

## Epidemiologic Investigation Of An Outbreak

*Commentary by Dorothea Strozyk, MD*

Epidemiology is the study of the distribution and determinants of health-related states in specified populations and the application of this study to control health problems. In the past few months, the World Health Organization (WHO) has coordinated an international investigation that has produced epidemiologic discoveries in regards to the worldwide outbreak of severe acute respiratory syndrome (SARS).

Many outbreaks are first recognized and reported by concerned health care providers or citizens. Field epidemiologists, together with laboratory and other logistic capacities, start an investigation by looking for the "population at risk" – the people who might be considered sick cases or who are most at-risk to become sick cases.

By comparing the current number of sick people to the number of similarly sick people from the previous few weeks, months, or even from a comparable period during the previous few years, the epidemiologist determines whether an outbreak exists (i.e., whether the observed number of cases exceeds the expected number in a given time frame). Hospital discharge records, telephone surveys of local physicians, health department surveillance records and death registries are often useful sources of data for determining any trends that might indicate an outbreak is present.

After verifying the existence of an outbreak, the specific nature of the disease has to be identified as accurately as possible. The goal is to ensure that the problem has been properly diagnosed, and that it really is what it has been reported to be. Verifying the diagnosis requires reviewing the clinical findings, including the symptoms and features of illness, and laboratory results for the people who are affected. While epidemiology can guide appropriate public health action, laboratory evidence is crucial in confirming the nature of the disease and in securing the findings. In addition, conversations with patients are very helpful in generating hypotheses about the cause, source and spread of disease. Critical information in an epidemiologic investigation is often gathered by asking questions, such as: What were you exposed to before becoming ill? What do you think caused your illness? Do you know anyone else with the disease or similar symptoms? Do you have anything in common with others who have the disease? Furthermore, it is important to note the characteristics of the affected population. Age, gender, occupation, information about their general location and the chronological order of events leading up to the patient's symptoms are all significant factors in determining previously unrecognized relationships of the disease and its population and a further course of action.

Taken all together, the goal of epidemiologic field investigations is to provide a comprehensive description of an outbreak by showing its trend over time, its geographic extent (place) and the populations (people) affected by the disease. Such a descriptive analysis leads to the development of causal hypotheses. Causal hypotheses address the source of the agent (i.e. virus), the mode of transmission (i.e. airborne, person-to-person, etc...) and the exposures that caused the disease.

To evaluate the credibility of a causal hypothesis, epidemiologists quantify the relationship between various hypotheses and the disease. For example, in the recent SARS investigation, a strong relationship between the new coronavirus and the disease outbreak was observed. This link indicated the virus may very well be the causative agent. Finally, it is crucial to the field of epidemiology to implement control and prevention measures in an investigation. Control measures can be implemented as soon as the source of an outbreak is known. These measures can be aimed at specific links in the chain of infection such as the agent (i.e. virus), the source (where the agent originates) or the reservoir. These control measures are usually

directed at interrupting transmission or exposure. For example, to limit the airborne spread of an infectious agent among residents, infected people may be moved to a separate area to prevent exposure to others.

Other control measures are aimed at reducing the susceptibility of at-risk people by developing an effective vaccine against a new infectious agent. Likewise, novel antiviral agents, antiviral drugs in development or existing licensed drugs are tested to provide effective prophylaxis or treatment. It is a challenge to make these products available fast enough to prevent an extensive global outbreak.

The final task in an investigation is to communicate the findings. In many outbreaks, public health officials decide to alert the public directly through the media. In the recent SARS outbreak, announcements in the media have alerted the public to avoid traveling in affected regions and to see a physician if they had symptoms of the disease.

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