

Teacher Guide

Submitted by Lisa Durso

Gastrointestinal Illness Strikes Yourtown Nebraska Worksheet 1

Instructions:

This adaptation is designed to serve as an introduction to epidemiological (epi) investigations. It is suggested that the material be covered as a class, with occasional small group break out sessions. Questions are provided to stimulate discussion and to guide the students in organizing important concepts as the material is presented. Questions may be answered in class or assigned as homework.

The original version of this lab can be found at: www.cdc.gov/excite/intro.htm

Information:

One succinct way to sum up the task of epidemiologists is to say that they count things. Basically, epidemiologists count cases of disease or injury, define the affected population, and then compute rates of disease or injury in that population. Then they compare these rates with those found in other populations and make inferences regarding the patterns of disease to determine whether a problem exists. For example in the hepatitis B example earlier, you might ask: Is the rate of disease among people with no known risk factors greater than we would expect? Is the pattern or distribution of the cases suspicious? Once a problem has been identified, the data are used to determine the cause of the health problem, the modes of transmission, any factors that are related to susceptibility, exposure, or risk, and any potential environmental determinants.

An **epidemic** is the occurrence of more cases of disease than would normally be expected in a specific place or group of people over a given period of time. To an epidemiologist, “outbreak” means basically the same thing.

Student worksheet:

As an epidemiologist from the CDC, you have been asked to help a local health officer in Yourtown solve a problem. When you arrive at the town, the local health officer relates the following story:

Over the last few days, 46 people reported an acute episode of gastrointestinal illness characterized by watery, sometime bloody diarrhea, abdominal cramps, listlessness, and vomiting. All 46 people say that they attended the same school picnic before becoming ill. Their family members who did not attend the picnic did not become ill. A total of 80 people were at the picnic.

You confirm the finding of the local health officer and suspect that something at the picnic was responsible for all these cases of illness. You also know from recent National Health Survey data that, on average, a person experiences approximately two episodes of acute gastrointestinal illness per year.

1. Would you declare the situation in Yourtown an outbreak? Why or why not.

Answer:

An outbreak is the occurrence of more cases of a particular disease than expected in a given area, or among a specific group of people, over a given period of time. Having 46 out of 80 people develop acute gastrointestinal illness over two to three days is clearly above the “expected” or background rate of two episodes/person/year found in the National Health Survey.

Information:

To determine the expected number of cases, or baseline, when an outbreak is not so obvious, you usually 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. Sources of these data include

- health department surveillance records,
- hospital discharge records,
- mortality (death) records, and
- cancer or birth defect registries

2. List the steps of an outbreak investigation.

Answer:

1. Prepare for fieldwork
2. Establish the existence of an outbreak
3. Verify the diagnosis
4. Define and identify cases
5. Describe and orient the data in terms of time, place and person
6. Develop hypotheses
7. Evaluate hypotheses
8. Refine hypotheses and carry out additional studies
9. Implement control and previous measures
10. Communicate findings

Teacher’s Note:

The steps of an outbreak investigation are not fixed in order. In some situations control measures can and should be implemented immediately. Verification of the diagnosis may come at the same time as verification of an outbreak, or laboratory confirmation may come weeks after the investigation is over. Many components, such as the case definition, line listing, descriptive epidemiology, and hypothesis are continually altered throughout the investigation as investigators acquire additional information.

Information:

Epidemiologists use several different types of studies. Simply speaking, these can be classified as either experimental, where the epidemiologists have control over the circumstances from the start, or observational, where they do not. Vaccine efficacy trials are a good example of experimental studies because investigators control who gets the vaccine and who doesn't. Observational studies can be further subdivided into descriptive and analytical studies. In the descriptive process, we are concerned with "person" (Who was affected?), "place" (Where were they affected?), and "time" (When were they affected?). Once we know the answers to these questions, we can enter the realm of analytical epidemiology and ask how and why these people were affected.

Any inferences you make from the data available are likely bases for hypotheses, which would then have to be tested using one of three analytical study designs: cross-sectional, cohort, and case-control. In all three types, the epidemiologist is attempting to discover the relationship between an exposure or risk factor and a health outcome. For example: Did the chicken salad at the company picnic cause the salmonella outbreak? Does cigarette smoke cause lung cancer? Are alcohol use and motor vehicle crashes related? Does the supplement L-tryptophan cause EMA?

The first type of design, a cross-sectional study, is basically the same as the survey. Since the data collected in the survey represent a point in time, it is like taking a "snapshot" of the population. Cross-sectional studies are good for examining the relationship between a variable and a disease, but not for determining cause and effect.

In a cohort study, you select the study population according to their exposure, regardless of whether they have the disease or health outcome you are studying. You then determine the outcomes and compare them on the basis of the individual's exposure. The relationship between exposure and outcome in a cohort study is quantified by calculating the relative risk for the exposure.

In a case-control study, the epidemiologist is working backward, from the effect, to the suspected cause. Participants are selected on the basis of the presence or absence of the disease or outcome in question, so that you have one group of people with the health problem (case-subjects), and one without (controls).

3. Will you use a cohort or case-control study to investigate the Yourtown outbreak? Why? What measure of association is most appropriate to compute for this type of study?

Answer:

A cohort analysis is appropriate because the population is small and well defined (all those who attended the school picnic), with a common exposure.

If the connection with the school picnic had not been established, a case-control study could have been done to determine any common exposure.

4. Group Activity: You plan to interview the people who attended the picnic. What information will you want to collect?

Answer:

Identifying Information

name, address, phone number
respondent (e.g., self, parent of child, spouse)

Demographic Information

age or birth date
sex
occupation

Epidemiologic Information (exposures and contacts)

what was eaten at the supper, how much, and when
foods eaten before and after the supper (but before the illness)
contacts with other ill people
the person's role in food preparation and handling