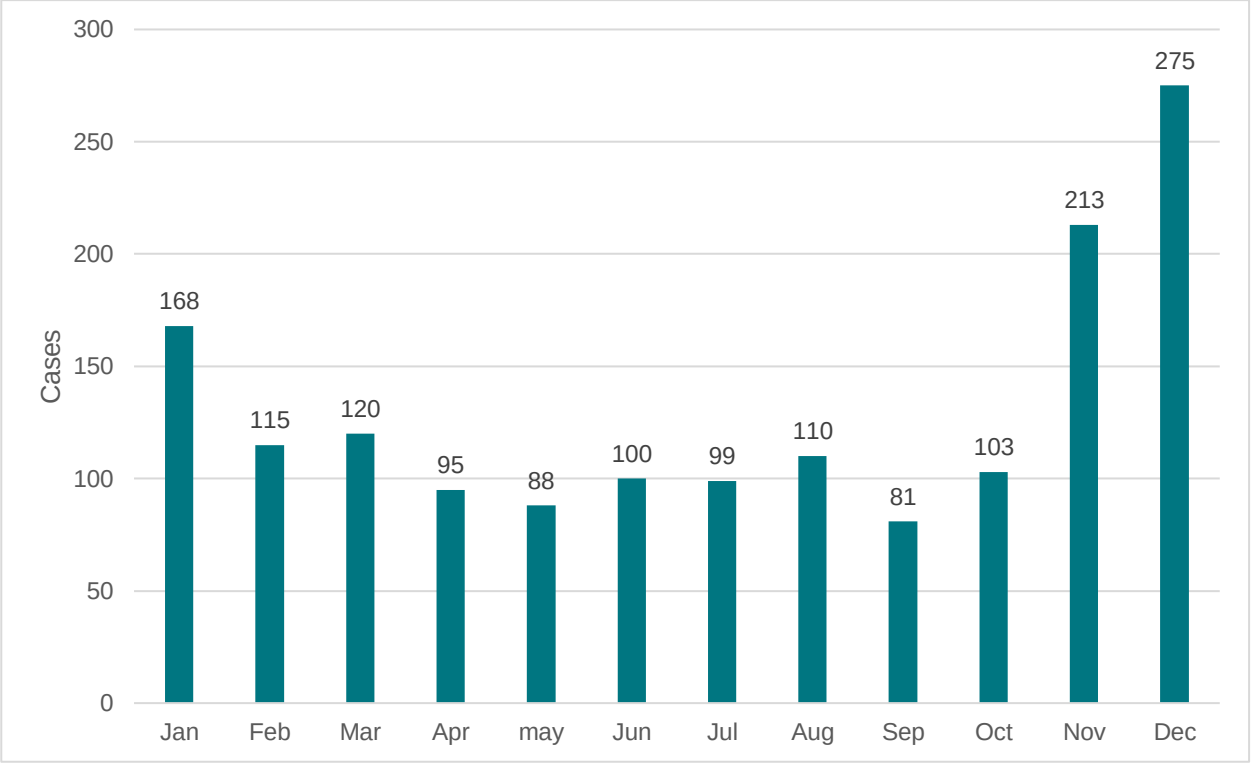


Figure 21: Monthly distribution of campylobacteriosis in the Auckland region in 2021

The incidence rate of campylobacteriosis is higher among males than among females.

In terms of age groups, the incidence rate was highest for:

- older people (148 per 100,000);
- infants and young children aged less than one (112 per 100,000);
- children aged one to four years old (137 per 100,000).

Table 13: Age and sex distribution and age-specific incidence rates of campylobacteriosis in the Auckland region in 2021

Age group	Female	Male	Total	Rate per 100,000
<1	13	11	24	112
1 to 4	49	69	118	137
5 to 14	41	75	116	51
15 to 24	60	109	169	75
25 to 44	181	225	406	77
45 to 64	179	225	404	97
65+	149	181	330	148
Grand Total	***672***	***895***	***1567***	***91***

The highest incidence rate was seen in the European or Other ethnic grouping. This group's incidence rate was double the rate for Māori, and more than ten times the rate for Pacific peoples.

Table 14: Ethnic group-specific incidence rates of campylobacteriosis in the Auckland region in 2021

Ethnicity - prioritised	Total	Rate per 100,000
Asian	221	45
European or Other	1,103	139
Māori	97	47
Pacific peoples	28	12
Unknown	82	Not calculable
Grand Total	***1567***	***91***

4.3.3 Cholera

Cholera is an infection of the small intestine caused by the bacterium *Vibrio cholerae*. The main symptoms are 'rice-water' diarrhoea and vomiting. This usually results in severe dehydration. Transmission occurs primarily by drinking water or eating food that has been contaminated by the faeces of an infected person, including asymptomatic cases.

- There were no cases of Cholera in 2021.
- Since 2010 there has only been two confirmed cases of toxigenic cholera in the Auckland region. One occurred in 2010 and the other in 2018.

4.3.4 Cryptosporidiosis

Cryptosporidiosis is a disease caused by *Cryptosporidium*, a protozoan parasite. It is faecal-orally spread, often through contaminated water. In most people, the main symptom is self-

limiting diarrhoea, but in immunocompromised individuals, such as those living with HIV/AIDS, the symptoms may be severe.

Cryptosporidiosis is often associated with animal contact, contaminated drinking water, and recreational water contact, and is a useful environmental health indicator in this regard.

Routine interviews with cases of cryptosporidiosis acquired in the Auckland region ceased in 2017.

Of note, some of the rise in case numbers after 2015 was due to the introduction of PCR testing.

- There were 140 cases of cryptosporidiosis in the Auckland region in 2021.
- There were no hospitalisations and no deaths.
- The incidence rate for the Auckland region was 8.1 cases per 100,000. The incidence rate for the rest of New Zealand was 13.7 cases per 100,000.

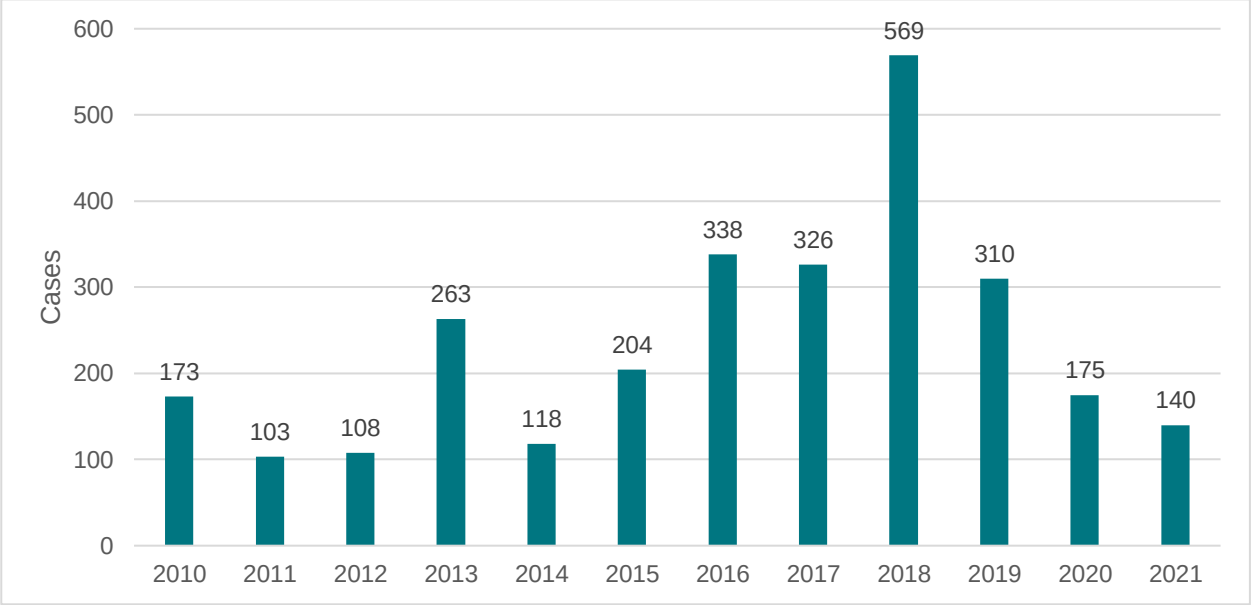


Figure 22: Cryptosporidiosis cases in the Auckland region 2010 – 2021[4]

Cryptosporidiosis shows a typical seasonal distribution, with an increase in spring during the lambing and calving seasons (which start in August) when increased contact with animals occurs.

[4] Some of the rise in case numbers since 2015 was due to the introduction of PCR testing.

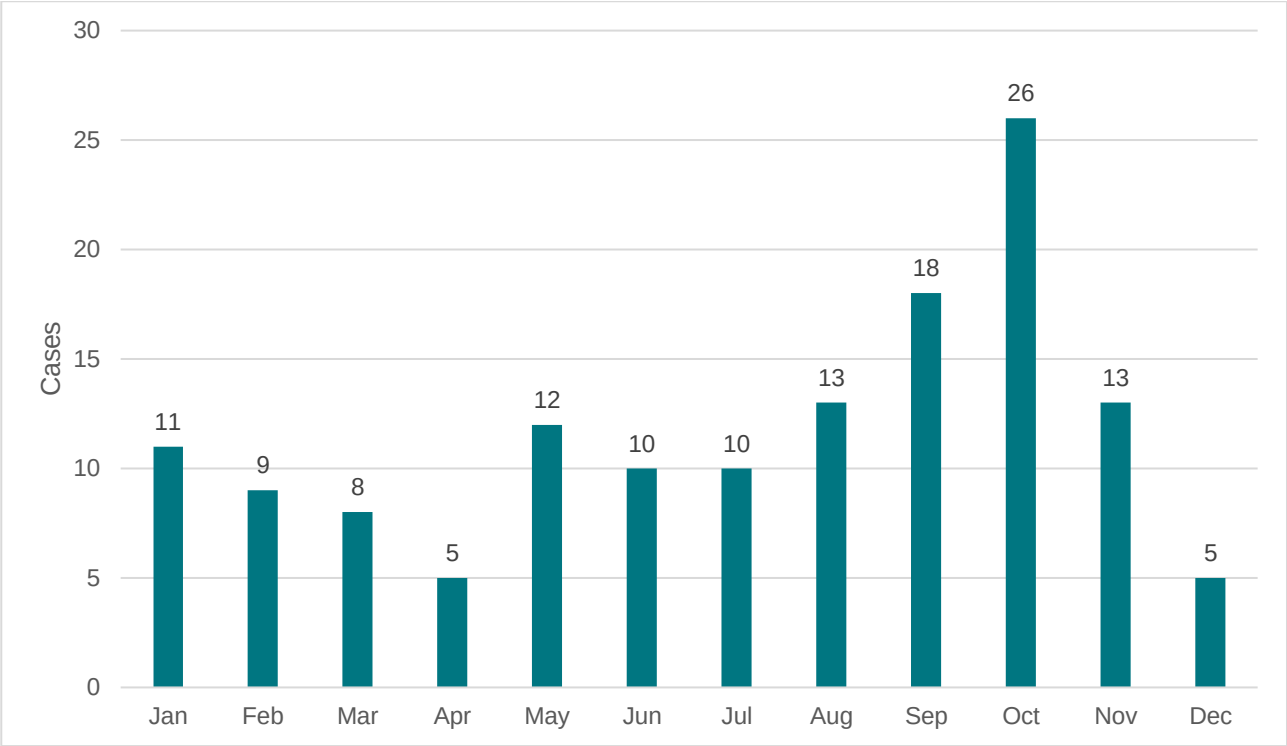


Figure 23: Monthly distribution of cryptosporidiosis cases in the Auckland region in 2021

Unlike with many other enterics, females remain more likely to contract cryptosporidiosis than males, especially women aged 24 to 44 years of age.

Age-wise, cryptosporidiosis was most common in those aged one to four years, with 22 cases per 100,000. There were no reported cases in infants less than a year old.

Table 15: Age and sex distribution and age-specific incidence rates of cryptosporidiosis in the Auckland region in 2021

Age group	Female	Male	Total	Rate per 100,000
1 to 4	12	7	19	22.0
5 to 14	9	14	23	10.0
15 to 24	12	10	22	9.7
25 to 44	31	16	47	8.9
45 to 64	9	11	20	9.5
65+	5	4	9	4.0
Grand Total	***78***	***62***	***140***	***8.1***

In terms of ethnicity, the incidence rate was lowest among people of Māori or Pacific ethnicity, with less than 2.4 cases per 100,000.

Table 16: Ethnic grouping-specific incidence rates of cryptosporidiosis in the Auckland region in 2021

Ethnicity - prioritised	Total	Rate per 100,000
Asian	24	4.9
European or Other	104	13.1
Māori	5	2.4
Pacific peoples	5	2.1
Unknown	2	Not calculable
Grand Total	***140***	***8.1***

4.3.5 Giardiasis

Giardiasis is a zoonotic parasitic disease caused by the flagellate protozoan *Giardia lamblia*. *Giardia* inhabits the digestive tract of a wide variety of domestic and wild animal species, as well as humans. It is the most common human pathogenic parasitic infection. In 2014, there were an estimated 280 million cases of worldwide symptomatic giardiasis.

Routine interviews with cases of giardiasis acquired in the Auckland region ceased in 2017.

- There were 266 cases of giardiasis in the Auckland region in 2021. This was a historic low.
- The incidence rate for the Auckland region was 15.4 cases per 100,000. For New Zealand as a whole it was 20.4 cases per 100,000.

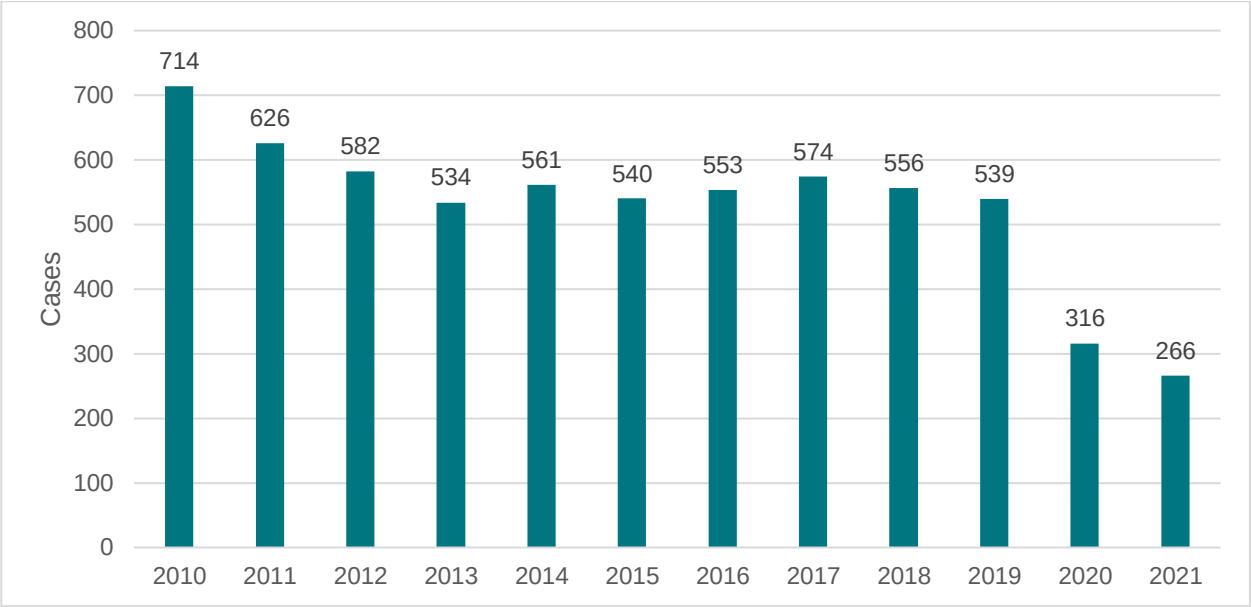


Figure 24: Giardiasis cases in the Auckland region 2010-2021

Giardiasis typically has the highest number of cases in the summer holiday period and autumn, before tailing off over the second half of the year. This pattern was repeated in 2021.

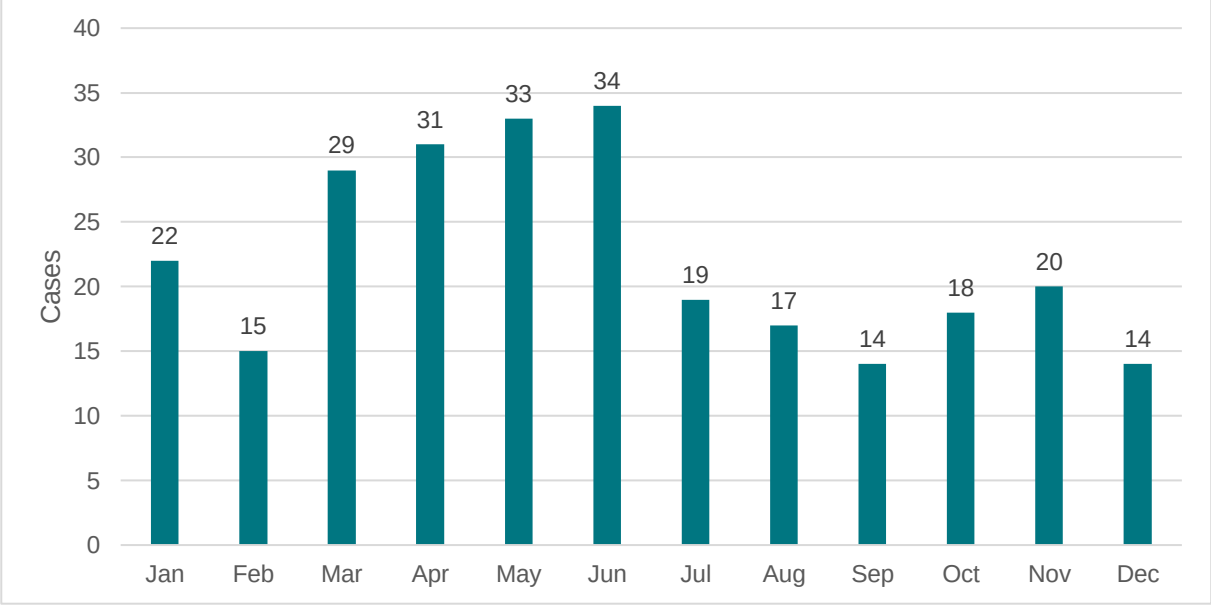


Figure 25: Monthly distribution of giardiasis in the Auckland region in 2021

The age-specific incidence rate was highest in the one to four age group, with 67.4 cases per 100,000.

Table 17: Age and sex distribution and age-specific incidence rates of giardiasis in the Auckland region in 2021

Age-group	Female	Male	Total	Rate per 100,000
<1	1	2	3	13.9
1 to 4	25	33	58	67.4
5 to 14	12	6	18	7.9
15 to 24	3	4	7	3.1
25 to 44	51	64	115	21.8
45 to 64	14	35	49	11.8
65+	11	5	16	7.2
Grand Total	***117***	***149***	***266***	***15.4***

The highest incidence was seen in those of European or Other ethnicities at 26 cases per 100,000. All other ethnic groups were less likely than the general population to develop giardiasis. Barriers to accessing primary care might be a factor in the low rates reported among those of Māori or Pacific ethnicities.

Table 18: Ethnic group distribution of giardiasis in the Auckland region in 2021

Ethnicity - prioritised	Total	Rate per 100,000
Asian	36	7.4
European or Other	207	26.0
Māori	17	8.3
Pacific peoples	1	0.4
Unknown	5	Not calculable
Grand Total	***266***	***15.4***

4.3.6 Listeriosis

Listeriosis is a serious bacterial infection caused by *Listeria monocytogenes*. It causes infections of the central nervous system (meningitis, meningoencephalitis, brain abscess) and bacteraemia, mostly in those who are immunocompromised, pregnant, and at the extremes of age (newborns and the elderly). It may also cause gastroenteritis in healthy people who have ingested a large amount of the organism.

Listeria is ubiquitous in the environment and is primarily acquired by eating contaminated food. *Listeria* has been isolated from raw meat, dairy products, vegetables, fruit and seafood, which is why many of these are not recommended during pregnancy. Soft cheeses, unpasteurised milk and unpasteurised pâté are higher risk food items.

Listeriosis is considered a serious infection because of its high risk of hospitalisation, death, and perinatal mortality.

- There were ten cases of listeriosis notified in the Auckland region in 2021. Case numbers in the Auckland region have remained stable over the last decade.
- All 10 cases were hospitalised. There were two deaths, with a case mortality rate of 20%.

- The incidence rate for the Auckland region was 0.6 per 100,000. The incidence rate for New Zealand as a whole was also 0.6 cases per 100,000.

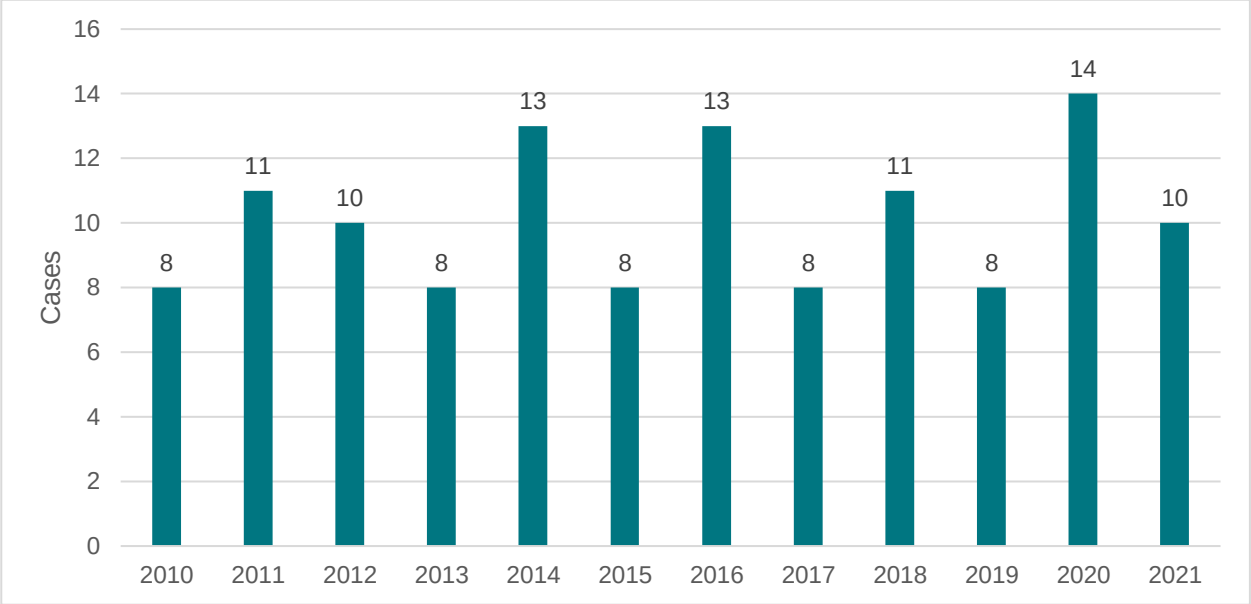


Figure 26: Listeriosis cases in the Auckland region 2010-2021

Eight cases were associated with underlying comorbid medical issues including acute strokes, end-stage renal failure and metastatic cancer. Inappropriate storage of refrigerator foods was reported for two of the cases.

There were no perinatal deaths from listeriosis in 2021, although relatedly, no cases of listeriosis were notified in women aged 15-44.

Table 19: Age and sex distribution and age-specific incidence rates of listeriosis in the Auckland region in 2021

Age-group	Female	Male	Total	Rate per 100,000
45 to 64	2	2	4	1.0
65+	1	5	6	2.7
Grand Total	***3***	***7***	***10***	***0.6***

In 2021 people of Asian ethnicity were over-represented in the data, with five notified cases. This represented an incidence rate of one per 100,000.

Table 20: Ethnic group distribution of listeriosis in the Auckland region in 2021

Ethnicity - prioritised	Grand Total	Rate per 100,000
Asian	5	1.0
European	3	0.4
Pacific peoples	2	0.8
Grand Total	***10***	***0.6***

4.3.7 Yersiniosis

Yersiniosis is caused by a bacterium of the genus *Yersinia*. Most yersiniosis infections among humans are caused by *Y. enterocolitica,* of which there are several pathogenic subtypes. Infection with *Y. enterocolitica* occurs most often in young children.

The infection is thought to be contracted by consuming undercooked meat products, especially pork, via unpasteurised milk, or by drinking water contaminated by the bacteria.

Routine interviews with cases of yersiniosis acquired in the Auckland region ceased in 2017.

- There were 517 cases of yersiniosis in the Auckland region in 2021.
- There were two hospitalisations and no deaths.
- The incidence rate for the Auckland region was 30 cases per 100,000. This was virtually identical to the incidence rate for New Zealand as a whole, which was 28 cases per 100,000.

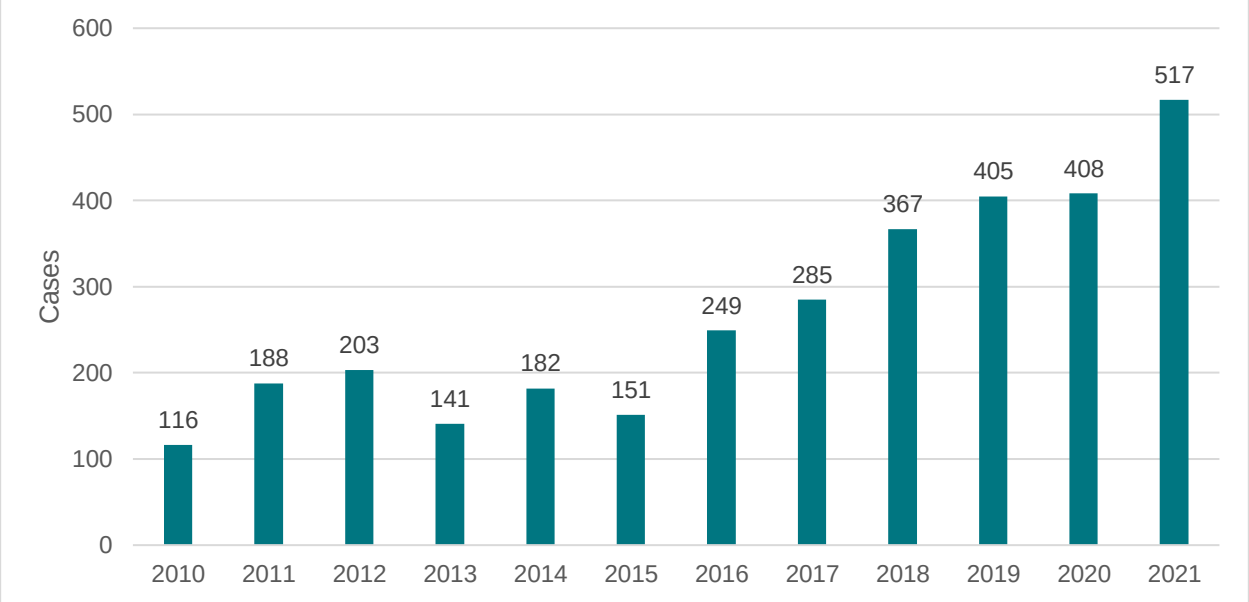


Figure 27: Yersiniosis cases in the Auckland region 2010 – 2021[5]

Usually yersiniosis occurs throughout the year, typically with spring peaks. In 2021 cases were observed throughout the year, but the expected spring peak did not materialise. Instead, cases were highest in July, prior to Auckland shifting into the COVID-19 Alert Level 3 in August. This suggests that yersiniosis cases were not being acquired at home.

[5] At the beginning of 2016, Labtests Auckland doubled the incubation period for stool culture from 24 to 48 hours based on evidence that this increased the yield of Yersinia enterocolitica and Yersinia pseudotuberculosis. Then, in mid-2017, Labtests introduced PCR testing, which led to the identification of many more cases of yersiniosis than previously.

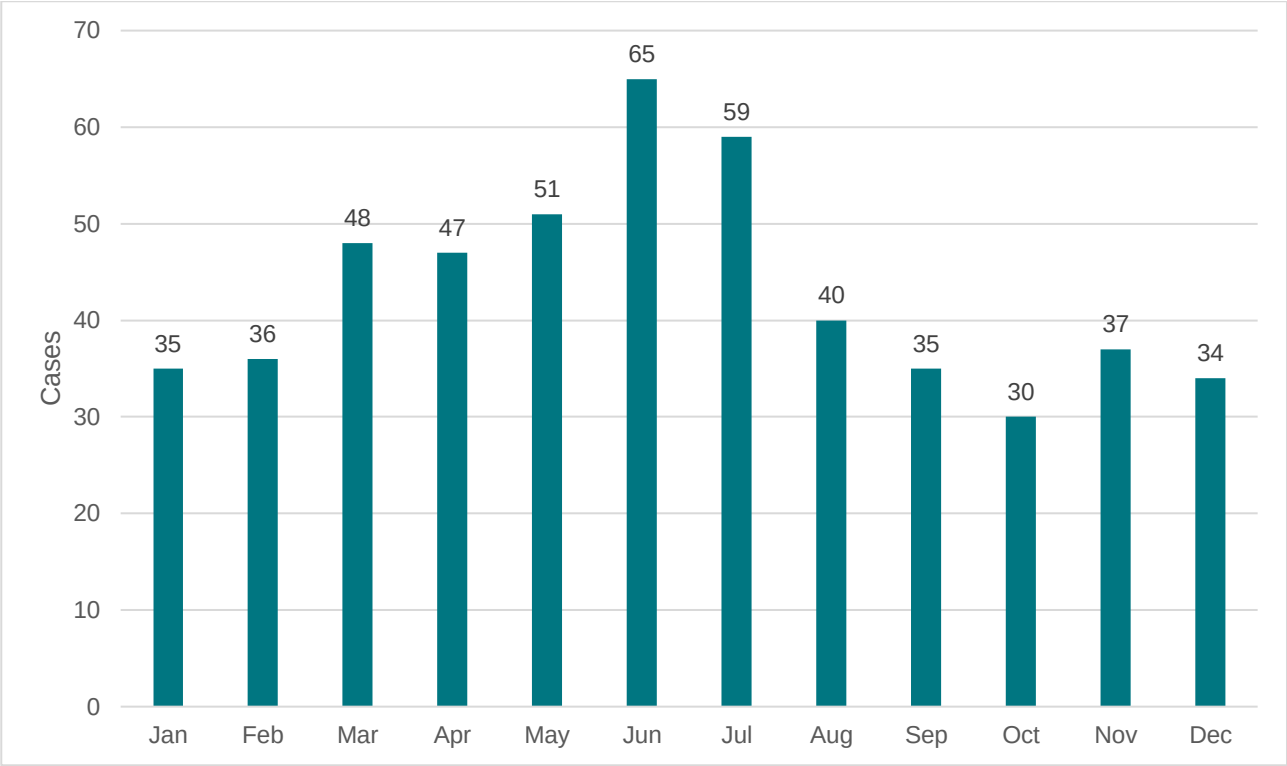


Figure 28: Monthly distribution of yersiniosis cases in the Auckland region in 2021

Children younger than five years old again led the age group-specific incidence rates.

Table 21: Age and sex distribution and age-specific incidence rates of yersiniosis in the Auckland region in 2021

Age group	Total	Incidence rate per 100,000*
<1	33	153
1 to 4	87	101
5 to 14	48	21
15 to 24	43	19
25 to 44	171	32
45 to 64	92	22
65+	43	19
Grand Total	***517***	***30***

As in previous years, people of an Asian ethnicity were more likely to develop yersiniosis than people of other ethnicities. Intriguingly, given that most Auckland cases of yersiniosis are among people of Asian ethnicities and that Asian New Zealanders are overwhelmingly located in Auckland, there is virtually no difference between the rate of yersiniosis in Auckland and the rate of yersiniosis in New Zealand at large.

Table 22: Ethnic-specific incidence of yersiniosis in the Auckland region in 2021

Ethnicity - prioritised	Total	Rate per 100,000
Asian	263	54
European or Other	181	23
Māori	18	9
Pacific peoples	37	15
Unknown	18	Not calculable
Grand Total	***517***	***30***

ESR microbiological typing of yersiniosis cases is shown below in table 23. The dominant strains of *Yersinia* present in the Auckland region in 2021 were *Yersinia enterocolitica* biotype 2/3 serotype O:9 comprising over half of all serotyped cases, and *Yersinia enterocolitica* biotype 4 serotype O:3 comprising approximately one sixth.

Table 23: Microbiological typing of yersiniosis in the Auckland region in 2021

Serotype	Total
No Yersinia enterocolitica or Yersinia pseudotuberculosis isolated (ie. different Yersinia species)	1
Yersinia enterocolitica biotype 1A	3
Yersinia enterocolitica biotype 1A not serotypes O:3, O:5, O:8, O:9	19
Yersinia enterocolitica biotype 1A serotype O:5	5
Yersinia enterocolitica biotype 1A serotype O:8	2
Yersinia enterocolitica biotype 2/3 serotype O:5, 27	8
Yersinia enterocolitica biotype 2/3 serotype O:9	318
Yersinia enterocolitica biotype 4 serotype O:3	87
Yersinia pseudotuberculosis	1
Information unavailable	73
Grand Total	***517***

4.4 Illness from foodborne toxins

4.4.1 Toxic shellfish poisoning

Toxic shellfish poisoning is caused by eating shellfish which have high levels of toxins. The chemicals that cause toxic shellfish poisoning are produced by certain species of toxic algae and released into the shellfish when they ingest the algae. Depending on the type of toxin, the poisoning can be serious, resulting in symptoms including paralysis, coma and death.

- There were no confirmed cases of toxic shellfish poisoning notified in the Auckland region in 2021.
- Two possible cases were referred to the Ministry for Primary Industries, but were not subsequently confirmed as cases.

- There have been no confirmed cases since 2010, with the exception of two probable cases in 2014.

4.4.2 Gastroenteritis from foodborne toxins

Cases of gastroenteritis not known to be caused by one of the above bacteria, or caused by a virus such as norovirus, are classified as gastroenteritis from foodborne toxins. This category also includes infection from the non-toxic shellfish bacteria *Vibrio*. Infection with *Vibrio parahaemolyticus* or *Vibrio fluvialis* is acquired by consuming raw seafood that has been contaminated or not stored at the proper temperature, allowing *Vibrio* bacteria to grow.

As with other causes of gastroenteritis the symptoms include watery diarrhoea, nausea, abdominal cramps and fevers. The incubation period is usually around 24 hours, but can be between four and 96 hours.

- There were 25 notifications of gastroenteritis from foodborne toxins in the Auckland region in 2021.
- The causative organism was specified in three cases. In two of these cases the implicated organism was *Vibrio fluvialis.* The other case was *Vibrio parahaemolyticus*.
- Both the *fluvialis* cases were hospitalised; the *parahaemolyticus* case was not hospitalised. There were no deaths.

5 Viral hepatitis

Viral hepatitis refers to liver inflammation due to viral infection. It may present in acute or chronic forms. The most common causes of viral hepatitis are the five quite unrelated hepatotropic viruses: hepatitis A, hepatitis B, hepatitis C, hepatitis D, and hepatitis E.

Key points

- There were significantly fewer hepatitis A and C notifications than in previous years.
- Hepatitis B notifications have been decreasing steadily since 2010.
- Hepatitis Not Otherwise Specified (NOS) notifications are less common, making it difficult to predict trends for notifications for hepatitis D and E.
- A total of 10 cases of probable and confirmed viral hepatitis were reported in 2019, compared with 59 cases in 2019.
- Three cases were hospitalised. No deaths were reported from acute viral hepatitis.
- The distribution of acute viral hepatitis serotypes by year is shown in Table 24.

Table 24: Classification of acute viral hepatitis cases in the Auckland region in 2021

Hepatitis Type	Total
Hepatitis A	2
Hepatitis B	5
Hepatitis C	1
Hepatitis NOS	2
Hepatitis D	2
Hepatitis E	0
Grand Total	***10***

5.1 Hepatitis A

Hepatitis A or “infectious jaundice” is caused by hepatitis A virus (HAV), a faecal-orally-transmitted picornavirus. It causes an acute form of hepatitis and does not have a chronic stage because the patient's immune system confers immunity against future infection.

People with hepatitis A are advised to rest, stay hydrated and avoid alcohol. A vaccine is available that will prevent HAV infection for up to 10 years. Hepatitis A is often spread through personal contact, consumption of raw berries or seafood, or drinking contaminated water.

- There were two cases of hepatitis A in the Auckland region in 2021.

- Neither case was hospitalised and there were no deaths.
- The incidence rate for the Auckland region was 0.1 cases per 100,000.

Of the two cases, one was a child and the other was an adult. One had recently travelled to Afghanistan and the other had not travelled.

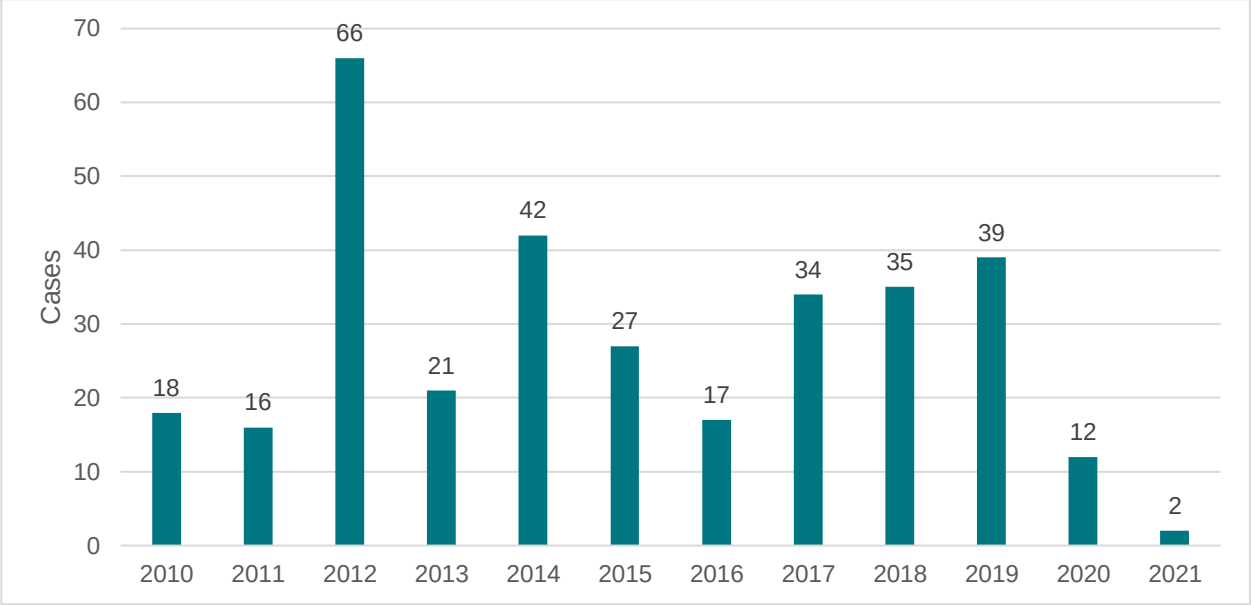


Figure 29: Hepatitis A cases in the Auckland region 2010 – 2021

5.2 Hepatitis B

Hepatitis B is a liver infection caused by the hepatitis B virus (HBV). It can cause both acute and chronic infections. It is a blood borne illness and included in this section for the sake of convenience.

Almost 20 per cent of adult infections have no symptoms during the initial infection. Some develop a rapid onset of sickness with vomiting, yellow skin, feeling tired, dark urine and abdominal pain. It may take months before symptoms begin. Symptoms often last a few weeks. Occasionally, the initial infection results in death.

Ninety per cent of those infected as babies develop chronic hepatitis B, along with about 50 per cent of children ages between one and five years and five per cent of adults. Most of those with chronic disease have no symptoms but are still at risk of cirrhosis and liver cancer. These complications cause the death of 15 to 25 per cent of those with chronic disease.

- There were five cases of acute hepatitis B in the Auckland region in 2021.
- Three of these cases were hospitalised and none died.

One case was a household contact of a person already known to have hepatitis B and one had multiple risk factors. The mode of transmission for the other cases was not recorded.

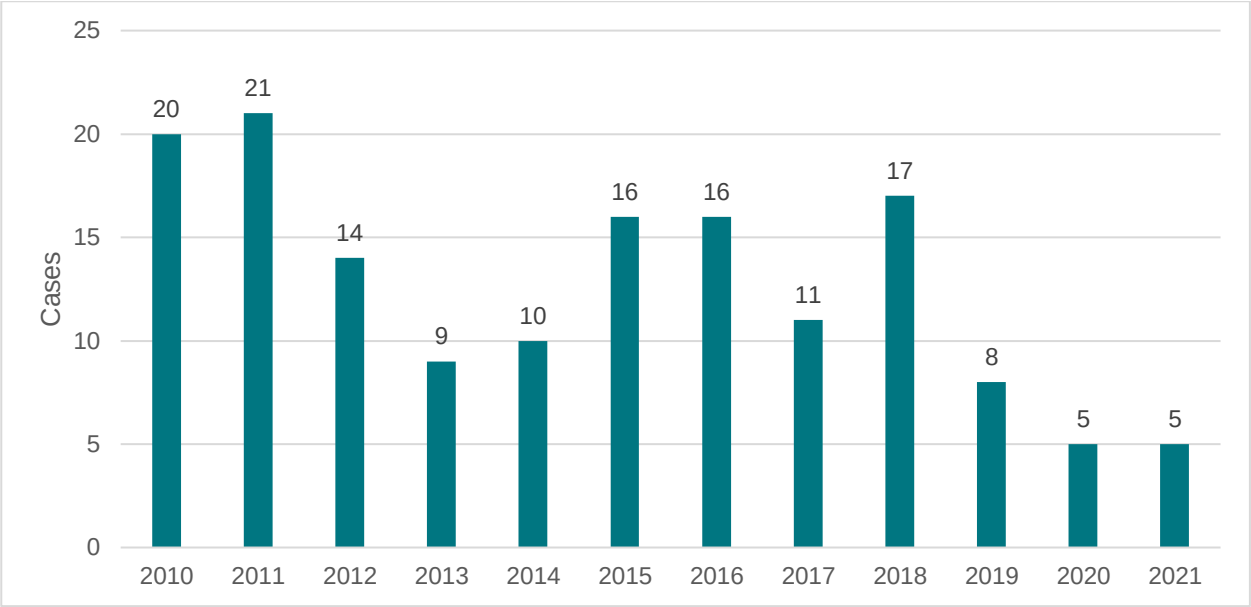


Figure 30: Acute Hepatitis B cases in the Auckland region 2010 – 2021

5.3 Hepatitis C

Hepatitis C is a blood-borne pathogen which causes liver inflammation and can result in liver cancer. It is spread mainly through contact with infected blood.

There are more than 50,000 people in New Zealand living with the hepatitis C virus, and it is estimated only half are currently diagnosed. People with the virus can remain asymptomatic for decades.

Hepatitis C is a curable disease when diagnosed early enough, although end-stage disease and liver cancer are more difficult to treat.

- There was one new hepatitis C case in the Auckland region in 2021.
- The case did not require hospitalisation.

The case had recently arrived in New Zealand from overseas.

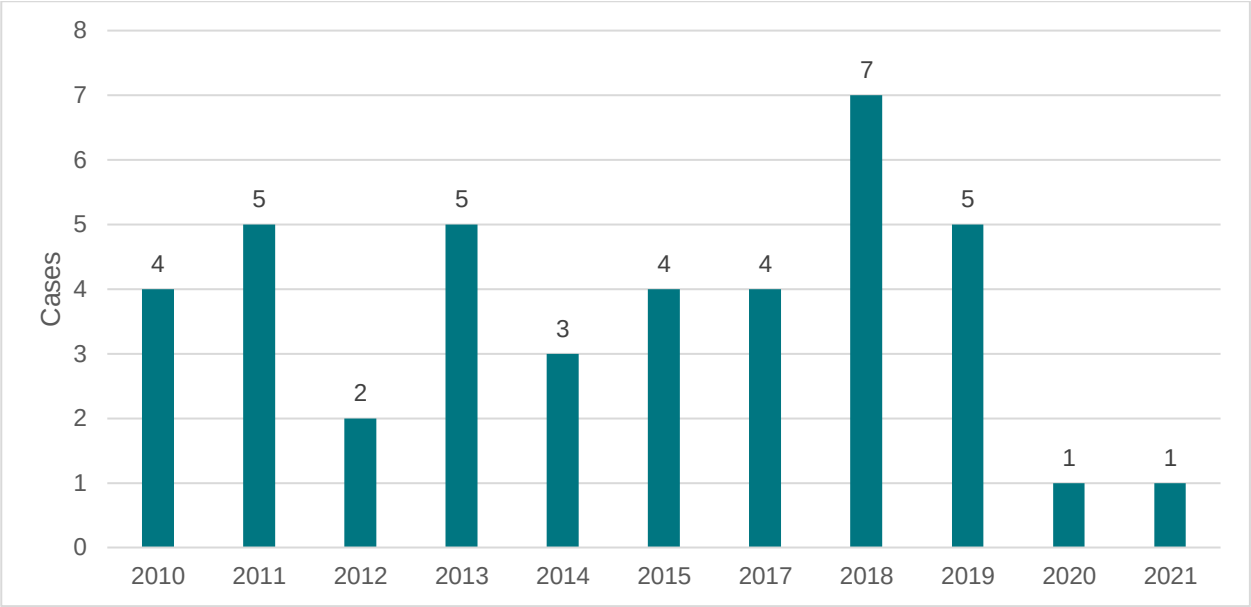


Figure 31: Hepatitis C cases in the Auckland region 2010 – 2021

5.4 Hepatitis - Not Otherwise Specified (NOS)

Hepatitis NOS includes the hepatitis D and E viruses, as well as cases of infectious hepatitis where the causative virus is unknown.

Hepatitis D (HDV) occurs either as an acute co-infection with hepatitis B or as a super-infection in cases of chronic hepatitis B. HDV-HBV co-infection is considered the most severe form of chronic viral hepatitis as patients with both viruses are far more likely to develop liver cancer. Vaccination against hepatitis B is the only method to prevent HDV infection.

Hepatitis E is similar to hepatitis A in that it is transmitted via the faecal-oral route, usually after drinking contaminated water. The infection is usually self-limiting and resolves within six weeks. Occasionally a serious disease known as fulminant hepatitis (acute liver failure) develops, which can be fatal.

- There were two cases of hepatitis NOS in the Auckland region in 2021, both of which were hepatitis D.
- Neither case required hospitalisation.

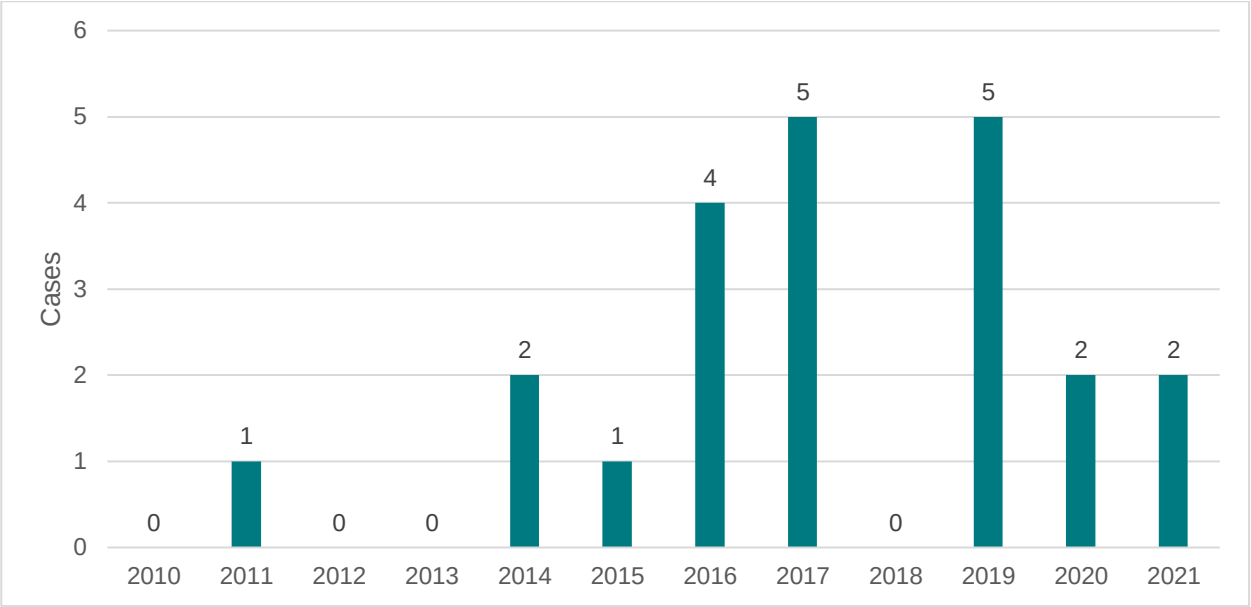


Figure 32: Hepatitis D cases in the Auckland region 2010 – 2021

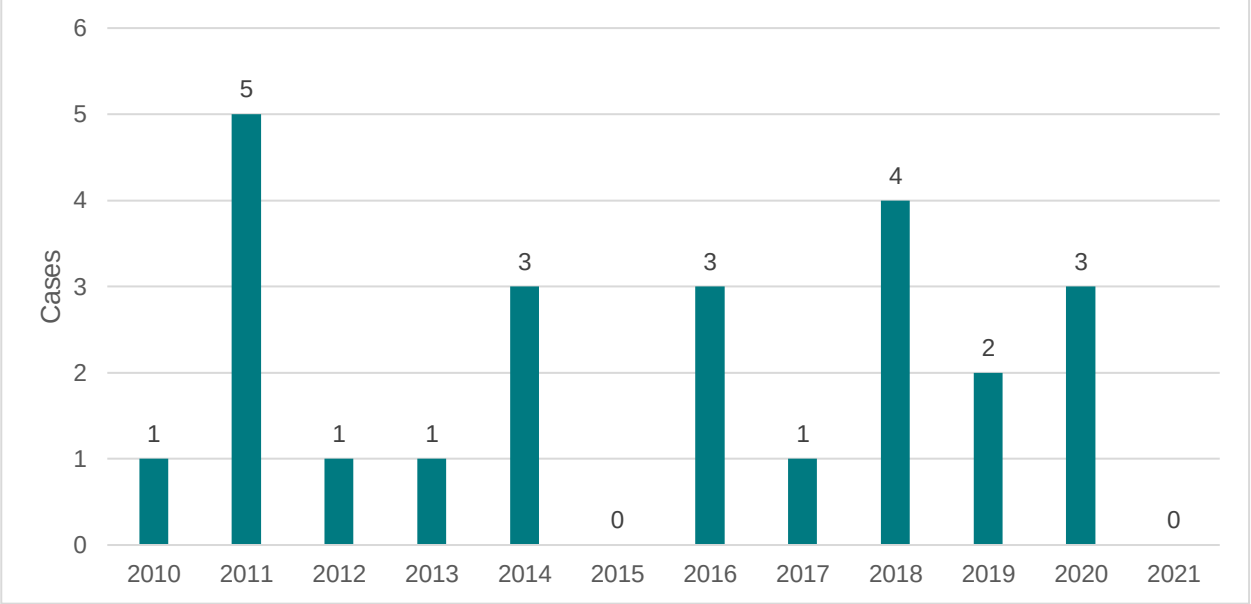


Figure 33: Hepatitis E cases in the Auckland region 2010 – 2021

6 Vaccine preventable diseases

Key points

- There were no cases of measles, mumps or rubella notified in the Auckland region in 2021. This is in stark contrast to the 1,734 cases of measles and 174 cases of mumps notified in relation to outbreaks in 2019.
- There were 12 cases of pertussis notified in 2021, however of these, 11 were classified as probable and one was confirmed on PCR testing. The total case number was well below the historical average. There were no cases of pertussis notified in infants aged less than a year old.
- Seasonal influenza was wholly absent in 2021. The most common causes of influenza-like illness in the Auckland region in 2021 were RSV and rhinovirus.
- Meningococcal disease notifications declined in 2021 with nine cases.
- Invasive pneumococcal disease notifications have gradually declined over the course of the decade but cases persist despite vaccination efforts. Rates for Māori and Pacific children and the elderly remain high. After the PCV13 vaccine was discontinued in favour of PCV10 we have observed an uptick in the number of cases which would have otherwise been covered by PCV13.

6.1 Measles

Measles is a highly contagious infection caused by the measles virus. Initial symptoms typically include fever (often greater than 40°C), cough, runny nose, and conjunctivitis. Two or three days after the start of symptoms, small white spots may form inside the mouth, known as Koplik's spots. A red, flat rash, which usually starts on the face and then spreads to the rest of the body, typically begins three to five days after the start of symptoms. Symptoms usually develop 10 to 12 days after exposure to an infected person, and last for seven to 10 days. Measles can be infectious up to four days before an infected person shows symptoms.

Worldwide, measles affects about 20 million people a year, primarily in the developing areas of Africa and Asia. Epidemics of measles in Europe, Asia, North America and the Philippines in 2018 led to an outbreak of measles in New Zealand in 2019 which infected 2,194 people. Though no one in New Zealand died of measles infection, the epidemic spread to Samoa from

Auckland in September 2019, where it infected 5,700 people and caused 83 deaths, most of them children.

There were no cases of measles notified in 2021.

The last cases of measles prior to 2021 were the seven notified in January 2020. These were linked to the 2019 measles epidemic.

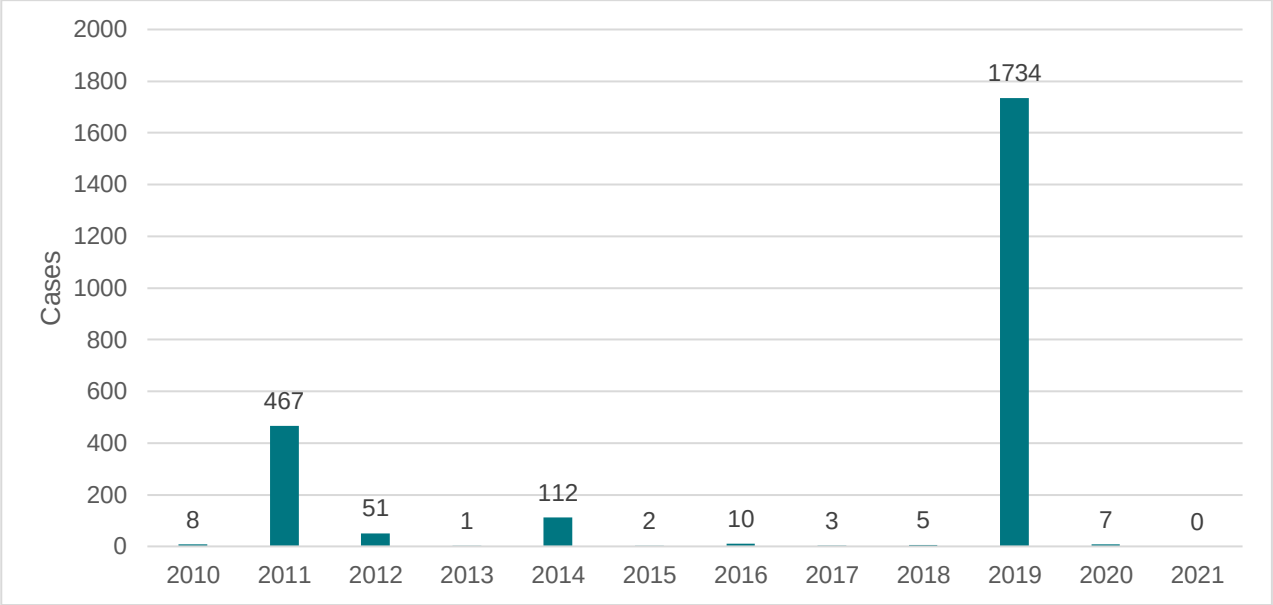


Figure 34: Measles cases in the Auckland region 2010 – 2021

6.2 Mumps

Mumps is a highly infectious viral disease caused by the mumps virus. Fever, painful swelling of the parotid glands, muscle pain, headache and feeling tired are common initial symptoms. Painful swelling of the salivary glands – classically the parotid glands – usually occurs and is the most typical presentation seen in up to 95 per cent of cases. Complications include painful testicular swelling, which can cause reduced fertility. Symptoms in adults are often more severe than in children. Mumps is highly contagious and spreads rapidly among people living in close quarters. Symptoms typically occur 14 to 18 days after exposure, and patients are infectious a few days before the onset of symptoms.

There were no cases of mumps notified in 2021.

The last mumps cases in Auckland occurred in April 2020, and the mumps outbreak which began in 2017 is considered closed.

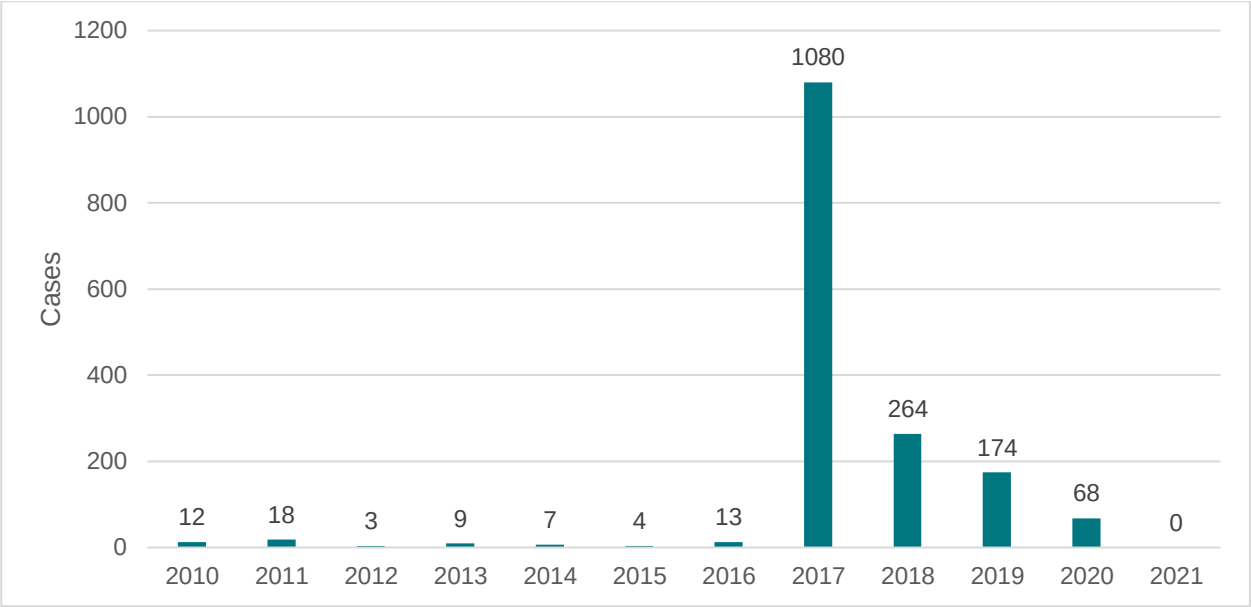


Figure 35: Mumps cases in the Auckland region 2010 – 2021

6.3 Rubella

Rubella is a common childhood infection that is seldom fatal, although transient arthropathy may occur in adults. Rubella is transmitted via airborne droplets. Serious complications are very rare. Rubella is considered dangerous because it can cross the placenta, and causes congenital rubella syndrome (CRS) when it infects foetuses in utero.

There were no cases of rubella notified in Auckland in 2021.

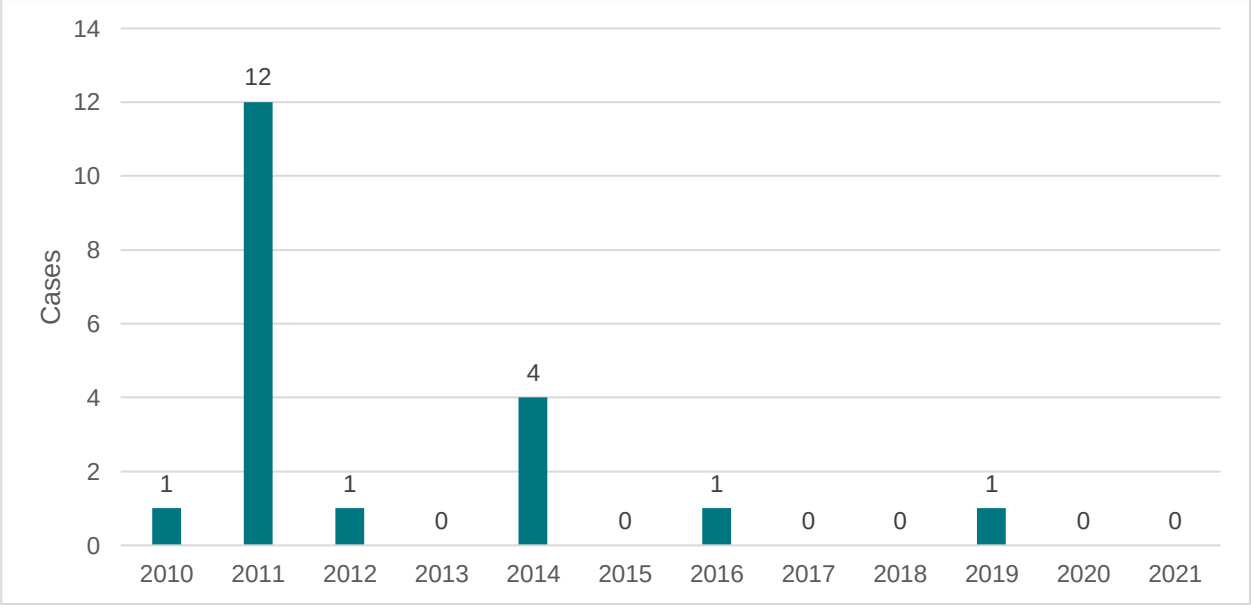


Figure 36: Rubella cases in the Auckland region 2010 – 2021

6.4 Pertussis

Pertussis (whooping cough) is a bacterial airborne disease transmitted by respiratory droplets and secretions. The incubation period ranges from one to three weeks, but is typically seven to 10 days. Pertussis can cause significant illness in infants under a year old. Among infants, whooping cough has a mortality rate of approximately one per cent.

- There was one confirmed pertussis case and 11 probable cases reported in the Auckland region in 2021.
- There were five hospitalisations and no deaths.

There has been a rapid decline in pertussis case numbers since the outbreak of 2017 and 2018. The number of cases in 2021 was the lowest number in 10 years.

In 2020 it was observed that cases decreased sharply during the COVID lockdown and COVID-19 measures likely continued to play a significant part in the low reported numbers for 2021.

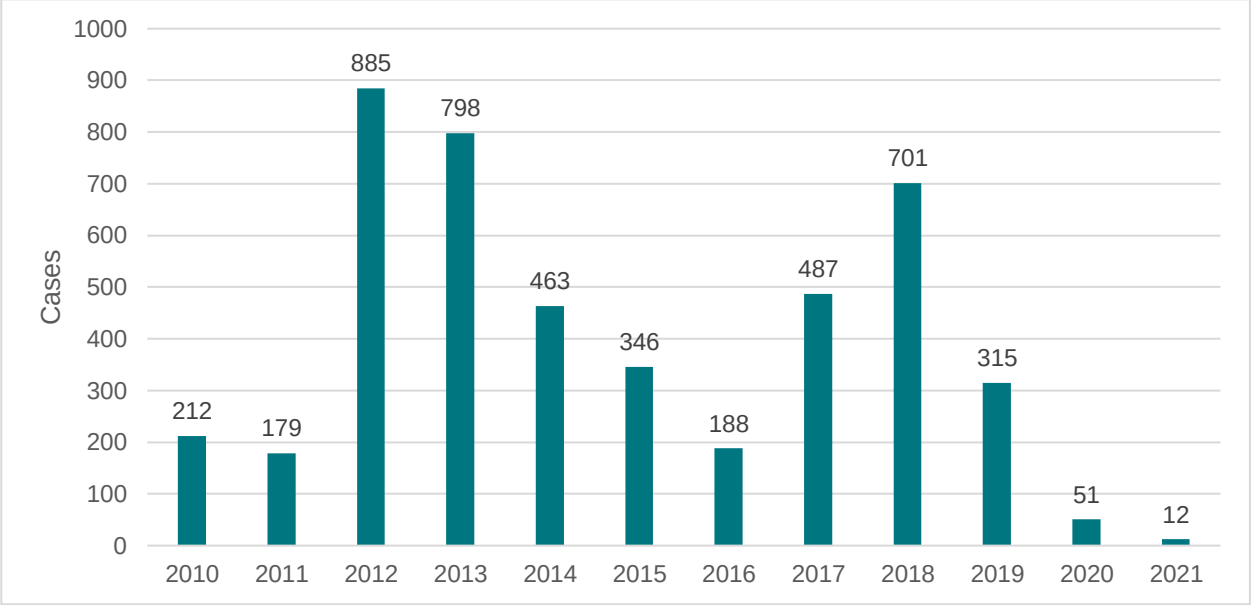


Figure 37: Pertussis cases in the Auckland region 2010 – 2021

ARPHS' pertussis strategy focuses on protecting infants less than one year of age and involves strenuous case containment efforts at early learning services and schools. Over the past 10 years there has been a downward trend in cases among under one year olds. There were no infants aged under one notified with pertussis in 2021.

Some caution should be applied interpreting the 2021 case numbers, given the high proportion of 'probable' cases, which can be diagnosed on the basis of clinical symptoms or non-specific serological evidence. There is a realistic possibility that endemic pertussis

was eliminated by the initial COVID-19 lockdown, with cases only returning sometime in 2021-22 as the borders re-opened.

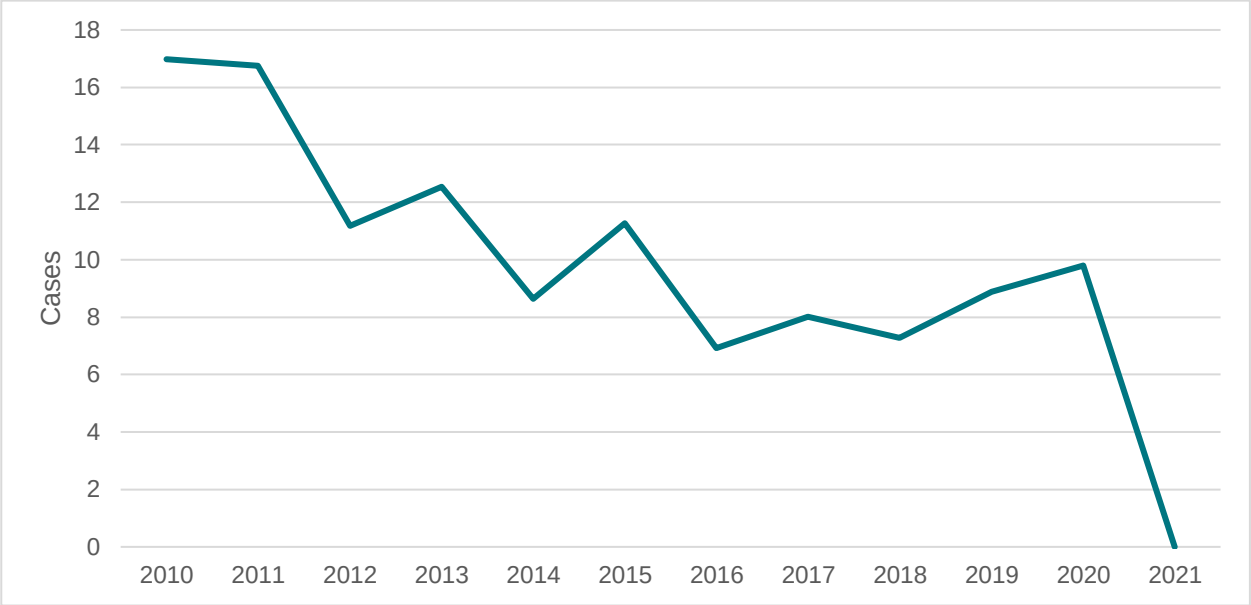


Figure 38: Percentage of pertussis cases in infants under one year old in the Auckland region 2010 - 2021

Table 25: Age and sex distribution of confirmed and probable pertussis cases in the Auckland region in 2021

Age group	Female	Male	Total	Incidence Rate per 100,000
5 to 14	1	0	1	0.4
15 to 24	0	1	1	0.4
25 to 44	3	2	5	0.9
45 to 64	1	3	4	1.0
65+	1	0	1	0.4
Total	***6***	***6***	***12***	***0.7***

Ethnic-specific rates of pertussis in 2021 were significantly higher among Europeans and New Zealand Europeans than other ethnic groupings. This is quite different to previous years, where case numbers were higher among Māori. The Asian ethnic group has consistently low incidence rates of pertussis, along with the highest childhood vaccination rates.

Table 26: Ethnic distribution of pertussis cases in the Auckland region in 2021

Ethnicity	Total	Incidence Rate per 100,000
Asian	1	0.2
European or Other	9	1.1
Māori	1	0.5
Pacific peoples	1	0.4
Grand Total	***12***	***0.7***

6.5 Influenza (seasonal flu)

The flu season is different depending on where you are in the world. In New Zealand, it usually falls between April and September. There are three types of flu viruses that cause seasonal influenza: A, B, and C.

Type A influenza is usually responsible for the majority of seasonal flu cases. There are many different varieties of influenza A that are classified into subtypes - H and N - and even further into different strains. Influenza A's H and N subtypes are based on the 16 different types of hemagglutinin (H) proteins and nine different types of neuraminidase (N) proteins attached to the virus.

Influenza B is typically less severe than influenza A. It does not cause pandemics. There are also different strains of influenza B.

Influenza C, which affects only humans, is much milder than types A and B. It typically causes mild respiratory illnesses, and it is not known to have caused any seasonal flu epidemics. The symptoms of influenza C are similar to those of a cold.

Any influenza A virus has the potential to cause a global pandemic in a relatively short amount of time. Some influenza pandemics have caused very severe illness and killed millions of people, such as the 1918 flu pandemic.

There were no cases of influenza in New Zealand in 2021.

6.5.1 Influenza tracking in the Auckland region

Influenza surveillance in the Auckland region was carried out in three ways in 2021:

1. The FluTracking initiative (https://info.flutracking.net) – this is a collaboration between Australian and New Zealand government agencies, the University of Newcastle Australia, and ESR. It relies on self-reporting by community volunteers to provide a picture of changes in influenza trends. Participating individuals are sent a survey each week asking whether they experienced influenza-like illness (ILI) in the past week, were tested for influenza, and whether the result was positive. FluTracking reports that in New Zealand in 2021 there was an average of 41,000 responses per week and more than 67,000 participants completing at least one survey.
2. Severe Acute Respiratory Infection (SARI) surveillance in hospitals was active from 26 April 2021. Intensive Care Unit SARI (ICU SARI) surveillance is similar to generic hospital SARI but is active year round and is ICU-specific. This data comes from Auckland (now Te Toka Tumai) and Counties Manukau District laboratories and is reported to ESR.
3. Influenza specimen collection from General Practices performed on patients presenting with ILIs.

In 2021, overall rates of hospitalisation due to respiratory illness were well below historical averages. There were no hospitalisations due to influenza.

Data across the three different surveillance methodologies used also found:

- Of 1,118 hospitalised patients with SARI reported by ESR, 883 (74.5%) were tested for influenza and none tested positive.
- Of the 1,374 specimens collected nationally from patients presenting to GP practices with ILIs, none were positive for influenza. This is in marked contrast to previous years. In the 2019 surveillance period 2,063 specimens were sent nationally for laboratory testing and 1,156 (56%) were positive for influenza.
- FluTracking also reported no cases of influenza in 2021.

Based on these findings, it is likely that the unique combination of low international travel, social distancing measures, and changed international influenza distribution patterns present in 2021 prevented transmission of influenza in New Zealand.

6.6 Other airborne viruses

As in previous years, rhinovirus and Respiratory Syncytial Virus (RSV) were the most frequently detected non-influenza respiratory viruses circulating in 2021.

The 2021 Annual Influenza Summary published by ESR reports that nationally, of the 1,374 specimens sent for ILI laboratory testing, 278 (20.2%) were positive for RSV and 193 (14.0%) were positive for rhinovirus.

Parainfluenzavirus was also present in a small number of samples.

6.7 Meningococcal disease

Meningococcal disease is an acute, potentially life-threatening illness caused by the bacterium *Neisseria meningitidis.* The bacteria are transmitted in large respiratory droplets or secretions from the nasopharynx of colonised individuals. Most transmission occurs from people who are colonised with the bacteria but do not have resulting disease. Meningococcal disease initially causes flu-like symptoms but can rapidly progress to meningitis and septicaemia.

In New Zealand the case fatality rate is historically four per cent, and up to 20 per cent of survivors may have long-term complications such as seizures, brain injury, deafness and limb amputations. There are multiple different serogroups of *N. meningitidis*, with A, B, C, Y and W being the most common groups in New Zealand. The New Zealand epidemic from 1991 to

2007 was attributed to a Group B strain. There were nine cases of meningococcal disease in the Auckland region in 2021. This was the lowest level of notifications since 2014.

- All cases were hospitalised and there were no deaths.

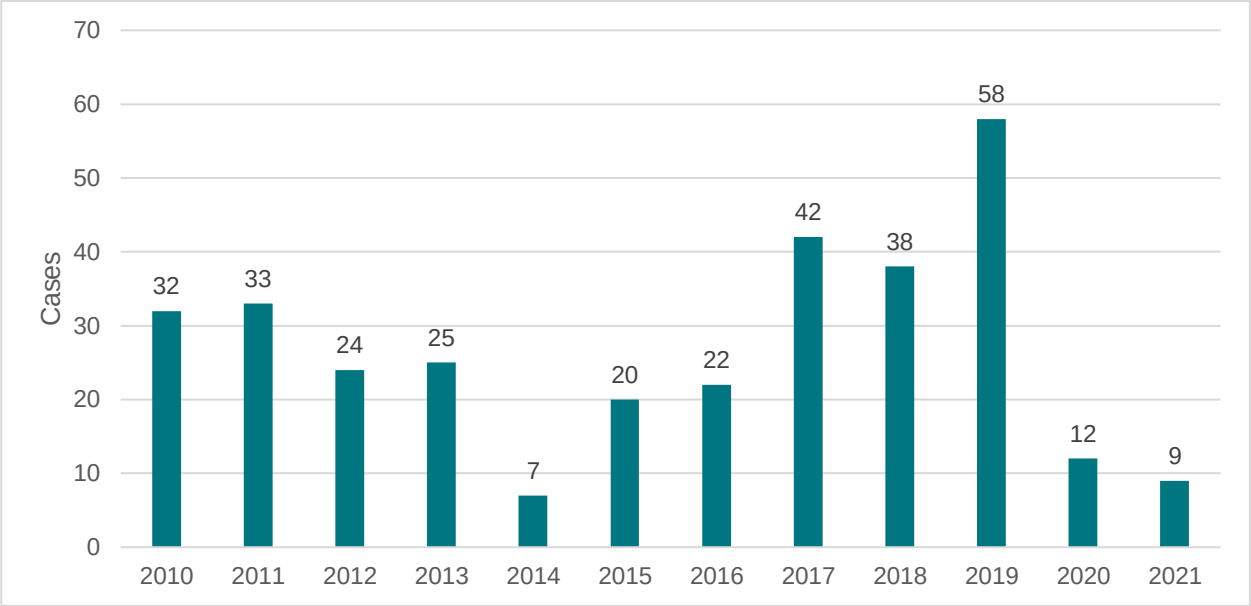


Figure 39: Meningococcal disease cases in the Auckland region 2010 – 2021

All cases were reported during the cooler months, occurring between April and October.

The majority of cases were in the under one age group, which had an incidence rate of 27.9 per 100,000.

The highest ethnic group incidence rate was among Māori, with four times as many cases as the rate for the population as a whole.

Table 27: Age and sex distribution and age-specific incidence rates of confirmed meningococcal disease in the Auckland region in 2021

Age group	Female	Male	Total	Rate per 100,000
<1	1	5	6	27.9
1 to 4	0	1	1	1.2
30 to 39	0	1	1	0.4
60 to 69	1	0	1	0.6
Total	*2*	*7*	*9*	*0.5*

Table 28: Ethnic group-specific incidence rates of confirmed meningococcal disease in the Auckland region in 2021

Ethnic Group	Number of cases	Rate per 100,000
Asian	1	0.2
European	2	0.3
Māori	4	2.0
Pacific peoples	2	0.8
Total	*9*	*0.5*

All meningococcal cases in 2021 were of serogroup B and there were no other groups detected[6].

6.8 Invasive pneumococcal disease

Invasive pneumococcal disease (IPD) is caused by *Streptococcus pneumoniae*. *S. pneumoniae* resides asymptomatically in the nasopharynx of healthy carriers.

S. pneumoniae is the main cause of community acquired pneumonia and meningitis in children and the elderly, and of septicaemia in HIV-infected persons. The methods of transmission include sneezing, coughing, and direct contact with an infected person.

Invasive pneumococcal diseases include meningitis, bacteraemia, sepsis, osteomyelitis, septic arthritis, endocarditis, peritonitis, pericarditis and brain abscess. Invasive pneumococcal disease (IPD) is defined as a *S. pneumoniae* infection in a normally sterile site.

- 126 cases of IPD were notified in the Auckland region in 2021.
- There were 122 hospitalisations and 18 deaths. This is the largest number of IPD-related deaths since 2014.
- The incidence rate for the Auckland region was 7.3 cases per 100,000. The incidence rate for New Zealand as a whole was 9.2 per 100,000.

[6] In recent years there was concern over the emergence of serotype W, with 14 cases in 2019 and 11 cases in 2018. Higher rates were noted in Northland and this prompted a mass vaccination campaign.

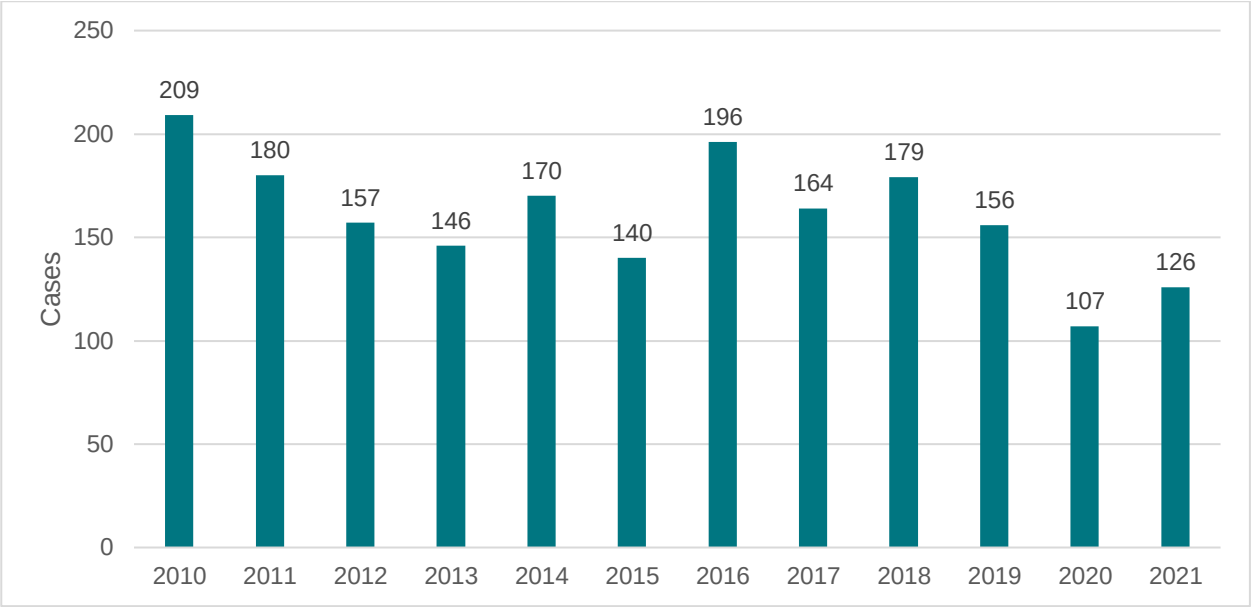


Figure 40: Invasive pneumococcal disease cases in the Auckland region 2010 – 2021

IPD cases are more common over the winter months, and this pattern was repeated in 2021.

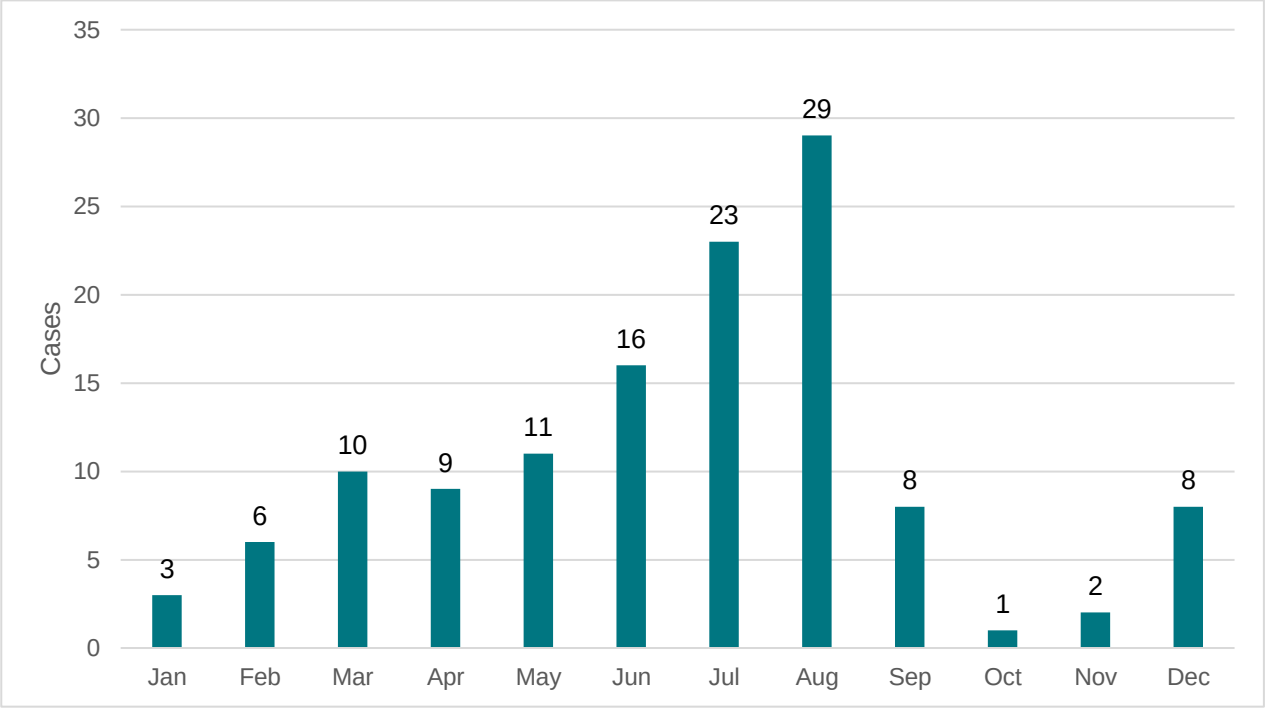


Figure 41: Monthly distribution of invasive pneumococcal disease cases in the Auckland region 2021

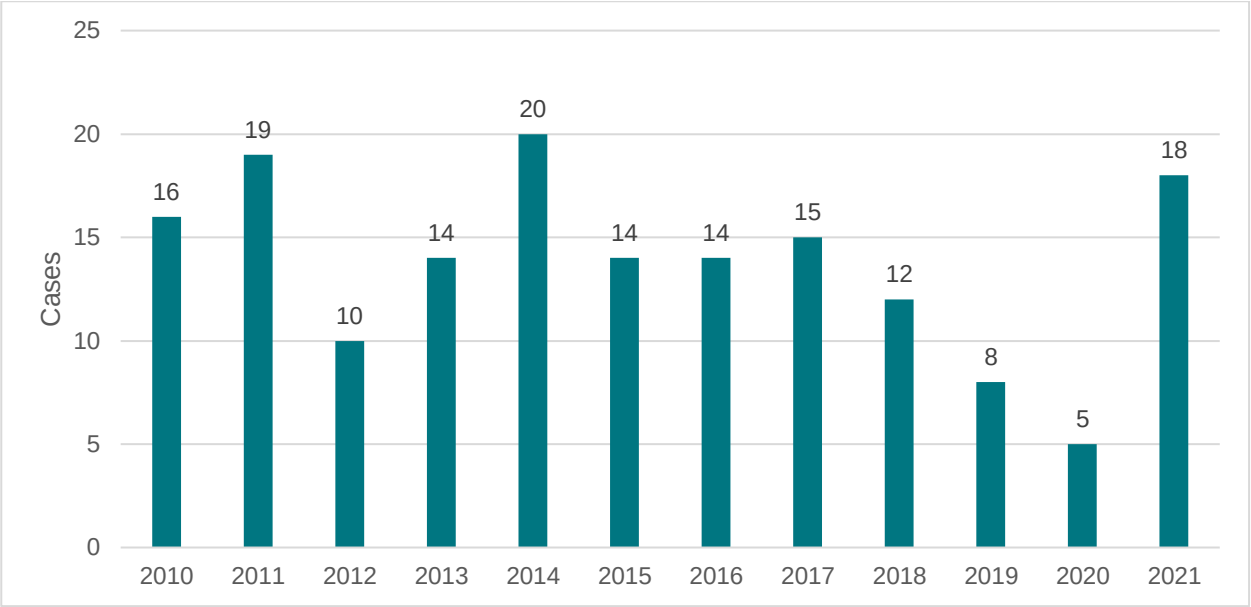


Figure 42: Deaths from invasive pneumococcal disease cases in the Auckland region 2010 – 2021

Invasive pneumococcal disease in the Auckland region in 2021 had a bimodal age-group distribution, being most common among preschool-aged children and adults over the age of 60.

Table 29: Age and sex distribution and age-specific incidence rates of pneumococcal disease cases in the Auckland region 2021

Age-group	Female	Male	Total	Rate per 100,000*
<1	2	4	6	27.9
1 to 4	5	10	15	17.4
5 to 9	2	4	6	5.3
10 to 14	1	1	2	1.7
15 to 19	1	0	1	0.9
20 to 29	1	1	2	0.8
30 to 39	5	10	15	5.5
40 to 49	7	6	13	5.8
50 to 59	4	7	11	5.0
60 to 69	15	9	24	15.0
70+	16	15	31	20.5
Total	***59***	***67***	***126***	***7.3***

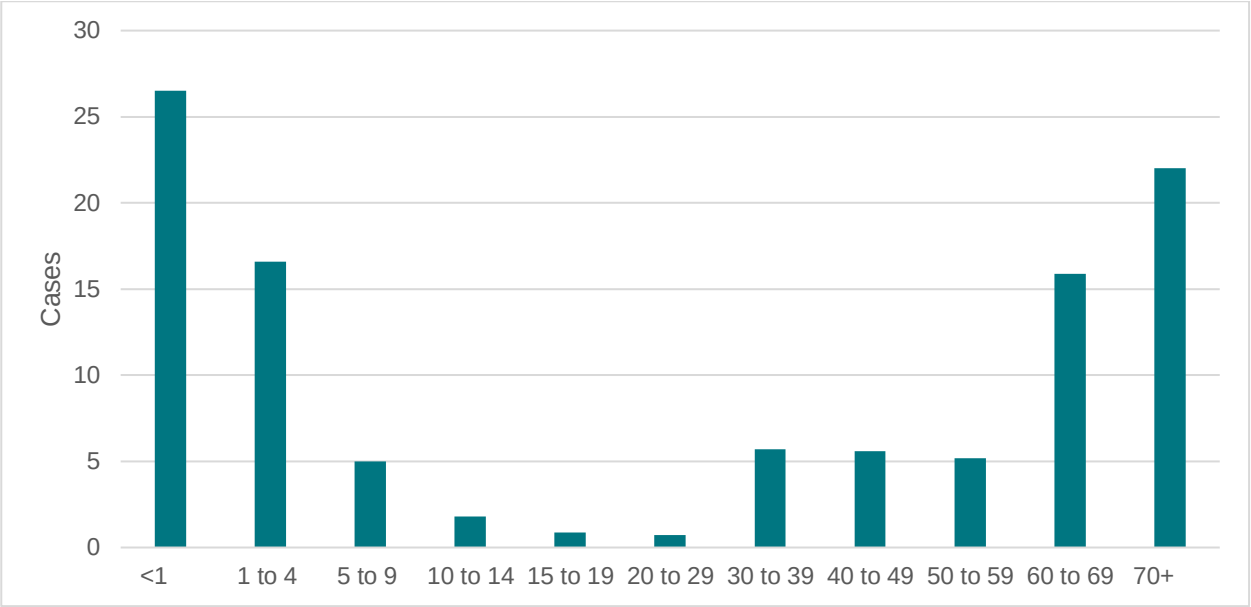


Figure 43: Bimodal age-group distribution of invasive pneumococcal disease case incidence rates in the Auckland region in 2021

Deaths from IPD in the Auckland region were also bimodally distributed. This has also been recorded in previous years. No sex bias in IPD deaths was observed.

Table 30: Age and sex distribution and age-specific incidence rates of death from invasive pneumococcal disease in the Auckland region 2021

Age-group	Female	Male	Total	Rate per 100,000
<1	1	0	1	4.6
1 to 4	1	0	1	1.2
30 to 39	0	2	2	0.7
60 to 69	3	1	4	2.5
70+	4	6	10	6.6
Total	***9***	***9***	***18***	***1.0***

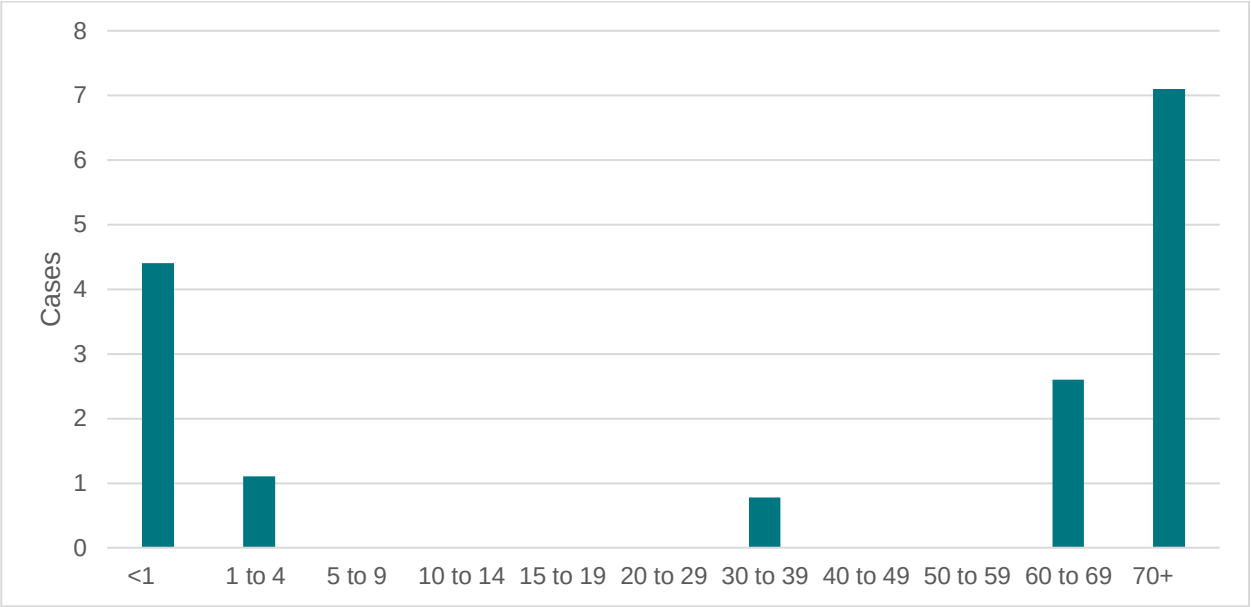


Figure 44: Bimodal age-group distribution of death from invasive pneumococcal disease in the Auckland region in 2021

Ethnic-specific incidence rates were highest for Pacific peoples and Māori, with rates of 14.9 and 12.6 cases per 100,000 respectively.

Table 31: Ethnic-specific proportion and incidence rates of pneumococcal disease cases in the Auckland region in 2021

Ethnicity-prioritised	Total	Rate per 100,000
Asian	18	3.7
European or Other	43	5.4
Māori	25	12.2
Pacific peoples	40	16.7
Total	***126***	***7.3***

IPD immunisation

Immunisation with PCV7 was introduced in June 2008. This was replaced by PCV10 in July 2011, and then PCV13 in July 2014. From July 2017, New Zealand went back to using PCV10 instead of PCV13 on the routine schedule. Additionally, from 2020, the NIR PCV10 schedule was changed to a two-dose primary schedule, plus booster doses given at six weeks, five months and 12 months. PCV13 remained at a three-dose schedule, plus booster for high-risk infants (ie given at ages six weeks, three, five and 12 months).

Notable increases in specific serotypes over the past decade have been among serotypes 12F and 8. Serotypes 22F and 23B were causing somewhat concerning numbers of cases in 2016-2018, but are now causing fewer cases. The number of cases caused by 19A

more than doubled in 2021 compared to 2020. These cases are preventable by PCV13 vaccine, but not by PCV10.

Table 32: Serotypes of IPD isolated, alongside the serotypes covered by the PCV10 and PCV13 vaccines in the Auckland region 2010 – 2021

Blue rows indicate serotypes contained in both PCV10 and PCV13 and pink rows indicate additional serotypes contained in PCV13 only.

Serotype	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total
1	37	15	2	0	0	0	0	0	1	0	1	0	56
3	9	10	7	5	17	7	10	9	7	7	9	6	103
4	15	16	13	7	6	2	8	6	2	2	1	0	78
5	0	0	0	0	0	0	1	0	0	0	0	0	1
6A	4	0	2	1	0	1	0	1	1	0	0	0	10
6B	6	6	1	2	0	1	1	0	2	3	1	0	23
6C	6	3	3	3	14	12	8	4	5	5	2	4	69
6D	0	0	0	0	0	0	1	0	0	0	0	0	1
7A	0	6	0	2	0	0	0	0	0	0	0	0	8
7C	0	0	0	0	1	2	2	2	1	1	0	2	11
7F	3	7	8	20	22	13	14	13	11	3	2	0	116
8	2	3	8	3	4	3	11	14	12	14	14	12	100
9 Non-typable	1	0	1	1	0	0	0	0	0	1	0	0	4
9N	6	2	4	3	3	3	7	4	5	6	2	3	48
9V	12	7	6	3	5	2	1	2	1	1	0	0	40
10 Non-typable	0	0	2	0	0	0	0	0	0	0	0	0	2
10A	3	6	2	1	1	0	2	1	5	3	0	2	26
11A	7	7	3	2	4	1	4	6	3	3	4	3	47
12F	1	2	0	3	1	1	2	7	25	16	12	7	77
13	0	0	2	0	1	1	1	0	0	2	1	0	8
14	17	6	5	5	0	0	2	2	0	1	0	0	38
15 Non-typable	0	0	2	2	1	0	0	0	0	0	0	0	5
15A	0	0	0	0	1	1	4	4	3	1	0	0	14
15B	0	4	3	1	5	6	4	4	2	4	2	7	42
15C	0	0	0	0	1	1	1	2	1	1	1	0	8
16 Non-typable	0	0	0	2	4	0	0	0	0	0	0	0	6
16F	0	0	0	0	0	0	6	3	3	5	3	5	25
17 Non-typable	1	0	0	0	0	0	0	0	0	0	0	0	1
17F	1	1	1	2	0	1	2	1	2	2	0	1	14
18A	0	1	0	0	0	0	0	1	0	0	0	0	2
18C	3	6	2	4	4	1	1	0	0	0	0	0	21
18F	0	0	0	0	0	0	0	0	1	0	1	0	2
19A	13	18	28	27	31	33	40	24	21	17	20	44	316
19F	11	10	11	5	6	9	3	2	4	3	3	3	70
20	3	2	2	2	0	1	0	1	0	0	0	0	11
21	0	1	0	0	0	0	2	0	1	3	0	0	7
22 Non-typable	1	0	0	0	0	0	0	0	0	0	0	0	1
22A	0	1	0	0	0	0	0	0	0	0	0	0	1
22F	9	15	10	15	16	6	15	7	12	13	6	5	129
23A	3	2	2	2	4	10	4	8	9	5	3	5	57
23B	1	0	3	2	2	2	5	3	7	6	4	3	38

23F	14	8	3	2	1	2	2	0	1	0	1	0	34
24 Non-typable	0	0	1	0	0	0	1	0	0	0	0	0	2
31	0	1	1	0	0	1	1	2	3	2	0	0	11
33 Non-typable	0	0	0	0	0	2	3	1	3	2	1	0	12
33F	1	0	1	2	2	2	7	4	2	0	0	3	24
34	0	1	0	1	2	1	4	1	4	2	0	2	18
35 No factor sera	2	2	0	0	0	0	0	0	0	0	0	0	4
35 Non-typable	0	5	1	2	5	0	0	0	0	0	0	0	13
35B	0	0	0	0	0	4	1	1	1	1	3	0	11
35F	0	0	0	0	0	0	0	2	1	0	1	1	5
37	0	0	0	0	0	0	1	0	1	0	2	0	4
38	2	1	1	0	1	1	0	5	2	1	0	0	14
42	0	0	0	0	0	0	0	1	0	0	0	0	1
Non-typable	2	0	0	0	1	1	2	2	3	3	1	0	15
Not stated	13	5	16	14	4	6	12	14	11	17	6	8	126
Grand Total	***209***	***180***	***157***	***132***	***170***	***140***	***196***	***164***	***179***	***156***	***107***	***126***	***1930***

After the PCV10 vaccine was introduced in 2010, PCV10-preventable cases of IPD fell dramatically, reaching an all-time low of three cases in 2021. Similarly, after the PCV13 vaccine was introduced in 2014, PCV13-preventable cases dropped year on year from 2014 to 2017, when its use was discontinued in favour of PCV10.

Since 2017, the proportion of PCV10-preventable IPD cases has continued to drop. At the same time, the proportion of PCV13-preventable cases has risen, propelled mainly by a rise in the number of 19A cases. Furthermore, the proportion of cases not preventable by either vaccine has steadily climbed.

Table 33: Percentage of IPD cases preventable by PCV10 and PCV13, or preventable by neither, in the Auckland region 2010-2021

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cases preventable by PCV10	118	81	51	48	44	30	33	25	22	13	9	3
Cases preventable by PCV13	144	109	88	81	92	71	83	59	51	37	38	53
Cases not preventable by either vaccine	65	71	69	65	78	69	113	105	128	119	69	73
Grand total	***209***	***180***	***157***	***132***	***170***	***140***	***196***	***164***	***179***	***156***	***107***	***126***
Percentage of cases preventable by PCV10	56.5	45	32.5	36.4	25.9	21.4	16.8	15.2	12.3	8.3	8.4	2.3
Percentage of cases preventable by PCV13	68.9	60.6	56.1	61.4	54.1	50.7	42.3	36	28.5	23.7	35.5	42.1
Percentage of cases not preventable by either vaccine	31.1	39.4	43.9	49.2	45.9	49.3	57.7	64	71.5	76.3	64.5	57.9

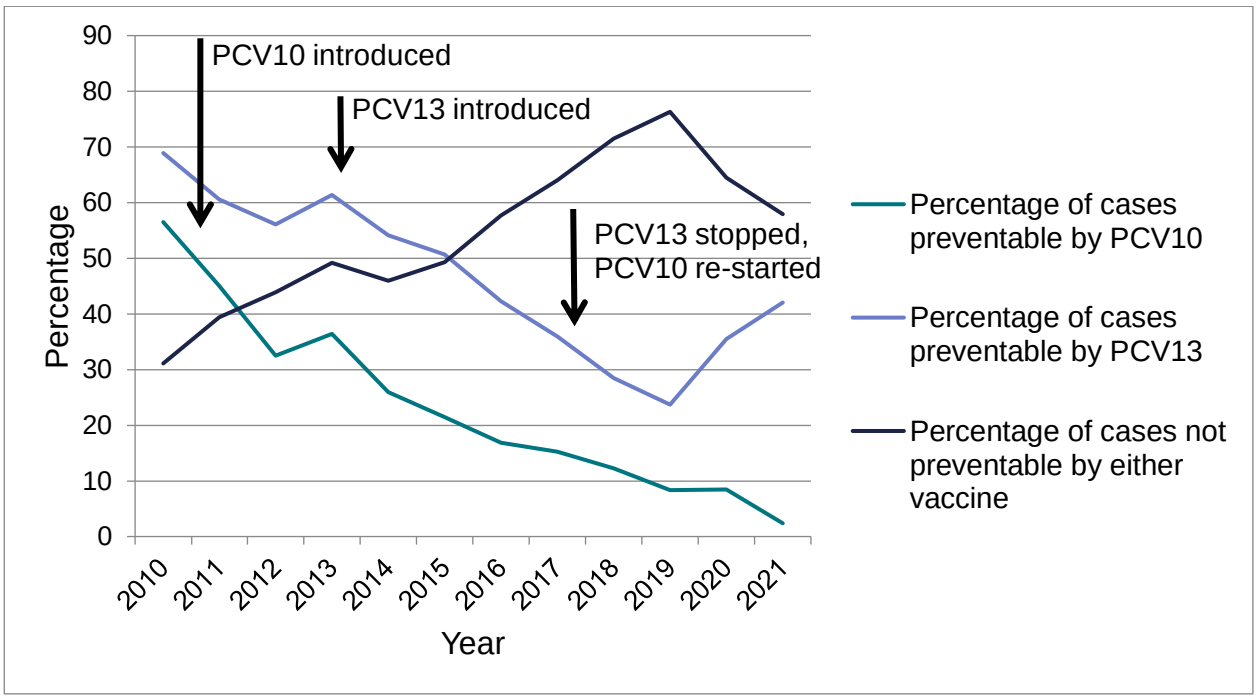


Figure 45: Percentage of IPD cases preventable by either pneumococcal vaccine in the Auckland region 2010-2021

Several conclusions can be drawn from these data:

- Vaccination against IPD has been very successful in reducing the prevalence of vaccine susceptible variants.
- Strains not covered by the vaccine become the dominant strain.
- Ideally, in the future there will be broader coverage with more serotypes covered by the available vaccinations.
- Based on current patterns, serotypes 19A, 8, 12F and 22F would be especially good candidates to be included.

7 Acute rheumatic fever

Key points

- There were significantly fewer notified cases of acute rheumatic fever (ARF) in 2021 compared to previous years.
- All cases occurred among people identifying with Māori or Pacific ethnicities.
- There is a clear clustering of cases in the higher deprivation levels, with about three-quarters of cases occurring in NZDep 2018 levels 8, 9, and 10.
- There was only one notified case of recurrent rheumatic fever. This was drastically fewer than in previous years.

7.1 Rheumatic fever

ARF is an inflammatory disease which can involve the heart, joints, skin, and brain and typically occurs after a Group A streptococcal throat infection. Signs and symptoms include fever, multiple painful joints, involuntary muscle movements, and occasionally a characteristic non-itchy rash known as erythema marginatum. The heart is involved in about half of cases. Damage to the heart valves, known as rheumatic heart disease (RHD), usually occurs after repeated attacks, but can sometimes occur after a single episode. Worldwide, ARF occurs in about 325,000 children each year, and about 33.4 million people currently have RHD. Those who develop ARF are most often between the ages of five and 14 years, with only 20 per cent of first-time attacks occurring in adults. The disease is most common in the developing world, and among indigenous peoples in the developed world.

- There were 30 confirmed and probable cases of ARF in the Auckland region in 2021. This was half the number in 2020.
- There were 28 hospitalisations for people with initial attacks, and one hospitalisation for someone with a recurrent attack. There were no deaths.
- The incidence rate for the Auckland region was 1.7 cases per 100,000. For the rest of New Zealand it was 1.4 cases per 100,000.

Rates of ARF in Auckland and for New Zealand were historically low in 2021. Of the 30 cases, 23 (76.7%) resided in the Counties Manukau district area.

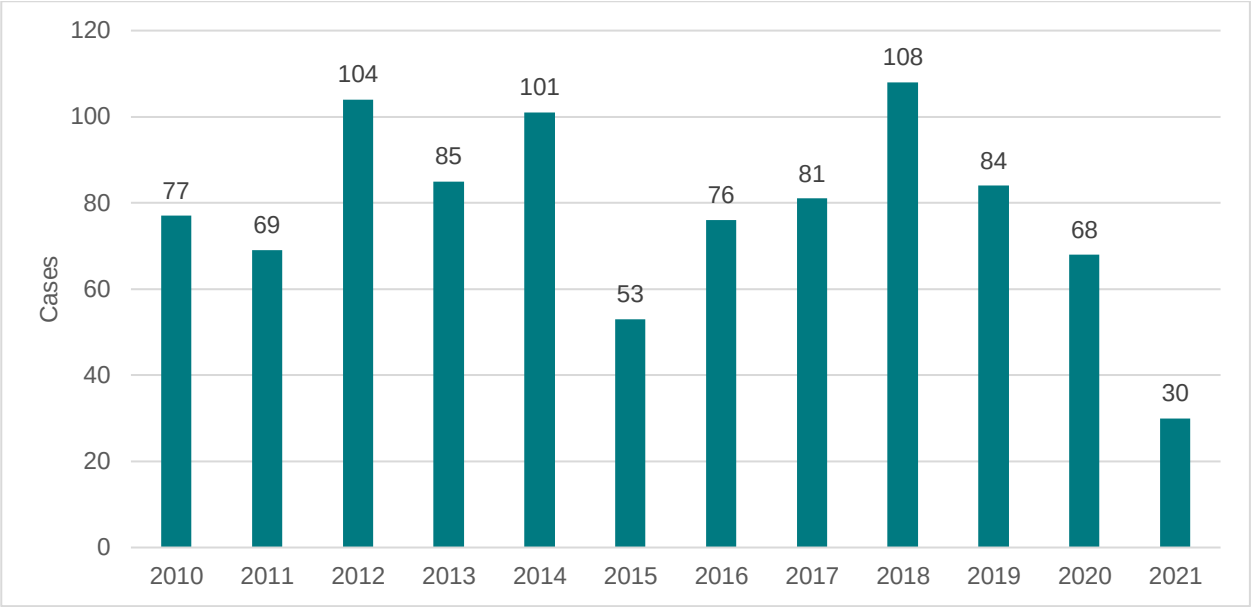


Figure 46: Acute rheumatic fever cases in the Auckland region 2010 – 2021

ARF typically occurs during childhood or adolescence, with the majority of cases occurring in five to 14 year old children. The highest age-specific incidence in 2021 was again in the five to 14 year old age group, which represented 86.7% of all new ARF cases.

In 2021 there were more cases amongst males than females.

Table 34: Age and sex distribution and age-specific incidence rates of ARF in the Auckland region in 2021

Age-group	Female	Male	Total	Rate per 100,000
5 to 9	5	5	10	8.6
10 to 14	5	11	16	13.9
15 to 19	0	2	2	0.9
20 to 29	2	0	2	0.8
Total	***12***	***18***	***30***	***1.7***

Seventeen cases in the Auckland region in 2021 were Māori and 13 were Pacific peoples. There were no cases among people of Asian or European/Other ethnicities.

Table 35: Ethnicity-specific incidence rates of ARF in the Auckland region in 2021

Ethnicity	Total	Rate per 100,000
Māori	17	8.3
Pacific peoples	13	5.4
Grand Total	***30***	***1.7***

In 2021, 77% of all ARF cases occurred in Auckland's most deprived areas (NZDep 8, 9 and 10).

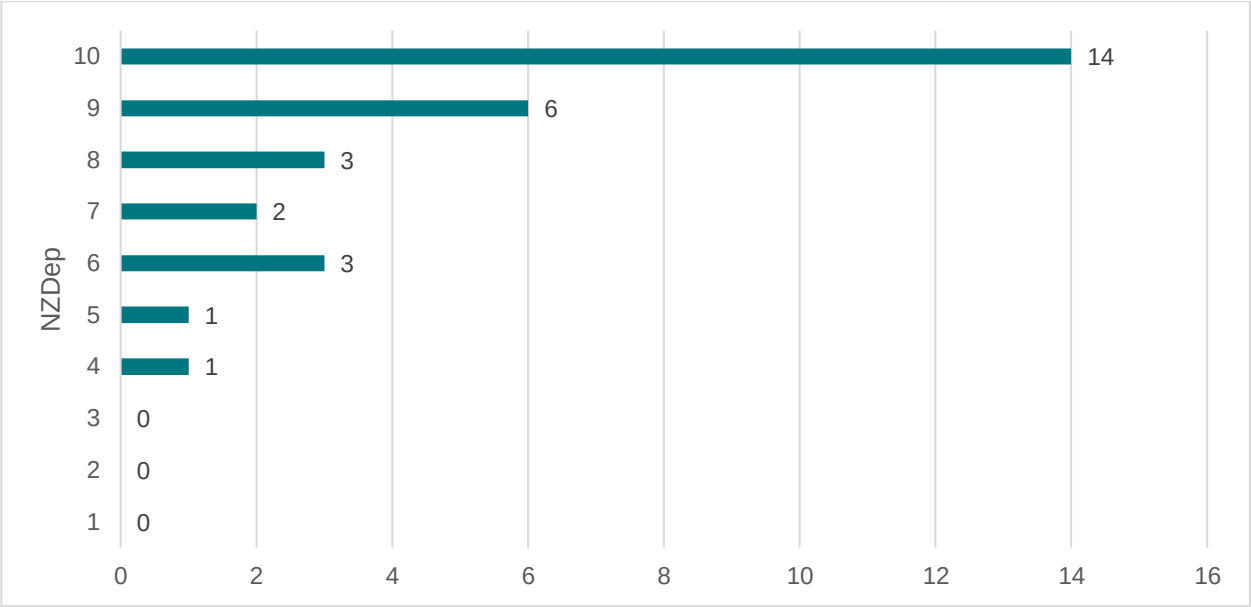


Figure 47: ARF cases by NZ deprivation index in the Auckland region in 2021

To prevent a recurrence of ARF, secondary prophylaxis is given. In New Zealand, this involves an intramuscular injection of antibiotic every 28 days, for a minimum of 10 years, depending on the extent of carditis (heart inflammation).

In 2011 the Rheumatic Fever Prevention Programme was established to prevent and treat strep throat infections, which can lead to ARF. The programme was expanded significantly from 2012 following the introduction of the then five-year ARF 'Better Public Services' target (now rescinded). Its target was to reduce ARF by two-thirds, to 1.4 cases per 100,000 people. The programme is no longer nationally coordinated, however some aspects have been maintained, especially in the Counties Manukau district area.

When recurrences occur, it can indicate something has gone wrong with the intended ARF follow-up. Within the Auckland region, the ARF recurrence rate for 2021 was historically low at just one case. This contrasts sharply to previous years. 2014 and 2018 in particular saw far greater numbers of ARF recurrence. It remains to be seen whether this low rate of recurrence reflects natural variation in the number of cases, or whether it will remain the norm.

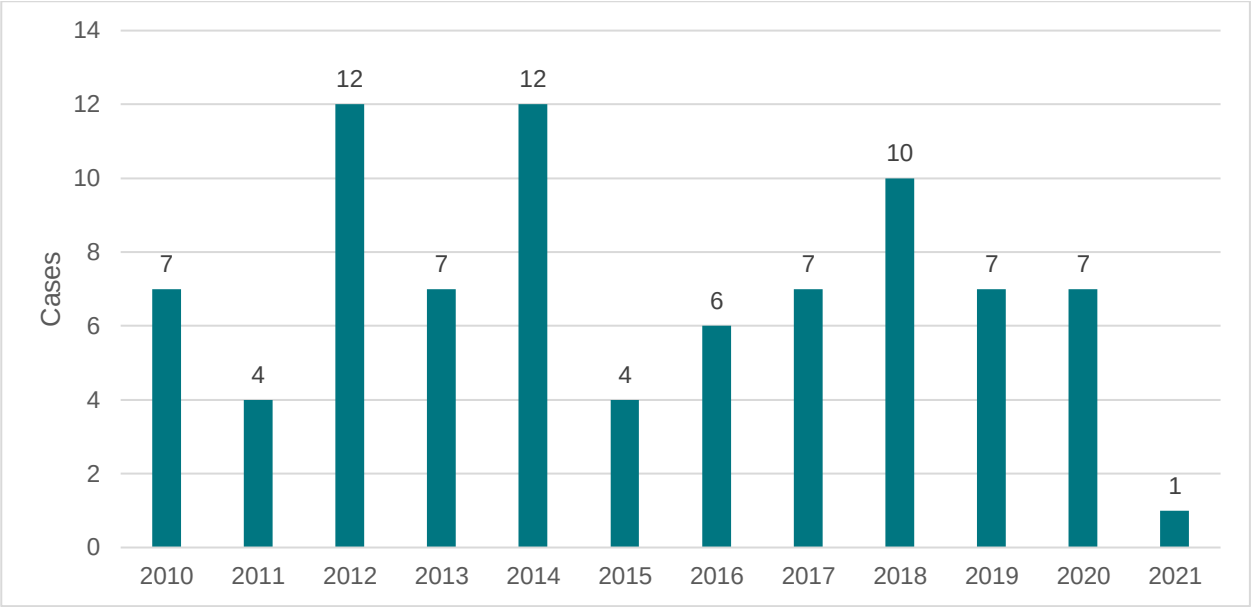


Figure 48: Numbers of recurrent rheumatic fever cases in the Auckland region 2010 – 2021

8 Tuberculosis, Latent Tuberculosis and Leprosy

Key points

- Trends in tuberculosis (TB) notifications remained remarkably stable in 2021. Overall notification numbers and incidence rates had barely changed for a decade and see only slight fluctuation from year to year. This is despite a rapidly growing population in the Auckland region.
- There were 146 tuberculosis cases in 2021. The highest rates were observed in the 20 to 29, 40 to 49 and over 70 age groups, with the highest incidence seen in people originally born in India, China, Samoa and the Philippines.
- There is a clear clustering of cases in the higher deprivation levels, with more than half of the cases occurring in NZDep levels 7, 8, 9, and 10.
- Multidrug resistance was found in two new TB cases. Vietnam and Indonesia were the source countries.
- There were no new outbreaks of TB notified in the Auckland region in 2021.
- One case of leprosy was notified in 2021.

8.1.1 Tuberculosis

Tuberculosis (TB) is a bacterial infection usually caused by *Mycobacterium tuberculosis*. TB usually affects the lungs (pulmonary TB), but can also affect many other parts of the body (extrapulmonary TB). TB disease is usually curable, but requires six to 12 months of multi-drug therapy to achieve cure. Multi-drug resistant TB (MDR-TB) has lower cure rates than drug sensitive TB, and requires treatment for up to two years or more, with drugs that may have more side effects.

Following infection with the TB bacterium, 90 to 95 per cent of people contain and control the infection as latent TB infection (LTBI), with only five to 10 per cent of people developing primary TB. However, this applies only to healthy HIV-negative adults; the risk of progression to active TB disease is much higher for young children, for adults with certain medical risk factors, and especially for people who are living with HIV/AIDS.

People with LTBI are not infectious to others and do not have any symptoms of TB disease. However, due to their small risk of developing TB disease in the future, LTBI is often treated.

TB is one of the top 10 leading cause of death worldwide, and the leading cause from a single infectious agent, ranking above HIV/AIDS. In 2018, there were an estimated 1.2 million TB deaths among HIV-negative people (down from 1.7 million in 2000), and an additional 251,000 deaths among people living with HIV/AIDS.

- There were 146 confirmed new TB diagnoses notified in the Auckland region in 2021.
- Of the 146 cases, 88 (60.3%) received inpatient hospital care. Six TB-associated deaths were reported in 2021. The case-fatality rate was 4.1%.
- The incidence rate of new TB cases for the Auckland region was 8.4 cases per 100,000. For the rest of New Zealand the rate was 5.9 cases per 100,000.

The number of new TB diagnoses has remained broadly stable each year since 2010.

Of the 146 new TB diagnoses in 2021, 77 cases (52.7%) were pulmonary TB and 94 (64.3%) had an extrapulmonary TB manifestation (these categories are not mutually exclusive).

Pulmonary cases which are smear-positive are known to be especially infectious; of the pulmonary TB cases notified in 2021, 44 (57.1%) were smear-positive.

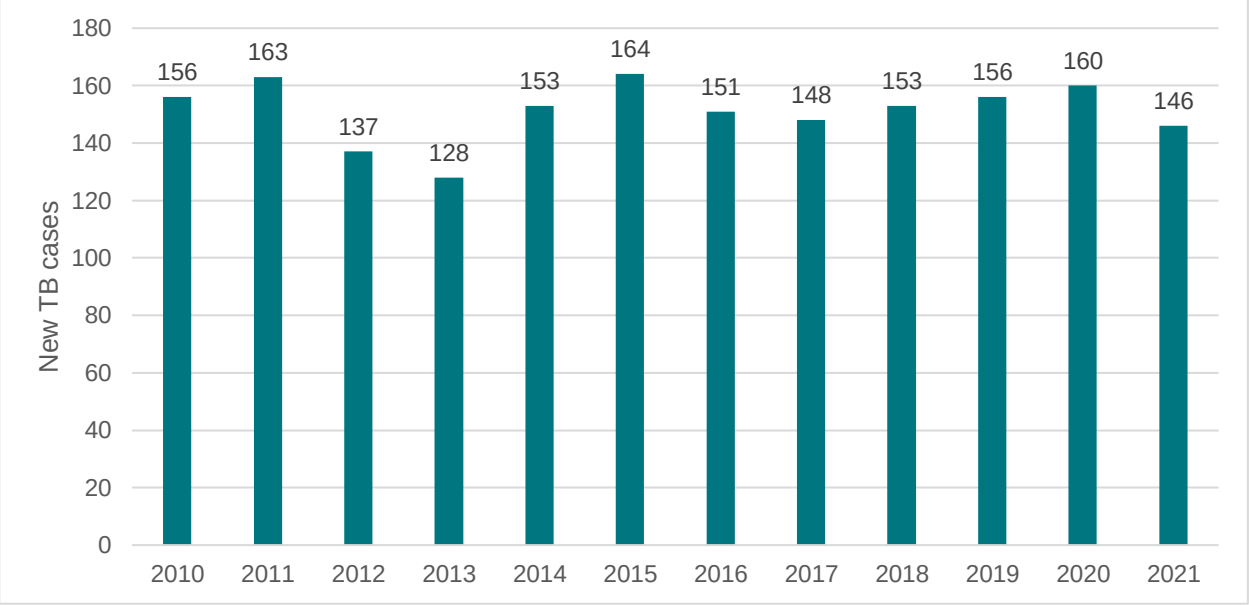


Figure 49: New TB cases in the Auckland region 2010 – 2021

In 2021 the highest age-specific incidence rate of new tuberculosis was found in the 40 to 49 age group, with 14.7 cases per 100,000.

Table 36: Age-specific incidence and age-specific incidence rates of new tuberculosis cases in the Auckland region in 2021

Age-group	Female	Male	Total	Rate per 100,000
0 to 4	0	1	1	0.9
5 to 9	0	3	3	2.6
10 to 14	1	1	2	1.7
15 to 19	3	4	7	6.5
20 to 29	18	19	37	14.3
30 to 39	14	10	24	8.7
40 to 49	15	18	33	14.7
50 to 59	7	7	14	6.4
60 to 69	4	6	10	6.2
70+	4	11	15	9.9
Grand Total	***66***	***80***	***146***	***8.4***

New cases of TB notified held to a wide range of ethnic affiliations, the most prevalent of which were Indian, Filipino, Chinese and Samoan, respectively.

Table 37: Ethnic affiliation of new tuberculosis cases in the Auckland region in 2021 (Total response)

Ethnicity	Cases
African NFD	1
Asian NFD	1
Australian	1
Bangladeshi	2
Burmese	1
Cambodian	1
Chinese	11
Cook Islands Māori	2
Ethiopian	1
European NFD	2
Fijian (except Fiji Indian / Indo-Fijian)	1
Fijian Indian	3
Filipino	14
I-Kiribati	3
Indian	50
Indonesian	3
Iraqi	1
Korean	1
Māori	7
Cook Islands Māori	1
Nepalese	3
Niuean	1
Other African NEC	1
Pakistani	2
Samoan	8
Singaporean Chinese	2
Somali	1
South African NEC	1
South African NFD	1
Southeast Asian NFD	1
Sri Lankan NFD	4
Thai	2
Tokelauan	1
Tongan	4
Tuvalu Islander	5
Vietnamese	4

Of the 146 cases new TB cases, 128 (87.7%) were born outside of New Zealand. The most common probable source countries for cases not born in New Zealand were:

- India (36%)
- Philippines (11%)

- China (9%)

Table 38: Birth countries for new tuberculosis cases in the Auckland region in 2021

Birth country	Number of cases
India	47
New Zealand	17
Philippines	14
China, People's Republic of	11
Samoa	6
Fiji	4
South Africa	4
Sri Lanka	4
Tonga	4
Viet Nam	4
Indonesia	3
Kiribati	3
Nepal	3
Thailand	3
Australia	2
Bangladesh	2
Pakistan	2
Singapore	2
United Arab Emirates	2
Cambodia	1
Cook Islands	1
Ethiopia	1
Iraq	1
Korea, Republic of	1
Myanmar	1
Somalia	1
Sudan	1
Tuvalu	1
Grand Total	***146***

Thirty-three new TB cases (23%) had close contact with a known TB case, while 106 cases (73%) did not. The remainder (7 cases, 5%) were reported as “Unknown”.

There were no new outbreaks of TB in the Auckland region in 2021. Four more cases were discovered linked to a previously reported outbreak which commenced in 2020. Most cases in that outbreak identified with a Pacific ethnicity. Three of these cases were new and one was a relapse.

The NZ Deprivation Index distribution of new TB cases is shown below. There remains a clear clustering of cases in more deprived areas, with more than half of the cases occurring in NZDep deciles 7, 8, 9, and 10.

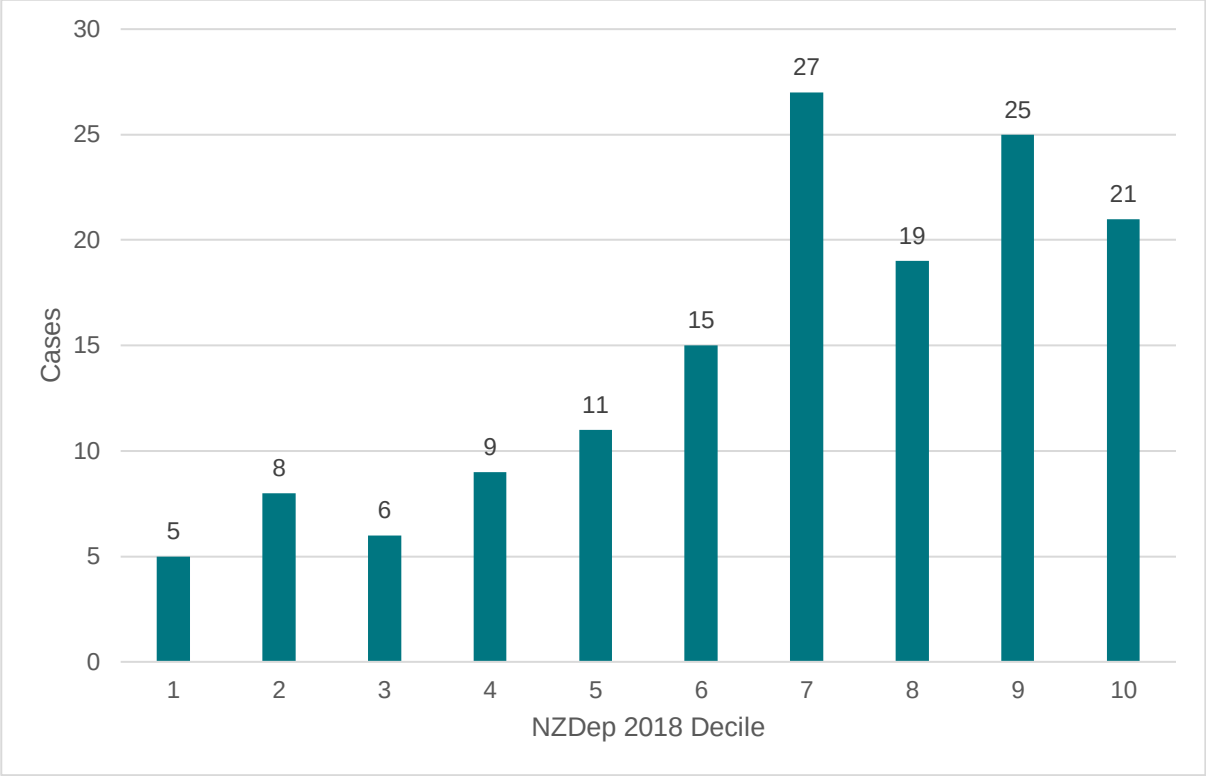


Figure 50: Distribution of new TB cases by NZDep 2018 in the Auckland region in 2021

Multi-drug resistance (to rifampicin and isoniazid, in both cases) was found in two new TB cases, one in a person born in Vietnam, and the other in a person born in Indonesia. Eleven cases were associated with mono-drug resistance.

There were eight cases of TB relapse or reactivation notified in 2021. One case died, none were resistant to medications, and five were smear-positive.

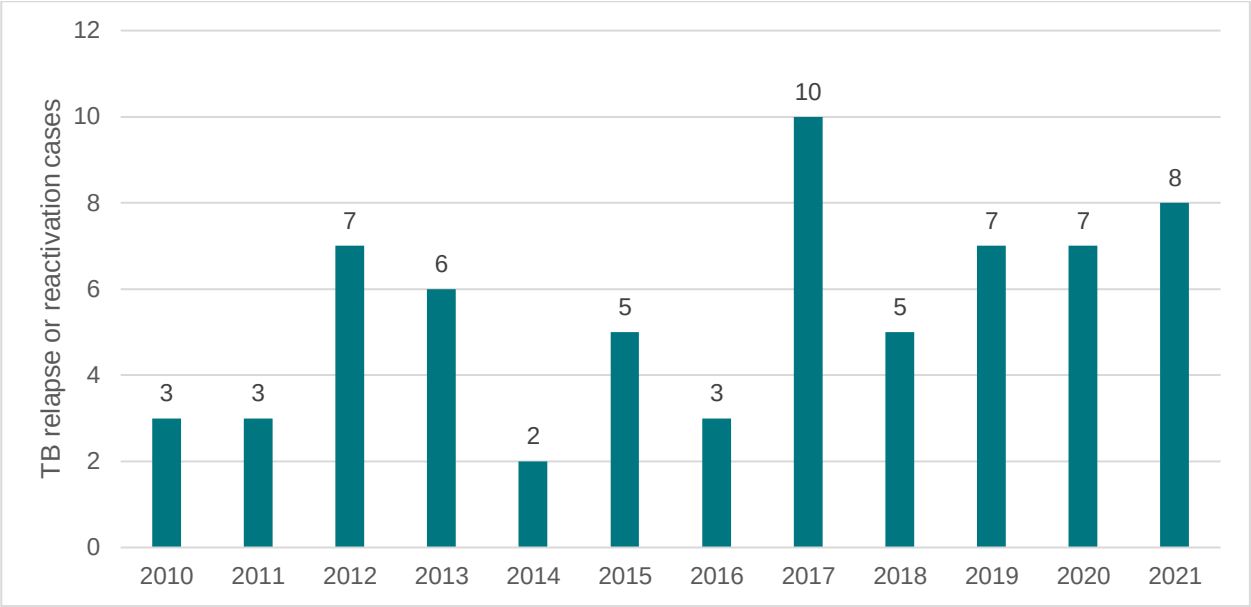


Figure 51: Cases of TB relapse or reactivation in the Auckland region 2010 – 2021

There were seven cases of TB infection among persons on preventative treatment notified in the Auckland region in 2021.

8.1.2 Leprosy

Leprosy, also known as Hansen's Disease (HD), is a rare but important notifiable infectious disease in New Zealand. Cases notified in New Zealand are acquired in overseas countries where leprosy is still endemic[7]. Leprosy is caused by *Mycobacterium leprae*, an acid-fast bacillus, and has a latent period which can last decades. The disease is curable with appropriate multidrug therapy (MDT). Leprosy is not particularly infectious, but its timely diagnosis and treatment is important to prevent the disability associated with untreated disease, and to prevent transmission in New Zealand.

One case of leprosy was notified in the Auckland region in 2021.

[7] There were 133,802 new leprosy cases notified globally in 2021 to the World Health Organisation (WHO), a likely undercount due to the effects of the Covid-19 pandemic on the 143 WHO countries which provided statistics for this year. New Zealand's Pacific neighbour Kiribati is notable for having the world's highest reported incidence rate of leprosy, at 133 cases per 100,000 people in 2020.

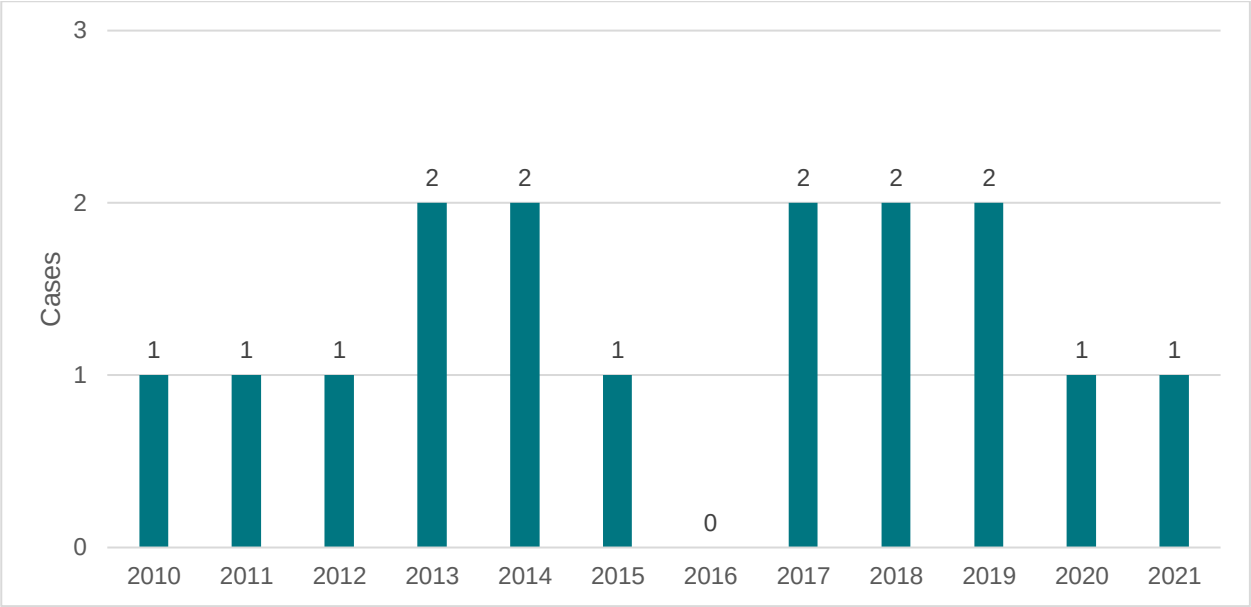


Figure 52: Cases of leprosy in the Auckland region 2010 – 2021

9 Environmental related diseases

Key points

- Legionellosis notifications were consistent with historical norms in 2021. Men continue to make up about twice as many legionellosis cases as women and older people are especially at risk.
- Lead absorption notifications rebounded in 2021 after a historic low number of cases in 2020. The data is incomplete but most were probably due to occupational exposures. Pacific men in high risk occupations, and those using Aryurvedic supplements, are most at risk.
- There were 15 cases of hazardous substances injury notified during 2021. The incidence rate was again highest in the under-five age group. The majority of cases were from poisoning by ingestion or by inhaled fumes and the majority of events took place in the home.

9.1 Legionellosis

Legionnaires' disease (also known as legionellosis) is a form of atypical pneumonia caused by any species of gram-negative aerobic bacteria belonging to the genus *Legionella*. The main causative species are *L. pneumophila* and *L. longbeachae*. *L longbeachae* is typically present in soil, whereas *L. pneumophila* is generally found in water, where it thrives in temperatures between 25 and 45°C.

Legionnaires' disease is transmitted by inhalation of aerosolised water and/or soil contaminated with the bacteria. It is not transmitted from person-to-person. Sources where temperatures allow the bacteria to thrive include hot water tanks, cooling towers, evaporative condensers, hot tubs and spas, and large air-conditioning systems (such as those commonly found in hotels and large office buildings). The most common sources identified are domestic hot water systems where the water isn't chlorinated, and hot tubs/spas, but overall the source is identified only in a minority of cases.

- 60 legionellosis cases were notified in the Auckland region in 2021.
- The incidence rate for the Auckland region was 3.5 cases per 100,000. This was identical to the rest of New Zealand.
- 58 cases were hospitalised. There were eight deaths.

Diagnoses of legionellosis were made based on pan-*legionella* PCR, *legionella*-species specific PCR, *legionella* urinary antigen test, ESR-confirmed indirect fluorescent antibody titres, or specific ESR confirmed antibody titres, in the presence of a clinically compatible illness.

The case-fatality rate in the Auckland region in 2021 was 13.3%, with eight deaths. Six deaths were associated with *L. pneumophila* and one was associated with *L. longbeachae*. The species for the other death is unknown.

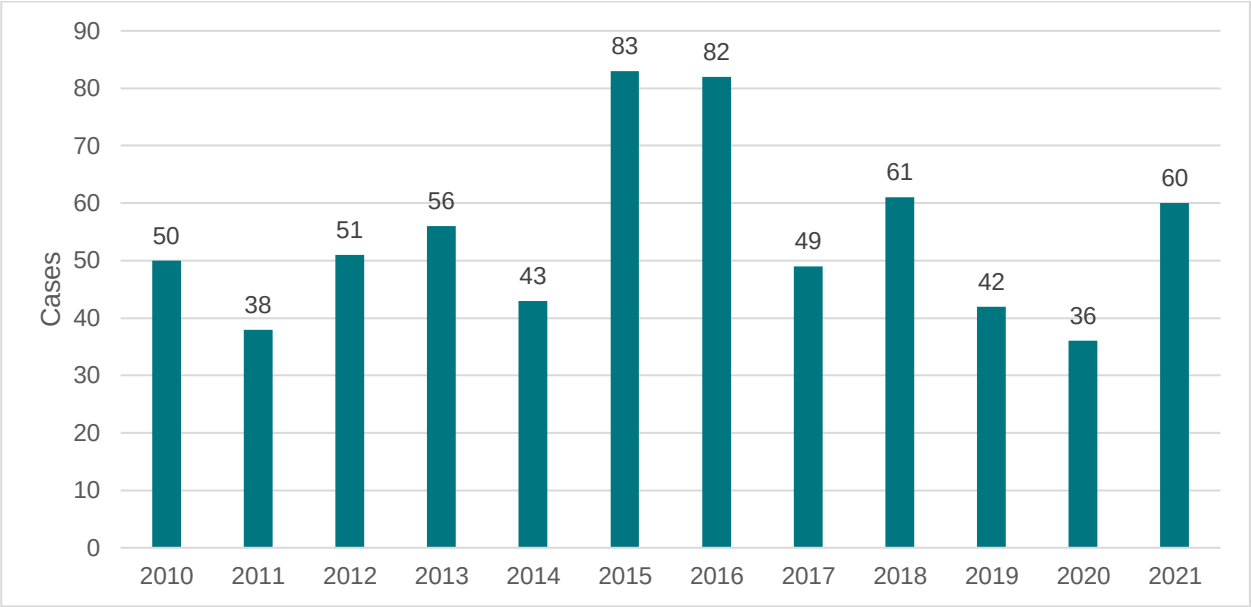


Figure 53: Legionellosis cases in the Auckland region 2010 – 2021

Thirty cases (50%) were diagnosed with legionellosis following urinary antigen testing. This data is suspected to be incomplete because only one case was identified using an alternative diagnostic method; it is suspected that almost all cases of legionellosis are diagnosed using urinary antigen testing. Forty-two cases (70%) were recorded as having radiological evidence of legionellosis.

In previous years, cases of legionellosis in the Auckland region peaked in late spring and summer, before falling during winter. The pattern in 2021 was not hugely different, with cases falling over winter as usual. There were fewer cases during November and December than usual, but due to the small number of cases involved this was not statistically significant.

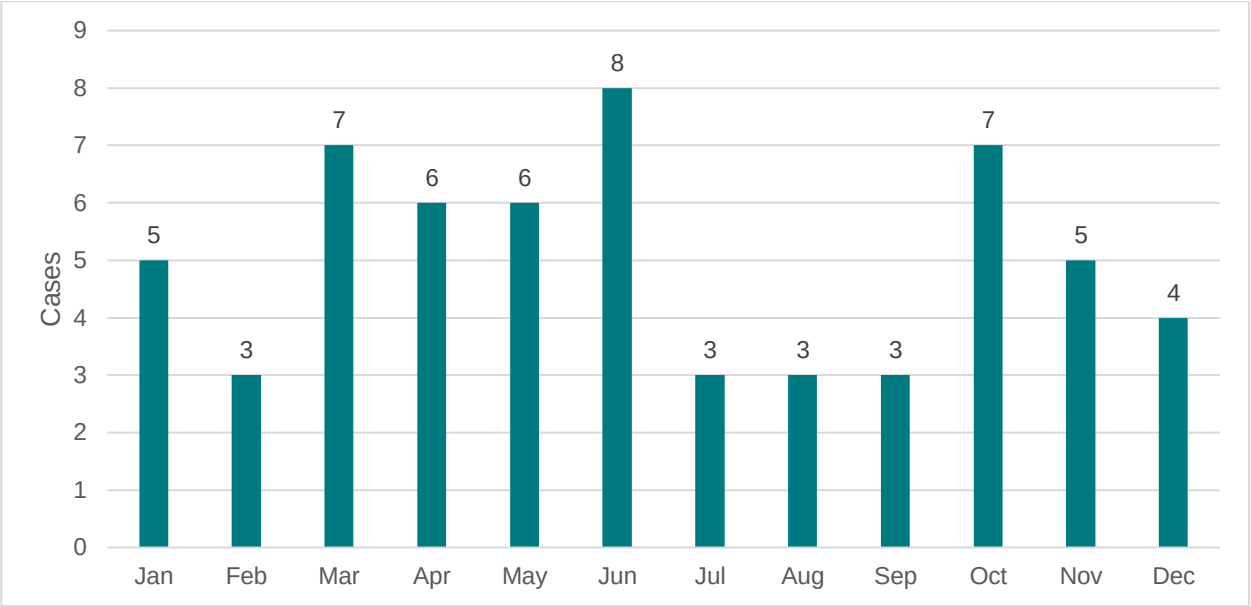


Figure 54: Monthly distribution of legionellosis cases in the Auckland region in 2021

The male to female ratio was approximately 2:1. The ages of the reported cases ranged from 28 to 90 years. The highest incidence rate was among men aged over 70.

Table 39: Sex- and age-specific incidence rates of legionellosis in the Auckland region in 2021

Age group	Female	Male	Total	Female Rate per 100,000	Male Rate per 100,000	Total Rate per 100,000
20 to 29	0	1	1	0	0.8	0.4
30 to 39	0	1	1	0	0.7	0.4
40 to 49	2	1	3	1.8	8.9	1.3
50 to 59	1	10	11	0.9	9.5	5.0
60 to 69	3	11	14	3.6	14.2	8.7
70+	12	18	30	14.6	26.0	19.8
Grand Total	***18***	***42***	***60***	***2.1***	***4.9***	***3.5***

All cases of legionellosis were acquired in New Zealand. Those in the European or Other ethnic grouping had the highest incidence rate, with 4.8 cases per 100,000.

Table 40: Ethnic group-specific legionellosis cases and incidence rates in the Auckland region in 2021

Ethnic group	Total	Rate per 100,000
Asian	8	1.6
European or Other	38	4.8
Māori	5	2.4
Pacific peoples	9	3.8
Grand Total	***60***	***3.5***

Twenty-two cases (36.7%) had evidence of concurrent immunosuppressive illness.

Serotyping was not available for 37 cases (62%). For the 23 cases where serotyping was performed, the predominant serotype was *L. pneumophila serogroup 1*, which is typically associated with aerosolised water.

Table 41: Legionella serotypes in the Auckland region in 2021

Legionella serotype	Total
L. longbeachae serogroup 1	1
L. longbeachae not further defined	1
L. pneumophila serogroup 1	18
L. pneumophila serogroup 2	2
L. pneumophila serogroup 7	1
L. pneumophila serogroup 13	1
L. pneumophila not further defined	10
Information not available	26
Total	***60***

9.2 Lead absorption

Lead is a heavy metal. It interferes with the development of the nervous system, so is particularly dangerous for children, causing learning and behaviour disorders. Exposure mechanisms to lead include contaminated air, water, soil, food, and consumer products. Occupational exposures such as painting and lead smelting are common causes of lead poisoning in adults. Certain hobbies (such as DIY projects involving house renovations and indoor shooting) and consumption of Ayurvedic medications are recurrent sources of lead absorption in Auckland.

The threshold for notification for lead absorption was halved on 8 April 2021, from serum lead levels greater than 0.48μmol/L to serum lead levels greater than 0.24μmol/L. This resulted in more cases of lead absorption being identified in 2021 than would previously have been the case.

- There were 129 cases of lead poisoning notified in 2021, compared to 29 cases in 2020. The higher number of cases in 2021 is a reflection of the lower blood lead level that now triggers notification.
- There was one hospitalisation and no deaths.
- The incidence rate in the Auckland Region was 7.5 cases per 100,000. This compares to an incidence rate of 8.8 cases per 100,000 for the whole of New Zealand.

In 2021 the median blood lead level was 0.51μmol/L. The highest individual level was 4.81μmol/L and occurred in an Indian male taking Ayurvedic supplements.

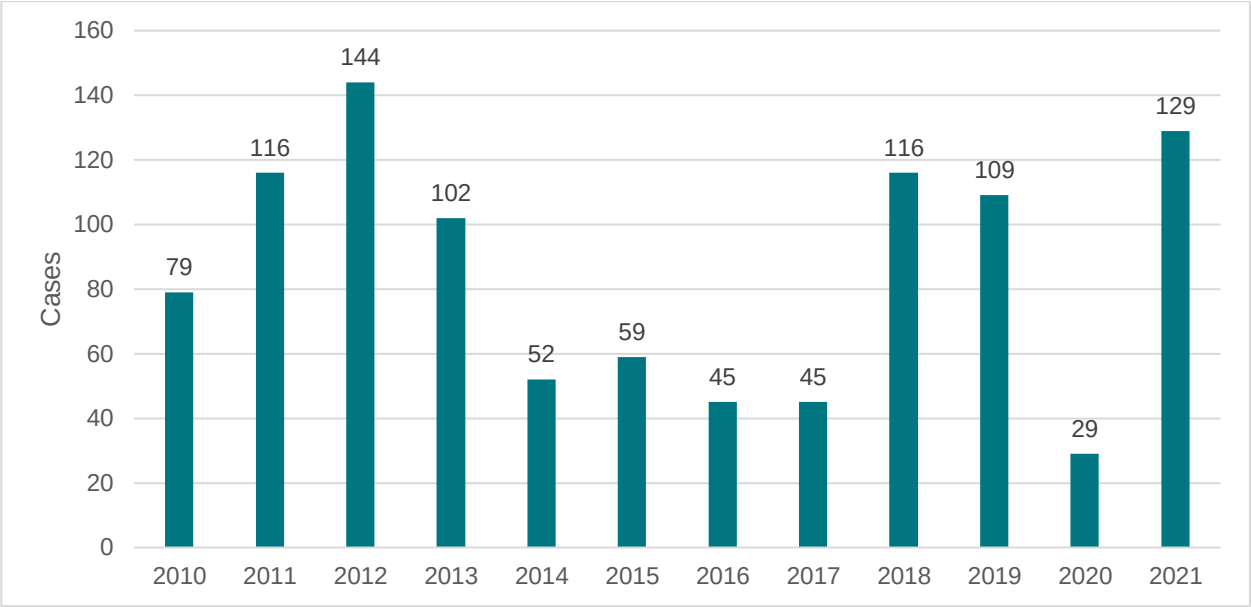


Figure 55: Lead absorption cases in the Auckland region 2010 – 2021

The highest age-specific rate was among people aged 45 to 64 (14.7 cases per 100,000). This age group experienced approximately double the rate of lead poisoning as the rest of the population.

Lead poisoning is an illness which overwhelmingly affects males, and this trend was repeated again in 2021. Only nine cases out of 129 (7%) were female.

Table 42: Age-specific incidence rates of lead absorption in the Auckland region in 2021

Age group	Female	Male	Total	Rate per 100,000
<1	1	0	1	4.6
1 to 4	1	3	4	4.6
5 to 14	0	0	0	0
15 to 24	0	11	11	4.9
25 to 44	1	37	38	7.2
45 to 64	5	56	61	14.7
65+	1	11	13	5.8
Grand Total	***9***	***120***	***129***	***7.5***

Individuals identifying with a Pacific ethnicity were over-represented in the data, with an incidence rate of 19.7 per 100,000. This compared to 7.2 per 100,000 for the next highest ethnic group of European or Other.

Table 43: Ethnic group-specific lead absorption cases and incidence rates in the Auckland region in 2021

Ethnic group	Cases	Rate per 100,000
Asian	8	1.6
European or Other	57	7.2
Māori	9	4.4

Pacific peoples	47	19.7
Unknown	8	Not calculable
Grand Total	***129***	***7.5***

All but seven cases were identified as being the result of occupational exposure. Five cases were identified following non-occupational paint removal, and two because they presented to their practitioner with pica as a symptom.

Table 44: Occupation of notified lead absorption cases in the Auckland region in 2021

Occupation	Total
Chef	1
Child under 5	3
Construction Trades Worker	1
Construction Worker	1
Fabrication Engineering Trades Worker	8
Machine Operator	1
Metal Casting Trades Worker	4
Metal Engineering Process Worker	20
Metal Polisher	1
Not in the labour force	1
Not Stated/response not identifiable	51
Painting Trades Worker	31
Potter or Ceramic Artist	1
Radiator Fitter	1
Retired	2
Solicitor	1
Teacher	1
Grand Total	*129*

9.3 Hazardous substances injuries

As defined in the **Hazardous Substances and New Organisms Act 1996**, a hazardous substance is legally defined as any substance with one or more of the following intrinsic properties: explosive; flammable (catches fire); capacity to oxidise; corrosive; or toxic to humans.

Hazardous substances injury cases encompass a vast group of diagnoses, including children swallowing cleaning products or cosmetics, intentional overdoses with agrichemicals, carbon monoxide poisoning, illness caused by exposure to chemicals such as solvents or chlorine, contact dermatitis from chemicals, fireworks burn or eye injuries, and huffing of substances.

Medical practitioners and hospitals are required to notify hazardous substances injuries to the Medical Officer of Health. Only accidental injuries meet the definition of a case and become recorded as such.

Prior to 2018 data on hazardous substance injuries were made available to ARPHS only by Auckland DHB (now Te Toka Tumai), though after this, all Auckland region DHBs contributed. These data are assessed and managed by ARPHS as required and the resultant clinical and epidemiological data is entered into the national Hazardous Substances Disease and Injury Reporting Tool (HSDIRT) database before being collated and analysed by **Massey University's Centre for Public Health Research**.

ARPHS notifies all hazardous substance injuries and lead poisoning cases that arise from work to WorkSafe NZ as required by the Health and Safety at Work Act 2015, s199.

- 22 cases of hazardous substances injuries were notified in 2021 in the Auckland region.
- There were no hospitalisations or deaths.

Prior to 2021 there were three years of historic (though decreasing) highs in the number of notified cases of hazardous substance injuries. This was triggered by changes to the way hazardous substance injury data were collected, which came into effect in 2018.

Some of the decline in case numbers since 2018 may be attributable to decreasing awareness levels among medical practitioners that hazardous substance injuries are a notifiable disease.

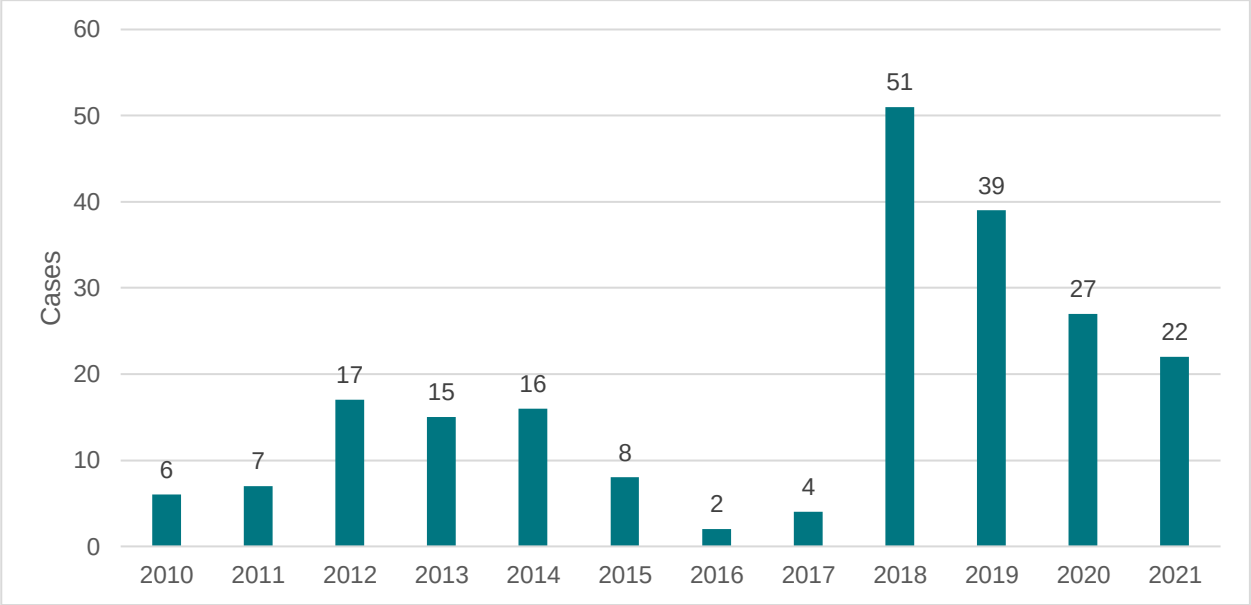


Figure 56: Hazardous substance injury cases in the Auckland region 2010 – 2021

In 2021, hazardous substance injuries were much more common among younger children, especially those aged less than five years old.

Table 45: Hazardous substances injury cases by age group in the Auckland region in 2021

Age group	Female	Male	Total	Rate per 100,000
<1	1	0	1	4.6
1 to 4	3	4	7	8.1
5 to 14	1	0	1	0.4
15 to 24	1	1	2	0.9
25 to 44	0	5	5	0.9
45 to 64	1	2	3	0.7
65+	0	3	3	1.3
Grand Total	***7***	***15***	***22***	***1.3***

Māori were much more likely than the general population to be notified with a hazardous substances injury.

Table 46: Hazardous substances injury cases by ethnicity grouping in the Auckland region in 2021

Ethnic group	Total	Rate per 100,000
Asian	2	0.4
European or Other	11	1.4
Māori	5	2.4
Pacific peoples	4	1.7
Grand Total	***22***	***1.3***

Of the 22 cases reported:

- Eleven incidents occurred in the home, three occurred at work, and seven occurred in unknown or other locations.
- Eleven cases were due to chemical ingestion, seven due to chemical poisoning, three due to corrosive burns, and one occurred via an unknown mechanism.
- One case was caused by a workplace chemical, all other cases were caused by household chemicals.

Table 47: Hazardous substances injury cases by type of injury in the Auckland region in 2021

Type of injury	Cases
Accidental chemical ingestions	11
Environmental chemical poisoning	7
Inhaled fumes	3
Unknown	1
Total	***22***

Table 48: Auckland region hazardous substances cases by setting in 2021

Place of exposure	Total
Home	11
Work	3
Other/unknown	7
Total	***22***

Hazardous agents causing notifications are recorded in table 49 below. A common theme is that several of these substances were stored in soft drink bottles lacking child-proof lids and were then placed within reach of children.

Table 49: Hazardous substances injuries by agent in the Auckland region in 2021

Hazardous agent	Total
Antiseptic compound	1
Inhaled helium	1
Antifreeze	1
Coolant	1
Fatty cream	1
Medication	1
Sodium hydroxide	1
Sodium hypochlorite/Bleach	1
Vape steam	1
Unknown	13
Total	***22***

10 Rare diseases

The information for rare diseases has been deliberately generalised to protect confidentiality.

10.1 Brucellosis

Brucellosis is a highly contagious zoonosis caused by ingestion of unpasteurised milk or undercooked meat from infected animals, or from close contact with their secretions.

Brucella species are small, gram-negative, non-motile, non-spore-forming, rod-shaped (coccobacilli) bacteria. They function as facultative intracellular parasites and cause chronic disease that usually persists for life. Acute symptoms include profuse sweating and joint and muscle pain.

There was one confirmed case of brucellosis notified in 2021. The case was hospitalised but did not die. The case was acquired in the Pacific.

10.2 Haemophilus influenzae B (HiB)

Invasive HiB disease is an acute, potentially life-threatening illness caused by the bacterium *Haemophilus influenzae*, a gram-negative coccobacillus. Non-encapsulated *H. influenzae* strains cause non-invasive disease, such as bronchitis and otitis media. However, six encapsulated strains of the bacteria (types A-F) cause invasive disease. Prior to the introduction of vaccination, type B (HiB) was the prevalent strain.

There were no confirmed cases of Haemophilus influenzae in 2021. There were 24 notifications which were investigated and found not to be cases.

10.3 Hydatid disease

Hydatid disease, also called echinococcosis, is a parasitic tapeworm disease. There are two main types of disease, cystic echinococcosis and alveolar echinococcosis. Hydatid disease often starts without symptoms, with an incubation period of up to a year. It is spread when food or water that contains the parasite's eggs is consumed, or by close contact with an infected animal. Dogs are commonly infected after eating the organs of a carrier animal that contains the parasitic cysts, such as sheep or rodents. Dogs then pass hydatid disease on to humans.

There were no cases or suspected cases of hydatid disease notified in 2021. The most recent cases were in 2016.

10.4 Q fever

Q fever ("Query" fever) is a disease caused by infection with the bacterium *Coxiella burnetii*. This uncommon organism may be found in cattle, sheep, goats and other domestic mammals, including cats and dogs. Human infection usually results from inhalation of a spore-like small cell variant, or from contact with the secretions or faeces of infected animals. Other modes of transmission include tick bites, ingestion of unpasteurized milk or dairy products, and human-to-human transmission, but are rare.

There were no confirmed cases of Q fever in 2021. There were three notifications which were investigated and found not to be cases.

10.5 Rickettsial disease

Rickettsial disease in humans (spotted fevers, typhus or scrub typhus) is caused by a number of related species of intracellular bacteria of the genus *Rickettsia*, which have blood-feeding arthropod vectors. Each species is associated with a different spectrum of clinical features, geographical distribution, insect vector (tick, louse, flea, mite or chigger), seasonal incidence and other epidemiological factors.

There were no confirmed cases of Rickettsial disease fever in 2021. There were two notifications which were investigated and found not to be cases.

10.6 Murine typhus

Murine typhus is caused by *Rickettsia typhi* and *R. felis*, which are transmitted to humans by fleas. It is clinically similar to, but milder than, epidemic typhus, causing chills, headache, fever, and rash. Animal reservoirs include wild rats, mice, and other rodents. A known population of carrier rodents in the southern Kaipara region just north of Auckland's main urban area causes sporadic cases.

There were no notifications for murine typhus in 2021.

10.7 Diphtheria

Diphtheria is an infectious disease cause by *Corynebacterium diphtheriae*, a gram-positive bacillus. Toxigenic strains of *C. diphtheriae* can cause respiratory diphtheria; both toxigenic and non-toxigenic strains can cause cutaneous diphtheria. Non-toxigenic strains are not a notifiable disease in New Zealand.

There were no confirmed cases of diphtheria in 2021. There were two notifications but neither was a case as both were non-toxigenic strains.

The last confirmed case of toxigenic and *C. diphtheria* was in 2017.

10.8 Taeniasis

Taeniasis is a parasitic disease due to infection with tapeworms belonging to the genus *Taenia*. The two most important human pathogens in the genus are *Taenia solium* (the pork tapeworm) and *Taenia saginata* (the beef tapeworm). The third species - *Taenia asiatica* - is found only in East Asia. Taeniasis is generally asymptomatic, but a heavy parasite burden causes weight loss, dizziness, abdominal pain, diarrhoea, headaches, nausea, constipation, chronic indigestion, and loss of appetite. Some taeniasis infections involve the central nervous system.

There was one confirmed case of Taeniasis in 2021.

11 Outbreaks

Key points

- There were 121 outbreaks notified in the Auckland region in 2021. This included eight COVID-19 outbreaks. This was the lowest number of outbreaks notified in any year since 2010.
- The number of outbreaks of respiratory illness was reasonably high. When identified, the causative agent for these was usually respiratory syncytial virus (RSV).
- Overall, foodborne outbreaks were slightly more common than outbreaks due to respiratory illness.
- There were no TB outbreaks in 2021.
- Of the foodborne diseases, the most common cause was norovirus in the early childhood education setting.
- The most notable outbreak (besides the COVID-19 outbreak) was a norovirus outbreak related to a contaminated water source at a farm. This outbreak infected at least 116 wedding guests across two separate wedding events as well as seven farm residents, over a time period of at least two months.

Summary

- ARPHS identified or received 121 outbreak notifications in 2021. This is the lowest number of outbreak notifications ARPHS has received in any year since 2010.
- The most substantial outbreak was the COVID-19 August 2021 – January 2022 Delta community outbreak, with 9,925 cases in 2021.
- Of the non-COVID-19 outbreaks, gastroenteritis from either foodborne intoxication or an unknown case (1,043 cases) and influenza-like illness[8] (706 cases) were associated with the most cases.

[8] Outbreaks of influenza-like illness (ILI) are not usually notifiable, but in 2021, ARPHS strongly encouraged early childhood education centres (ECECs), long-term residential care facilities and healthcare facilities to report these to ARPHS as if they were notifiable, as a method of COVID-19 surveillance. ILI data are presented in this report alongside those of other notifiable outbreaks.

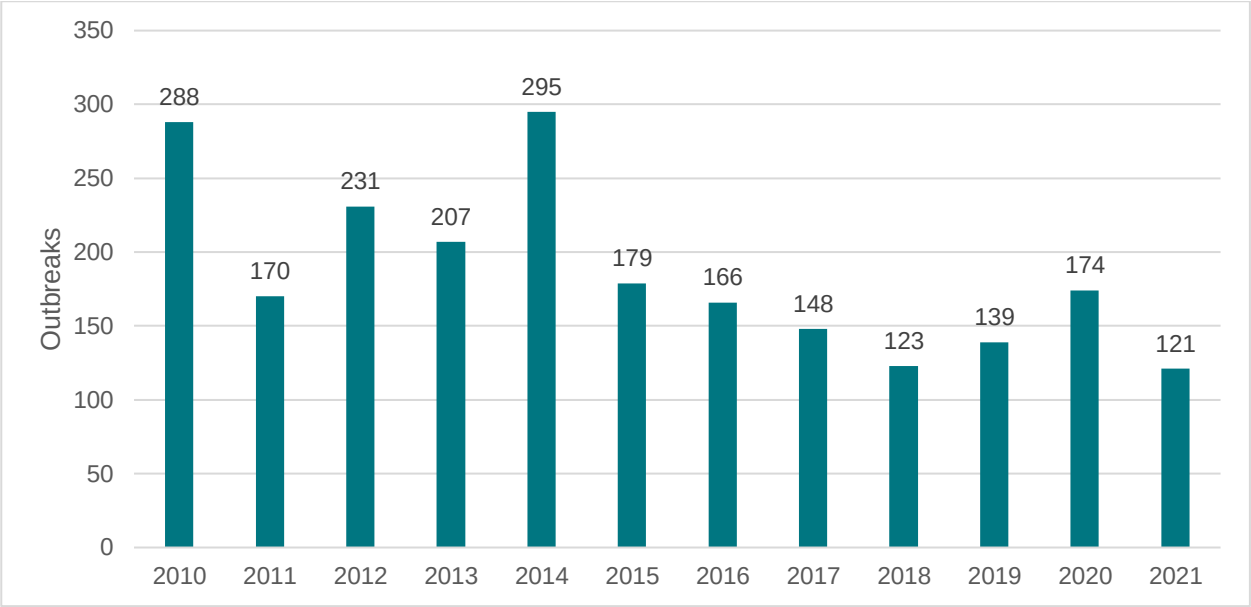


Figure 57: Outbreaks by year in the Auckland region 2010 – 2021

Monthly breakdown

There are typically more outbreaks reported in summer and early spring, but this pattern was not observed in 2021. Instead, the number of reported outbreaks peaked in August, before rapidly tailing off towards the end of the year.

This unusual pattern is partly due to the number of notifications for influenza-like illness (ILI) ARPHS received over the winter (16 in July and 13 in August). There was substantial public health messaging at this time, both from ARPHS and from other public health actors, which encouraged healthcare professionals and the public to be vigilant about the possibility of further community COVID-19 outbreaks. Additionally, the lack of post-August outbreaks can confidently be attributed to the public health measures imposed to prevent the spread of COVID-19.

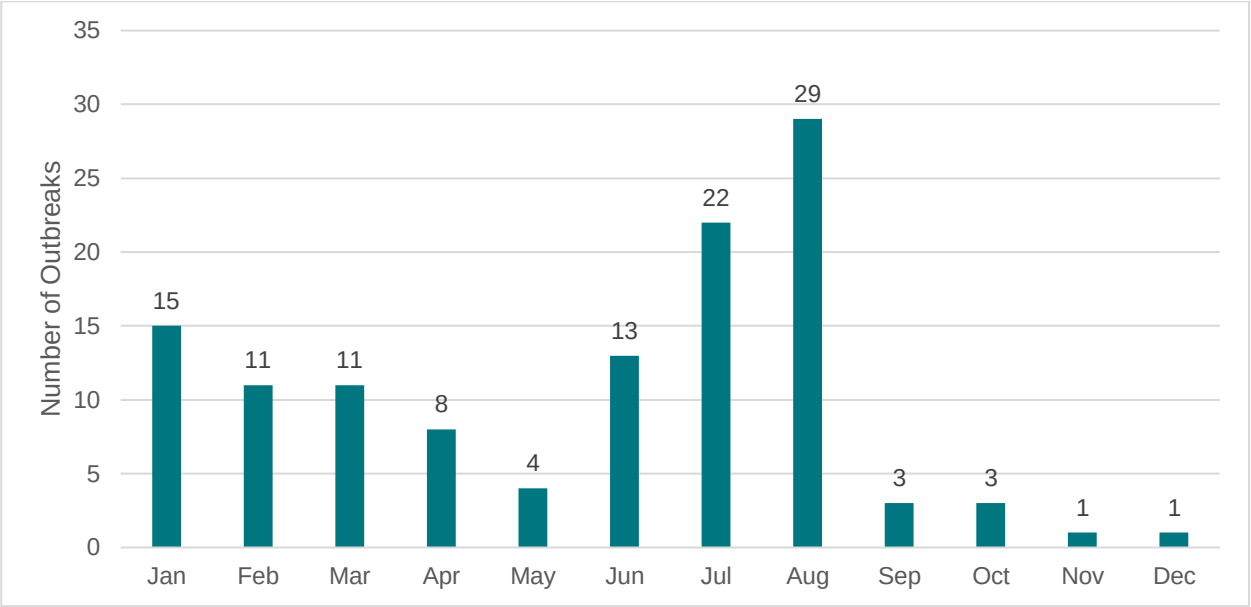


Figure 59: Outbreaks identified by ARPHS in the Auckland region in 2021 by month

Causative agents

There were only 12 different specific causative agents identified. In a large number of cases (especially with outbreaks due to gastroenteritis and ILI) the specific causative agent was not ultimately determined.

Of the pathogens which were identified with certainty, norovirus was responsible for 23 outbreaks (19% of all outbreaks and 40% of those where a causative agent was identified).

Table 50: Causative agent associated with outbreaks identified by or reported to ARPHS in 2021

Causative Agent	Number of Outbreaks
Acute respiratory infection – specific agent unknown	2
COVID-19	8
Gastroenteritis – specific agent unknown	32
Giardiasis	2
Histamine (scombroid) fish poisoning	1
Influenza-like illness – specific agent unknown	30
Lead absorption	2
Legionellosis	2
Norovirus	23
Parainfluenzavirus 1	1
Respiratory Syncytial Virus	6
Salmonellosis	3
Sapovirus	5
Shigellosis	1
VTEC/STEC infection	1
Grand Total	***121***

Of the 121 outbreaks, 70 (57.8%) were enteric; the causative enteric agent was identified in 37 of the enteric outbreaks (53%). Largely a result of COVID-19 restrictions, there were many outbreaks throughout the year when it was not possible to obtain faecal samples to confirm a pathogen.

By comparison, in 2019, a causative enteric agent was identified in three-quarters of outbreaks.

11.1 Non-enteric outbreaks

11.1.1 Lead absorption

There were two outbreaks of lead absorption affecting five people in total. Both were related to non-commercial paint stripping activities.

11.1.2 Legionellosis

There were two outbreaks of legionellosis, both caused by *L. pneumophila*, infecting six people in total.

One occurred at an aged care centre and was suspected to have been caused by a contaminated air-conditioning unit. The second was related to transportation, with one confirmed case and two probable cases. The source for the second outbreak was not identified.

11.1.3 Influenza-like Illnesses and Other Non-COVID-19 Respiratory Outbreaks

Around a third (39 reported outbreaks; 32%) of all outbreaks notified to ARPHS in 2021 were due to ILI or acute respiratory infection. Notification of ILIs and acute respiratory outbreaks was a new phenomenon for ARPHS in 2021; outbreaks of ILI are not usually notifiable, but ARPHS strongly encouraged ECECs, long-term residential care facilities and healthcare facilities to report these to ARPHS at this time, as a method of COVID-19 surveillance. Our first ever notifications for these occurred in 2020, and there were six that year.

In 2021 ARPHS received 36 notifications of non-COVID-19 ILI outbreaks and three notifications of acute respiratory infection outbreaks. A total of 744 people were infected during these outbreaks. Eight notifications were provided by ECECs and the remainder came from residential care facilities. The causative agent was identified in seven

outbreaks; parainfluenzavirus 1 was the implicated pathogen in one of these, and RSV was implicated in the remaining six.

11.1.4 COVID-19

There were eight formal outbreaks of COVID-19 in 2021:

- Five were confined to managed isolation and quarantine (MIQ) facilities, and these resulted in a total of 19 cases.
- Three outbreaks resulted in community transmission, and one of these was the Delta outbreak.
- The vast majority of Auckland's cases (9,925) were associated with the Delta outbreak of August 2021 to January 2022.
- The other community outbreaks were significantly smaller, and only resulted in a total of 20 cases.

The source of COVID-19 transmission within the MIQ facility was not always able to be ascertained. One outbreak occurred after simultaneous door opening with corridor exposure of two different travel bubbles. In another outbreak, a returnee had a direct genomic link with a returnee who had previously been billeted in the same MIQ hotel room, but had no direct contact with the index case at any point.

11.2 Enteric outbreaks

Norovirus, sapovirus and salmonellosis were the most commonly identified enteric outbreak causative agents in 2021:

- Norovirus caused illness in 23 outbreaks, causing 629 people to become unwell. This is the lowest number recorded since 2010.
- Sapovirus caused illness in five outbreaks, infecting 64 people.
- Salmonellosis caused illness in three outbreaks, infecting 74 people. One of these was linked to a nationwide *S. Enteritidis* outbreak connected to the poultry/egg industry.

In 2021 there were 34 enteric outbreaks notified for which no pathogen was found. The majority of these 'unknown cause' outbreaks are likely to be norovirus, based on data from previous years. Common reasons for this 'unknown' status may include negative testing; members of the public being unable to follow up with requested stool samples; and limitations as a result of COVID-19.

There were no enteric outbreaks related to overseas travel in 2021.

Table 51: Foodborne outbreaks in the Auckland region in 2021 by pathogen and number of cases associated with each outbreak

Pathogen	Outbreak size (number of cases)						Total
	2 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100+	
Gastroenteritis – specific agent unknown	4	15	11	4	0	0	***34***
Giardiasis	2	0	0	0	0	0	***2***
Histamine (scombroid) fish poisoning	1	0	0	0	0	0	***1***
Norovirus	3	1	9	8	1	1	***23***
Salmonellosis	1	1	0	1	0	0	***3***
Sapovirus	0	2	2	1	0	0	***5***
Shigellosis	1	0	0	0	0	0	***1***
VTEC/STEC	1	0	0	0	0	0	***1***

11.2.1 Gastroenteritis – specific agent unknown

The four largest outbreaks of gastroenteritis where a specific agent was not identified all occurred at ECECs. One of these outbreaks was closed because Auckland went into Alert Level 4 in August 2021, which curtailed the number of people infected. The other 28 outbreaks in this category occurred at ECECs, residential care facilities, school camps, and a police dinner (where six individuals were affected).

11.2.2 Giardiasis

Of the two giardiasis outbreaks, one outbreak occurred at an ECEC, affecting two children. Specific information for the other was not available.

11.2.3 Histamine (scombroid) fish poisoning

Two individuals became unwell after eating a miso soup containing dried fermented tuna and mackerel at an Auckland restaurant.

11.2.4 Norovirus

There was one very large norovirus outbreak which caused at least 123 individuals to become unwell.

- The setting for this outbreak was a wedding venue located on a farm. The index event, a wedding, was held in May before restrictions on the number of possible attendees at a gathering came into effect. Forty out of 75 wedding attendees started showing symptoms of gastroenteritis in the week following the wedding. Stool samples from two attendees was positive for norovirus.

- Subsequently a member of the public began investigating potential other outbreaks of gastroenteritis at the same wedding venue, and determined that a previous wedding event in April had also experienced an outbreak of gastroenteritis (which had not been reported at the time to ARPHS). Contact tracing was done, and it was determined that at this wedding, 76 out of 108 attendees had become unwell. Additionally, seven out of 11 residents of the farm had become unwell with gastroenteritis between April and May.
- It was initially difficult to determine the source of the outbreak. The catering companies between the two weddings were different, and none of the caterers had experienced any symptoms of gastroenteritis. Seven out of nine of the May event's caterers submitted stool samples, all of which were negative for norovirus.
- The farm's water source was initially thought to be an unlikely source of contamination (the causative agent was norovirus, which unlike *Escherichia coli*, is not commonly associated with waterborne disease). The farm was also supplied by spring water, not a tank. However, the farm's water was eventually tested for norovirus by taking water from the kitchen tap. These samples came back positive for norovirus.
- It was eventually determined that the farm's septic tank was located proximal to the spring. Though this theory cannot be definitively proven, it is suspected that a reservoir of norovirus within the septic tank continually leaked into the stream, causing this outbreak.

Other large outbreaks affecting somewhat fewer people occurred at a high school, retirement villages, and ECECs. The outbreak affecting a high school was closed after Auckland went into Alert Level 4 in August 2021, which may have resulted in an under-count of the final number of people affected.

11.2.5 Salmonellosis

Two of the salmonella outbreaks notified in the Auckland region in 2021 were related to households. One outbreak involved two children who experienced symptoms after swimming in the Hauraki Gulf following bad weather. The other occurred in a household of eight people and was thought to be related to undercooked chicken, pork or a raw fish salad.

The third outbreak involved 30 people in the Auckland region but was linked to a national outbreak, impacting 63 people across New Zealand. This outbreak was characterised by the presence of a specific *Salmonella* strain, *Salmonella enteriditis* genomic cluster profile Enteritidis_2019_C_01. It was caused by contaminated poultry and eggs. Multiple hatcheries and poultry farms were affected and produced contaminated food due to cross-contamination. The outbreak eventually petered out after public health messaging and fieldwork by the Ministry for Primary Industries to locate the sources of contamination.

11.2.6 Sapovirus

There were five outbreaks caused by sapovirus infection in the Auckland region in 2021, which all occurred at ECECs. The largest sapovirus outbreak caused 24 people to become infected, including both staff and children.

Most were due to inadequate hygiene precautions being taken by the ECEC. In one case, there was no designated nappy change area, so nappies were being changed on a mat in the middle of the floor. This was not being disinfected between uses by multiple children, including for play. Some ECECs also required reminding to cease water-play and play-dough use until their outbreaks were over.

11.2.7 Shigellosis

There was only one outbreak of shigellosis, which occurred in a household of two. This outbreak was thought to be due to undercooked and under-reheated meat.

11.2.8 Verotoxin-producing E. coli (VTEC/STEC)

VTEC/STEC outbreaks are uncommon as there is usually limited person-to-person spread; outbreaks are often confined to families where there has been a common exposure and typically only number two or three cases.

In 2021 there was one notified VTEC/STEC outbreak, which occurred in a family setting. This outbreak affected two individuals and probably involved person-to-person transmission. The original source of the VTEC/STEC infection in the index case is unknown.

11.3 Foodborne outbreak settings

In 2021 the Auckland region saw more outbreaks (34) and cases (460) linked to ECECs than any other location. There were 17 outbreaks in long-term residential care facilities which caused 280 cases. Other outbreaks were diverse in setting and smaller in scale (with the exception of the norovirus wedding outbreak).

Outbreaks in ECECs and long-term residential care facilities were more likely to involve more individuals than outbreaks in other settings.

Table 52: Foodborne outbreaks in the Auckland region by setting and number of cases in 2021

Setting	No. of outbreaks	Total no. of cases
Camp	1	12
Childcare centre (ECEC)	34	460
Community, church, sports gathering	1	18
Home	5	17
Hospital (acute care)	1	10
Long term care facility	17	280
Restaurant/cafe/bakery	2	8
School	3	53
Supermarket/delicatessen	1	63
Other food outlet	1	2
Other institution	3	201
Other setting	1	2
Grand Total	***70***	***1126***

Table 53: Number of foodborne outbreaks by setting and outbreak size in the Auckland region in 2021

Setting	Outbreak size (number of cases)						*Total*
	2 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100+	
Camp	0	0	1	0	0	0	***1***
Childcare centre	2	10	14	8	0	0	***34***
Community, church, sports gathering	0	0	1	0	0	0	***1***
Home	4	1	0	0	0	0	***5***
Hospital (acute care)	0	0	1	0	0	0	***1***
Long term care facility	2	5	5	4	1	0	***17***
Other food outlet	1	0	0	0	0	0	***1***
Other institution	2	0	0	0	0	1	***3***
Other setting	1	0	0	0	0	0	***1***
Restaurant/cafe/bakery	1	1	0	0	0	0	***2***
School	0	2	0	1	0	0	***3***
Supermarket/ delicatessen	0	0	0	0	1	0	***1***
Grand Total	***13***	***19***	***22***	***13***	***12***	***1***	***70***

References and resources

References

Ministry of Health. (2020). *Communicable Disease Control Manual*. Wellington: Ministry of Health. https://www.health.govt.nz/publication/communicable-disease-control-manual

Resources
Books

- Heymann, D. (2022). *Control of Communicable Diseases Manual: An Official Report of the American Public Health Association* (21st Edition), ISBN 978-0875533230
- Ministry of Health. (2020). *Immunisation Handbook*
- Mandell, Douglas and Bennetts (2019) *Principles and Practice of Infectious Disease* (Ninth edition)

Other data sources

- Statistics New Zealand (SNZ): http://archive.stats.govt.nz/ for 2021 estimated resident population numbers
- ESR Public Health Surveillance https://surv.esr.cri.nz
- ARPHS Fact Sheets www.arphs.govt.nz
- ARPHS Normal and After hours Protocols
- ARPHS Surveillance Strategy 2016-2018, 2018 to 2022
- Ministry for Primary Industries (MPI): www.mpi.govt.nz/travel-and-recreation/fishing/shellfish-biotoxin-alerts/
- ARPHS Biosecurity Logging Master

EpiSurv Reports

Most of the data in this report is from EpiSurv extracts. These extracts are archived as Excel spreadsheets at ARPHS.

- Lead absorption data are extracted from NDCMS with outputs to Excel
- Risk factor data is extracted through risk factor reports designed and created by ARPHS

Appendix 1: Notifiable diseases in New Zealand

Diseases which primarily relate to sexual health are reported on elsewhere and are not covered in this report, but for accuracy are included in this list.

Acute gastroenteritis (when part of a suspected outbreak)

AIDS

Anthrax

Arboviral diseases e.g. Dengue fever

Brucellosis

Campylobacteriosis

Cholera

COVID-19

Creutzfeldt-Jakob disease

Cronobacter species

Cryptosporidiosis

Cysticercosis

Decompression Sickness

Diphtheria

Enterobacter sakazakii invasive disease

Giardiasis

Gonorrhoeal infection

Haemophilus influenza B

Hazardous Substances

Hepatitis (acute A,B,C or viral NOS)

HIV infection

Hydatid Disease

Influenza (High pathogenic Avian) and non-seasonal influenza

Invasive Pneumococcal Disease

Lead Poisoning with a level of >0.23 μmol/L

Legionellosis

Leprosy

Leptospirosis

Listeriosis

Malaria

Measles

Meningoencephalitis (primary amoebic)

MERS

Mumps

Neisseria meningitidis (invasive disease)

Pertussis

Plague

Poisoning arising from chemical contamination of the environment

Poliomyelitis

Q fever

Rabies and other lyssa viruses

Rheumatic fever

Rickettsial diseases

Rubella

Salmonellosis

SARS

Shigellosis

Syphilis

Taeniasis

Tetanus

Trichinosis

Tuberculosis (all forms)

Typhoid and paratyphoid fever

Viral haemorrhagic fevers

VTEC/STEC

Yellow fever

Yersiniosis