Steps of an Outbreak Investigation

In the investigation of an ongoing outbreak, working quickly is essential. Getting the right answer is essential, too. Under such circumstances, epidemiologists find it useful to have a systematic approach to follow, such as the sequence listed in Table 6.2. This approach ensures that the investigation proceeds forward without missing important steps along the way.

Table 6.2
Steps of an outbreak investigation

1. Prepare for field work
2. Establish the existence of an outbreak
3. Verify the diagnosis
4. Define and identify cases
   a. establish a case definition
   b. identify and count cases
5. Perform descriptive epidemiology
6. Develop hypotheses
7. Evaluate hypotheses
8. As necessary, reconsider/refine hypotheses and execute additional studies
   a. additional epidemiologic studies
   b. other types of studies – laboratory, environmental
9. Implement control and prevention measures
10. Communicate findings

The steps described in Table 6.2 are in conceptual order. In practice, however, several steps may be done at the same time, or the circumstances of the outbreak may dictate that a different order be followed. For example, control measures should be implemented as soon as the source and mode of transmission are known, which may be early or late in any particular outbreak investigation.

Step 1: Preparing for Field Work

Anyone about to embark on an outbreak investigation should be well prepared before leaving for the field. Preparations can be grouped into three categories: (a) investigation, (b) administration, and (c) consultation. Good preparation in all three categories will facilitate a smooth field experience.

(a) *Investigation*

First, as a field investigator, you must have the appropriate scientific knowledge, supplies, and equipment to carry out the investigation. You should discuss the situation with someone knowledgeable about the disease and about field investigations, and review the applicable literature. You should assemble useful references such as journal articles

and sample questionnaires.

Before leaving for a field investigation, consult laboratory staff to ensure that you take the proper laboratory material and know the proper collection, storage, and transportation techniques. Arrange for a portable computer, dictaphone, camera, and other supplies.

(b) *Administration*
Second, as an investigator, you must pay attention to administrative procedures. In a health agency, you must make travel and other arrangements and get them approved. You may also need to take care of personal matters before you leave, especially if the investigation is likely to be lengthy.

(c) *Consultation*
Third, as an investigator, you must know your expected role in the field. Before departure, all parties should agree on your role, particularly if you are coming from "outside" the local area. For example, are you expected to lead the investigation, provide consultation to the local staff who will conduct the investigation, or simply lend a hand to the local staff? In addition, you should know who your local contacts will be. Before leaving, you should know when and where you are to meet with local officials and contacts when you arrive in the field.

Step 2: Establishing the Existence of an Outbreak

An **outbreak** or an **epidemic** is the occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time. In contrast, a **cluster** is an aggregation of cases in a given area over a particular period without regard to whether the number of cases is more than expected. In an outbreak or epidemic, we usually presume that the cases are related to one another or that they have a common cause.

Many epidemiologists use the terms "outbreak" and "epidemic" interchangeably, but the public is more likely to think that "epidemic" implies a crisis situation. Some epidemiologists restrict the use of the term "epidemic" to situations involving larger numbers of people over a wide geographic area.

Most outbreaks come to the attention of health departments in one of two ways. One way is by regular analysis of surveillance data. As noted in Lesson 5, unusual rises or patterns of disease occurrence can be detected promptly if surveillance data collection and analysis are timely. The second, and probably more common, way is through calls from a health care provider or citizen who knows of "several cases." For example, a member of the public may report three infants born with birth defects within a 1-month period in the same community. This aggregation of cases *seems* to be unusual, but frequently the public does not know the denominator--e.g., the total number of births--or the expected incidence of birth defects.

One of your first tasks as a field investigator is to verify that a purported outbreak is indeed an outbreak. Some will turn out to be true outbreaks with a common cause, some will be sporadic and unrelated cases of the same disease, and others will turn out to be unrelated cases of similar

but unrelated diseases. Often, you must first determine the expected number of cases before deciding whether the observed number exceeds the expected number, i.e., whether a cluster is indeed an outbreak.

Thus, as in other areas of epidemiology, you compare the **observed with the expected**. How then, do you determine what's expected? Usually we compare the current number of cases with the number from the previous few weeks or months, or from a comparable period during the previous few years.

- For a notifiable disease, you can use health department surveillance records.
- For other diseases and conditions, you can usually find existing data locally--hospital discharge records, mortality statistics, cancer or birth defect registries.
- If local data are not available, you can apply rates from neighboring states or national data, or, alternatively, you may conduct a telephone survey of physicians to determine whether they have seen more cases of the disease than usual.
- Finally, you may conduct a survey of the community to establish the background or historical level of disease.

Even if the current number of reported cases exceeds the expected number, the excess may not necessarily indicate an outbreak. Reporting may rise because of changes in local reporting procedures, changes in the case definition, increased interest because of local or national awareness, or improvements in diagnostic procedures. A new physician, infection control nurse, or health care facility may see referred cases and more consistently report cases, when in fact there has been no change in the actual occurrence of the disease. Finally, particularly in areas with sudden changes in population size such as resort areas, college towns, and migrant farming areas, changes in the numerator (number of reported cases) may simply reflect changes in the denominator (size of the population).

Whether you should investigate an apparent problem further is not strictly tied to your verifying that an epidemic exists (observed numbers greater than expected). As noted earlier, the severity of the illness, the potential for spread, political considerations, public relations, available resources, and other factors all influence the decision to launch a field investigation.

Exercise 6.2

For the month of August, 12 new cases of tuberculosis and 12 new cases of aseptic meningitis were reported to a county health department. Would you call either group of cases a cluster? Would you call either group of cases an outbreak? What additional information might be helpful in answering these questions?

Answers on page 398.