

Sentinel surveillance

Sentinel surveillance is a form of passive and active surveillance in which selected clinicians gather data and pass them on to those responsible for the surveillance. The notion of sentinel refers to keeping watch for particular diseases of interest. For example, the [Canadian Primary Care Sentinel Surveillance Network](#) links selected family health teams via an electronic record surveillance system. This can be used both to report rare events (such as side-effects they observe from influenza immunizations) and to help improve the quality of care. If the sample of physicians is carefully designed, estimates can be made of the population incidence of the event of interest without the need to survey the entire population.

[see Illustrative Material: Influenza surveillance](#)

[see Nerd's Corner: Analyzing surveillance reports](#)

7.4 PATTERNS OF DISEASE DEVELOPMENT IN A POPULATION: THE EPIDEMIC CURVE

When our efforts to prevent disease fail and an outbreak develops, the resulting distribution of cases may take various forms that are called epidemic curves (see [Epidemic curve](#) in Glossary). These show the distribution of incident cases over time, tracing the evolution of a population outbreak, which is equivalent to the idea of the [natural history of disease](#) for an individual case. The natural history of a population outbreak is most evident in infectious disease, but also occurs in situations such as a chemical spill leading to cases of respiratory disease or, on a much longer time-scale, in non-communicable, chronic diseases. The shape of the resulting epidemic curve can be used to propose hypotheses on the nature of the disease and its mode of transmission. The curve can provide information on the pattern of spread over time, the magnitude of the outbreak (the number of cases), the likely incubation period for the condition, and can reveal outliers (in time, perhaps in place).

To characterize different types of outbreak, the Centers for Disease Control classify epidemic curves based on the suspected type of exposure.² In a common source outbreak people are exposed, in a group, to a single noxious influence. The source may occur for a brief time or it may persist, depending on the circumstances. When the exposure is very brief, most people get sick at one incubation period following exposure, and this is called a point source outbreak. An example would be *Staphylococcus aureus* food intoxication from a single meal of tainted food at a wedding (how embarrassing!) This produces a single curve that wanes quickly, as long as there is no person-to-person spread (Figure 7.1).

Distribution of cases by onset of symptoms: point source type

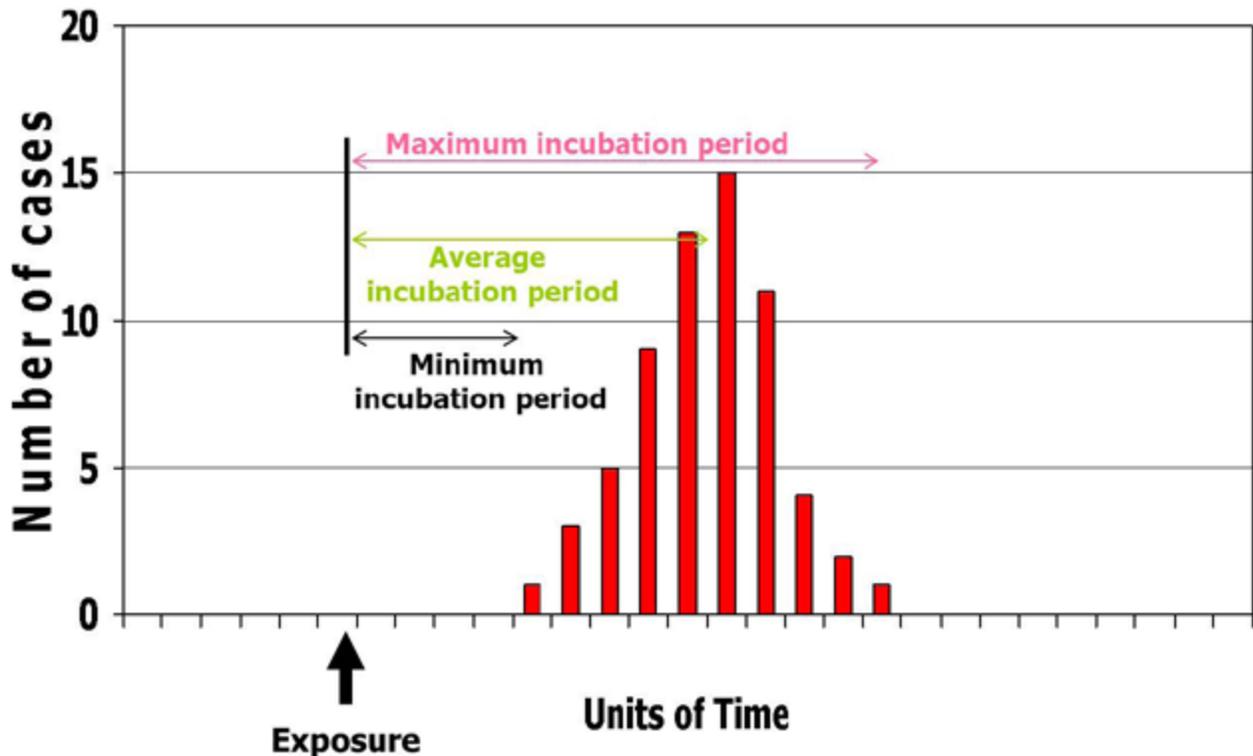


Figure 7.1: Point source exposure epidemic curve

The distribution of cases over time reflects the differential incubation period for different individuals and the time it takes them to seek help and, thereby, be included in the data collection. Perhaps some people ate more of the tainted food and became ill sooner than others, or they were more susceptible, or sought care more quickly.

Continuous source: Sometimes a common source exposure can be prolonged, as with exposure to a contaminated water supply, or via a restaurant that has a faulty refrigeration system that does not get fixed. Here, cases arise over an extended period but still originate from a common or single source. The resulting epidemic curve becomes longer and flatter, indicating the longer duration of the source and the variation in incubation periods between people: see Figure 7.2. The curve ends when the source of the contamination is corrected or when all susceptible people develop immunity. The relative flatness of the curve suggests that the infection comes from a common source and there is no person-to-person spread; otherwise the number of cases would grow over time as each person infects others.

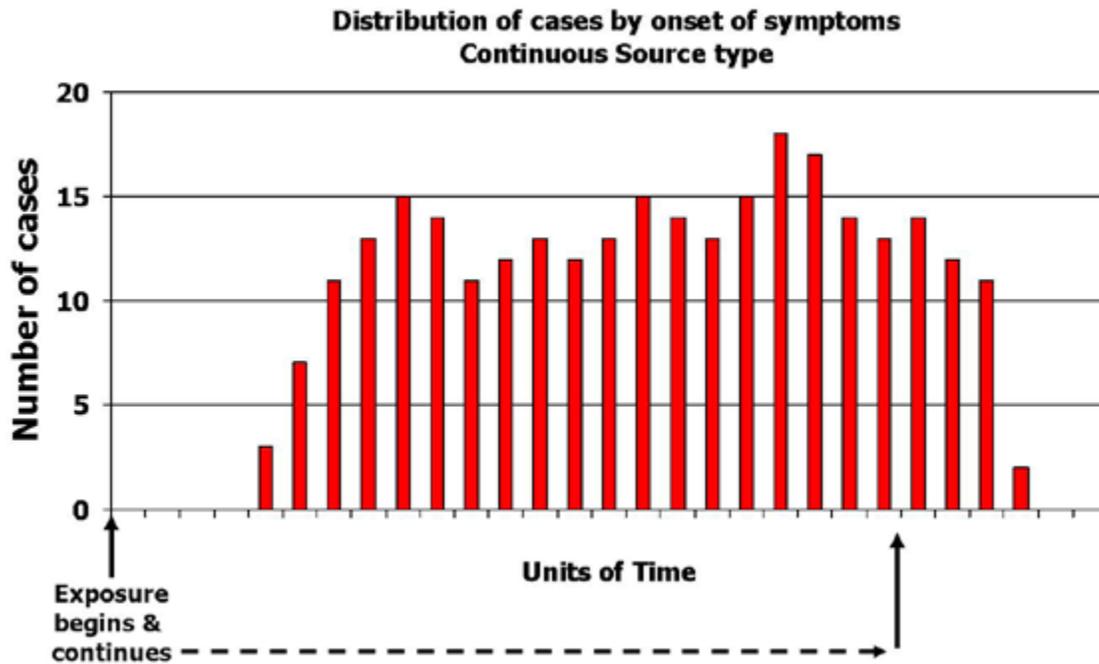


Figure 7.2: Continuous source epidemic curve

Intermittent exposure: Figure 7.3 shows an irregular pattern of cases that reflects the timing and extent of repeated exposures. It is not immediately clear whether this is a common source, such as an industrial contaminant emitted at intervals, or arises from varied sources, such as a series of outbreaks of food poisoning occurring at different summer camps for children. The gaps between the outbreaks could initially suggest person-to-person transmission followed by an incubation period, but the successive peaks do not become larger and merge as they would if the outbreaks were due to infectious spread, with one person infecting several. Hence, the epidemic curve in Figure 7.3 suggests a non-transmissible condition.

Distribution of cases by onset of symptoms. Intermittent outbreak

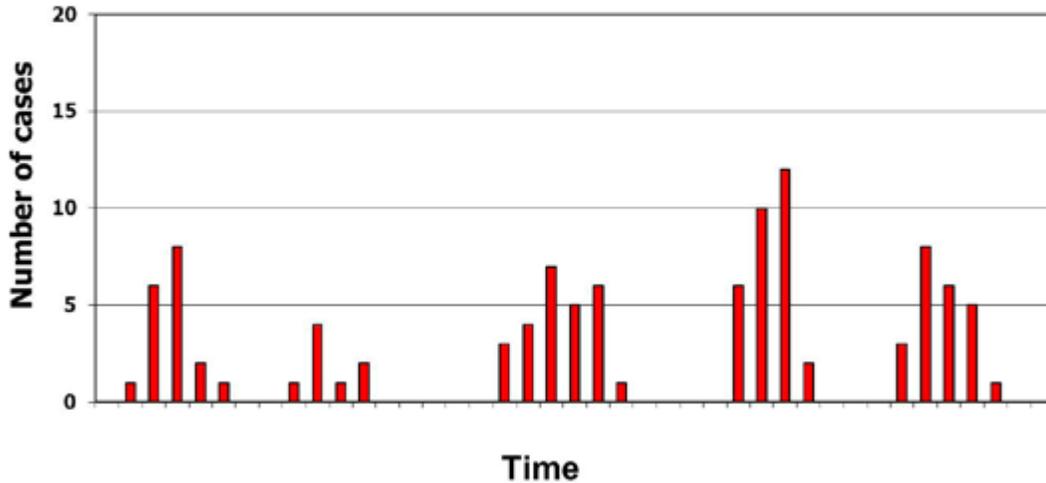


Figure 7.3: Intermittent outbreak epidemic curve

Index case with limited spread. Person to person spread is illustrated in Figure 7.4, which shows the typical pattern arising when a single index case (for example, a traveller returning from abroad) infects other people after an incubation period. This is called a point source with secondary transmission. The outbreak wanes when the infected people no longer transmit the infection to other susceptible people, perhaps because of successful control measures (isolation or quarantine).

Distribution of cases by onset date: Point source with index case and limited spread

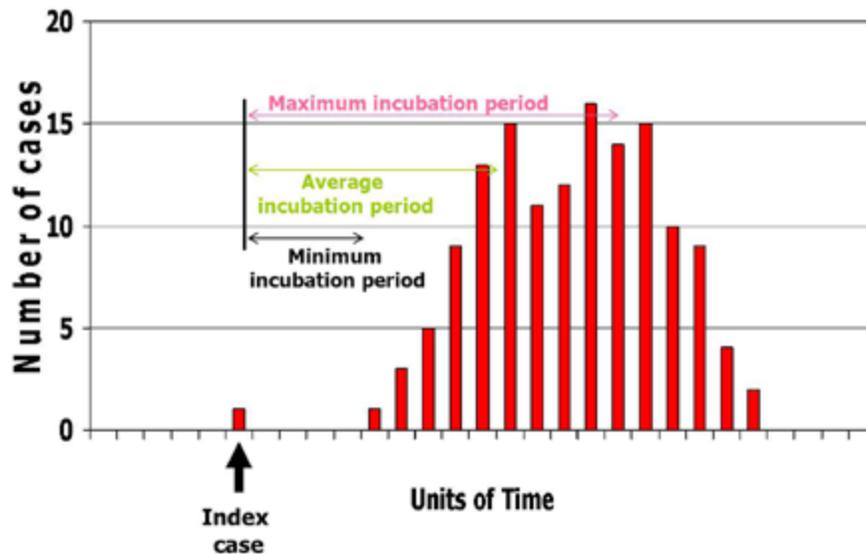


Figure 7.4. Secondary transmission from a single index case

Propagated Spread. This begins like an infection from an index case (Figure 7.4), but the secondary cases of the disease then act as sources to infect new people who, in turn, serve as sources for yet other cases. Figure 7.5 illustrates how this produces successively taller peaks, initially separated by one incubation period, but the peaks then tend to merge into waves with increasing numbers of cases in each generation (i.e., secondary and tertiary cases) and the epidemic continues until the remaining numbers of susceptible individuals declines or until intervention measures take effect. This pattern occurs with diseases such as measles that spread from person to person.

Distribution of cases by onset of symptoms.
Point source, index case with propagated spread

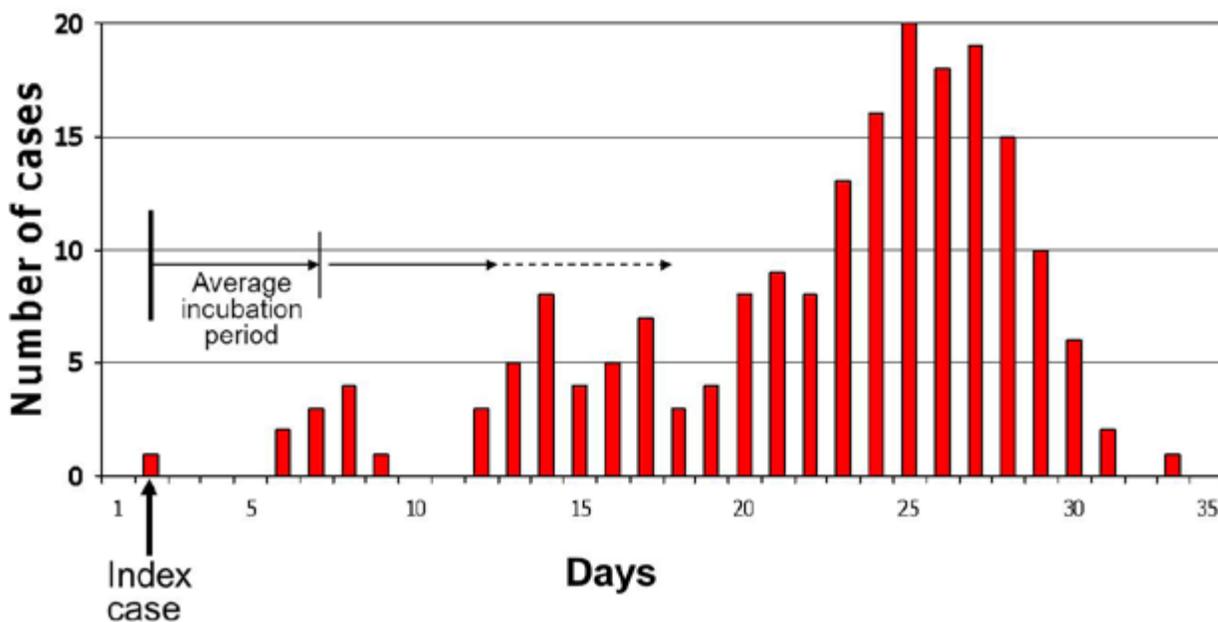


Figure 7.5: Index case with propagated spread epidemic curve

7.5 HEALTH SERVICES RESEARCH

The rising costs of medical advances mean that publicly funded systems have difficulty paying for every new treatment that becomes available. The costs mean that managers and providers of health services have to make choices about which programmes to fund. These decisions relate to whether the programmes are required, whether they are beneficial, and whether they may be improved upon. Research that informs such decisions is known as [Health Services Research](#), which can be divided into needs assessment, economic evaluation, and overall programme evaluation.