

# Page 1. Epidemics, pandemics and disease control

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An epidemic occurs when there is an abnormally high level of a disease at a particular time. It usually refers to infectious diseases, but it is also possible to have epidemics of non-infectious diseases such as heart disease and diabetes, and conditions such as obesity.

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A pandemic occurs when an epidemic spreads from one country to another and becomes prevalent around the world. New Zealand has experienced four pandemics, in 1890–94, 1918, 2009 and from 2020.

An endemic disease is continually present in a population at a low rate, or with a low death rate. An example of this in New Zealand in the 21st century is hepatitis B.

## Measuring epidemics

The severity of an epidemic is usually measured by its mortality rate (the number of people who die from the disease). Epidemics of some diseases will have a high morbidity rate – make a lot of people ill – but not cause many deaths. They can cause considerable social and economic disruption if large numbers of people have to stay at home.

Another measure of the severity of an epidemic is the case–fatality proportion, which is the percentage of people with the disease who die from it. An epidemic may affect a very small proportion of the population yet prove dangerous to those who catch the disease. Most pass unnoticed by the general public, unless increased hospital admissions or an alarming number of deaths are reported by the news media.

The severity of an epidemic depends on factors such as the size and health of the population, the nature of the infectious organism, the speed and ease of travel, and the availability of medical services and effective treatments. All these factors have changed considerably since the early 19th century, and vary from place to place.

## Epidemiology and disease control

Epidemiology is the branch of health science that studies the patterns of diseases, including epidemics. Since the 19th century research into diseases has led to some that were feared killers in the past – for example, influenza and smallpox – being controlled or eliminated by immunisation with a vaccine. However, New Zealand's immunisation rates are lower than those of many other developed countries.

### How immunisation works

People are immunised against infectious diseases with vaccines, which contain either fragments of a disease germ or weakened germs. These prompt the body to produce cells and antibodies that protect the person from the disease. Vaccinations have been used since the 19th century. To prevent some diseases, such as measles, from circulating in the community, at least 95% of the population needs to be vaccinated. The Ministry of Health's immunisation target is 95% of eight-month-olds fully immunised – in 2018, 91.7% were immunised.

traced to the SS *Nebraska*.

Until the 1920s some diseases, such as measles and rubella, simply disappeared after each local outbreak until they were reintroduced (usually from Australia), because the population was too small and thinly spread to sustain them. Some

Some diseases that caused high mortality in the 19th century, such as cholera, scarlet fever and typhoid, have virtually disappeared from developed countries (including New Zealand) due to improvements in personal hygiene, public sanitation, nutrition and health services. However, when developed infrastructures collapse during wars or natural disasters, these diseases can sometimes reappear and cause epidemics.

### Historical epidemic patterns

The historical pattern of epidemics in New Zealand reflects its isolation and relatively small population. The long sea voyage to New Zealand in the 19th century meant that most infectious diseases had died out by the time the ship arrived.

Some migrant ships suffered high infant mortality from scarlet fever and gastrointestinal infections. Quarantine regulations from the 1870s were aimed at preventing the arrival of unwelcome infections, especially smallpox. In 1872 a smallpox outbreak in Auckland was

diseases did thrive in New Zealand's small urban centres. In 1875 typhoid was widespread in towns and cities – there were 323 deaths.

Deaths from infectious diseases have generally declined since records began in the late 19th century. In the 1870s infectious diseases accounted for a third of all deaths. By 1900 the proportion was down to 15%, and in 2000 infectious diseases caused fewer than 7% of all deaths.

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