

Epidemiology Backgrounds and Synopses of the Investigations for the Curriculum's Five Modules

Module 1

The investigations in Module 1 of the *Detectives in the Classroom* curriculum prepare students to answer the first of five Essential Questions:

How is this disease distributed and what hypotheses might explain that distribution?

When students understand how to answer this question, they will be developing the first of five Enduring Understandings that provide the structural framework for the curriculum. The first Enduring Understanding is:

Health-related conditions and behaviors are not distributed uniformly in a population. Each has a unique descriptive epidemiology that can be discovered by identifying how it is distributed in a population in terms of person, place, and time. Descriptive epidemiology provides clues for formulating hypotheses.

Various types of scientists use different methods to try and determine what is causing people to get sick. Pathologists work at the cellular level and study microscopic tissue samples and organisms. Physicians work at the individual level and study the signs, symptoms, and medical histories of specific patients. Epidemiologists take a more distant view and study groups of people at the population level. The community is the epidemiologist's laboratory.

One of the ways epidemiologists study diseases or other health-related outcomes is to describe how the disease is distributed in terms of person, place, and time (PPT). If we step back and observe how a disease is distributed, we realize that the disease does not affect everyone, everywhere, all the time. Only certain people get sick, in certain places, at certain times. The description of who these sick people are, where they are sick, and when they became sick is the descriptive epidemiology of the disease.

Each disease has its own unique descriptive epidemiology. Breast cancer is more likely to occur among women than men. Skin cancer is more likely to occur among people who live closer to the equator. The flu is more likely to occur during the winter.

The table below, "Describing the Distribution of a Disease," identifies a few of the person, place, and time characteristics that can be used to describe the distribution of a disease.

<u>Describing the Distribution of a Disease</u>		
<u>Person</u> (who)	<u>Place</u> (where)	<u>Time</u> (when)
Sex Occupation Age Economic Group Ethnicity	Residence Occupation At Specific Events Geographic Site Anatomical Site	Year Season Day Date of Onset Duration

Once we know how a disease is distributed, we can begin to speculate as to why it is distributed that way. Why did these people get sick, in this place, at this time? As we study these descriptive epidemiological clues, we can begin to identify some suspected causes and formulate hypotheses, or educated guesses, to try to explain why some people got sick and others did not.

For example, because breast cancer is more likely to occur among women than men, we might speculate that something about female sex hormones causes the disease. Because skin cancer is more likely to occur among people who live closer to the equator, we might formulate a hypothesis about exposure to the sun causing skin cancer. And because the flu is more likely to occur during the winter, we might speculate that exposure to cold weather causes the flu.

In **Investigation 1-1: Why Are These Students Getting Sick?**, selected students are given “DZ” (disease) signs that represent a fictitious disease. For example, the teacher may give “DZ” signs to all students wearing sneakers. The students observe how the “DZ” is distributed and develop hypotheses about possible “causes” of “DZ”. Students may hypothesize that fumes from the school’s newly refinished gymnasium floor caused the “DZ”. In Investigation 1-1, students begin to become familiar with the terminology of epidemiology (called “Epi Talk”) by using terms such as disease distribution, hypothesis, and disease detectives. (Note: Epi Talk is used throughout the Investigations in all five of the modules.)

In **Investigation 1-2: In the News**, students read news articles about different health-related outcomes, identify the parts of the articles that describe the distribution of those outcomes, and categorize the descriptions in terms of person, place, and time (PPT). Students also identify the parts of the articles where the authors describe hypotheses that attempt to explain the distributions.

In **Investigation 1-3: What’s My Hypothesis?**, each student is assigned an exposure, for example, using a cell phone, and writes a description of how a disease would be distributed in terms of PPT if that exposure caused a disease. Then, thinking like an epidemiologist, students review other students’ PPT descriptions and formulate one or more hypotheses for each. Students compare their hypotheses and realize that a given PPT distribution of a health-related outcome can lead to the formulation of several different educated guesses.

In Investigation 1-4: The Case of Amy, students are given a letter to a principal from the mother of a sick child, Amy. Amy's mother believes that her daughter is sick because of a school-based exposure and demands that action be taken immediately. Students are asked to predict the descriptive epidemiology of the disease if it were caused or were not caused by different school-based exposures. Assuming the roles of various stakeholders (manufacturer, principal, epidemiologist, and newspaper reporter), students critique the evidence and conclusions from different perspectives. Students realize the limits of descriptive epidemiological evidence and that formulating hypotheses is not the same as proving a hypothesis. Role-playing helps students appreciate that various stakeholders may interpret descriptive epidemiology clues differently.

In Investigation 1-5: A Mysterious Ailment, students read a 1981 newspaper column about AIDS (before it was called AIDS and before the virus had been identified) and identify the descriptive epidemiological clues that led to the formulation of early causal hypotheses. To further understand the value of descriptive epidemiology, students predict what the descriptive epidemiology of AIDS would have been if the disease was caused by mosquito bites, sitting on toilet seats, donating blood, or shaking hands. Students realize that descriptive epidemiology is sometimes useful in determining that certain causal hypotheses do not make sense.

In Investigation 1-6: Concept Connections, students identify the important concepts that need to be understood in order to answer the first Essential Question: "How is this disease distributed and what hypotheses might explain that distribution?" Each Epi Team then creates a Concept Map that depicts and explains how the concepts connect to each other. At the conclusion of this investigation, students will realize that they have developed the first Enduring Understanding of *Detectives in the Classroom*: "Health-related conditions and behaviors are not distributed uniformly in a population. Each has a unique descriptive epidemiology that can be discovered by identifying how it is distributed in a population in terms of person, place, and time. Descriptive epidemiology provides clues for formulating hypotheses."