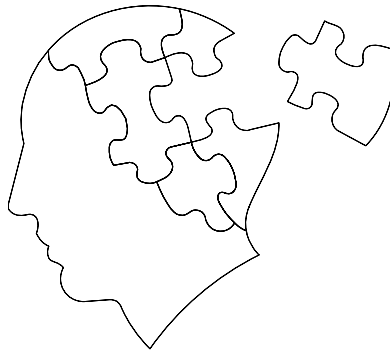


## Essential Question 3



# Concept Connections

## Part 1

Detectives in the Classroom - Investigation 3-8: Concept Connections

**Investigation 3-8: Concept Connections** is divided into two parts and will take two class periods to complete.

In Part 1, students will identify the important concepts that are needed to answer the third Essential Question: “Is the association causal?” Each Epi Team then creates a **Concept Map** that depicts and explains how the concepts connect to each other.

In Part 2, the Epi Teams will present their **Concept Maps** to the class.

At the conclusion of this investigation, students should have developed the third Enduring Understanding of *Detectives in the Classroom*: “Causation is only one explanation for finding an association between an exposure and a disease (or an outcome). Because observational studies are flawed, other explanations must also be considered.”

**Next Slide**

**Essential Question 3**

**In the News**

**Confounding**

**Is the association causal?**

**Chance** **Cause**

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

During the previous seven investigations, students learned how a disease detective tries to answer the third Essential Question: “Is the association causal?”

Briefly review each of the previous investigations in Module 3:

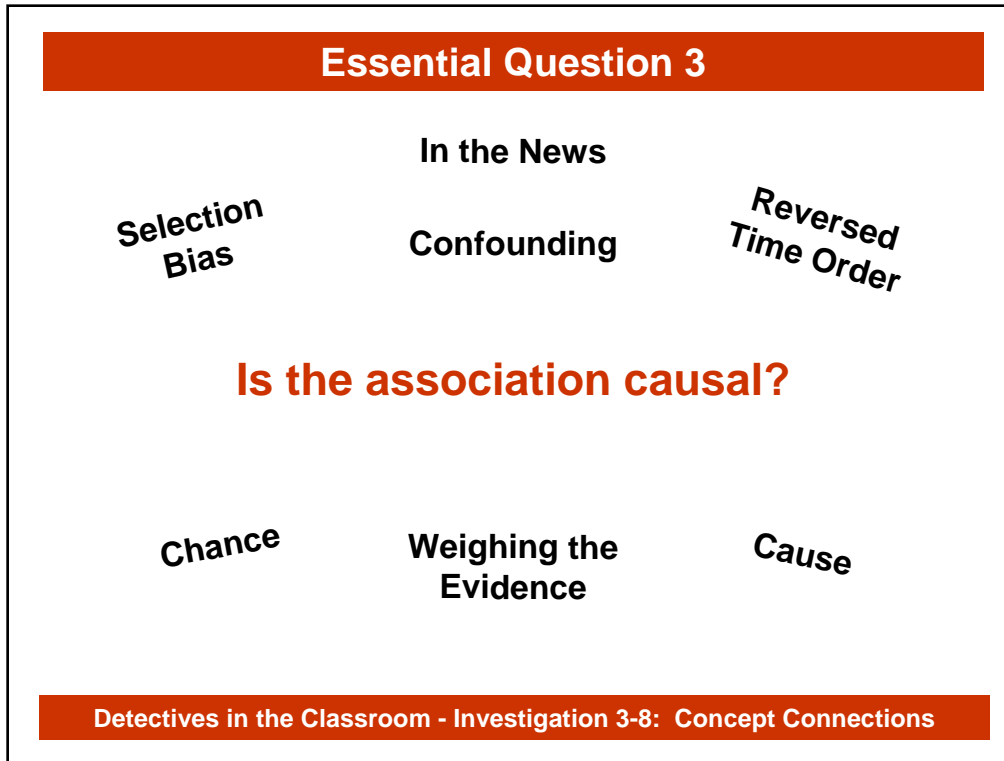
In **Investigation 3-1: In the News**, students began to appreciate the fundamental distinction between an association and a cause and that associations are not necessarily causal.

In **Investigation 3-2: Cause**, students began to explore the first of several explanations for finding an association, causation.

In **Investigation 3-3: Chance**, students were given a deck of 100 cards, with 25 labeled a, 25 labeled b, 25 labeled c, and 25 labeled d, representing the number of people in the population who would be in cells a, b, c, and d if a hypothesis were tested. Then they mixed up the cards, took a sample of 20 cards, counted the number of a, b, c, and d cards, constructed a 2 x 2 table, calculated the relative risk, and uncovered how an association can be found by chance.

In **Investigation 3-4: Confounding**, students explored the possibility that a confounder, an exposure associated with the studied exposure and the actual cause of the outcome, might be the reason an association is found.

**Next Slide**



In **Investigation 3-5: Reversed Time Order**, students learned that another possible explanation for finding an association between an exposure and an outcome is reversed time order. This investigation addressed the possibility that an association could be found because of a faulty assumption about the time order of the exposure and the outcome.

In **Investigation 3-6: Selection Bias**, students considered another faulty assumption in a study that could make things appear differently from how they really are, namely, that the association was found because of the way the study participants were selected.

And in **Investigation 3-7: Weighing the Evidence**, students uncovered the importance of distinguishing associations that are causal from those that are not and began to identify causal criteria questions.

Ask students to review their **Epi Talk** for Module 3 and identify the words and phrases that an epidemiologist needs to know in order to answer the third Essential Question: “Is the association causal?”

**Next Slide**

## Investigation 3-8 Worksheet

Detectives in the Classroom Name: \_\_\_\_\_

Investigation 3-8: Epi Log Worksheet Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

- Write Essential Question 3 at the top of the paper.
- Write the following words and phrases on index cards:
  - 2x2 Table
  - Analytical Epidemiology
  - Association
  - Belmont Report
  - Bias
  - Biological Sense
  - Case-Control Study
  - Causal Judgment
  - Cause
  - Chance
  - Coherence
  - Cohort Study
  - Confounding
  - Consistency
  - Descriptive Epidemiology
  - Dose / Response
  - Epidemiology
  - Explanations for an Association
  - Exposure
  - Exposure / Disease Time Order
  - Formulate Hypotheses
  - Natural Experiments
  - Observational Studies
  - Outcome
  - Person, Place, and Time
  - Prevent Disease
  - Randomized Trial
  - Relative Risk
  - Reversed Time Order
  - Selection Bias
  - Strength of the Association
  - Test Hypotheses
  - X-Sectional Study
- Arrange words and phrases to show connections.
- Draw arrows, circles, and boxes to further show connections.
- Describe the connections on the arrows, circles, and boxes.

### Detectives in the Classroom - Investigation 3-8: Concept Connections

Give each student an **Investigation 3-8: Epi Log Worksheet**.

**Next Slide**

## Epi Teams



Detectives in the Classroom - Investigation 3-8: Concept Connections

Divide the class into Epi Teams of four or five students per team.

**Next Slide**

## Essential Question 3

1

Is the association causal?

Detectives in the Classroom Name: \_\_\_\_\_  
Investigation 3-8: Epi Log Worksheet Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Write Essential Question 3 at the top of the paper.

Write the following words and phrases on index cards:

- 2x2 Table
- Analytical Epidemiology
- Association
- Belmont Report
- Bias
- Biological Sense
- Case-Control Study
- Causal Judgment
- Cause
- Chance
- Coherence
- Cohort Study
- Confounding
- Consideration
- Descriptive Epidemiology
- Dose / Response
- Epidemiology
- Explanations for an Association
- Exposure
- Exposure / Disease Time Order
- Formable Hypotheses
- Natural Experiments
- Observational Studies
- Outcome
- Person, Place, and Time
- Primary Causes
- Randomized Trial
- Relative Risk
- Retrospect Time Order
- Selection Bias
- Strength of the Association
- Test Hypotheses
- X-Sectional Study

3. Arrange words and phrases to show connections.  
4. Draw arrows, circles, and boxes to further show connections.  
5. Describe the connections on the arrows, circles, and boxes.

Leave Space

**Write Essential Question 3 at the top of the paper.**

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Give each Epi Team a large (about 3 ft x 4 ft) piece of paper.

Review the steps to create a **Concept Map**.

Step 1: Write Essential Question 3 at the top of the paper.

Tell students to leave a 4- to 6-inch space at the bottom of their paper.

**Next Slide**

# Connections

2

2x0

Analytical

Epidemiology

CDC

Descriptive

Epidemiology

Hypothesis

Cause

Randomized

Study Designs

2. Write the following words and phrases on index cards:

- 2x2 Table
- Analytical Epidemiology
- Association
- Biased Report
- Bias
- Biological Plausibility
- Case-Control Study
- Causal Judgment
- Cause
- Chance
- Cohort Study
- Confounding
- Consistency
- Descriptive Epidemiology
- Dose-Response
- Epidemiology
- Explanations for an Association
- Exposure
- Exposure-Outcome Time Order
- Formulate Hypotheses
- Natural Experiments
- Observational Studies
- Outcomes
- Person, Place, and Time
- Prevent Disease
- Randomized Trial
- Relative Risk
- Reversed Time Order
- Selection Bias
- Strength of the Association
- Test Hypotheses
- X-Sectional Study

3. Arrange words and phrases to show connections.

4. Draw arrows, circles, and boxes to further show connections.

5. Describe the connections on the arrows, circles, and boxes.

**Write the following words and phrases on index cards:**

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Step 2: Write the words and phrases on index cards.

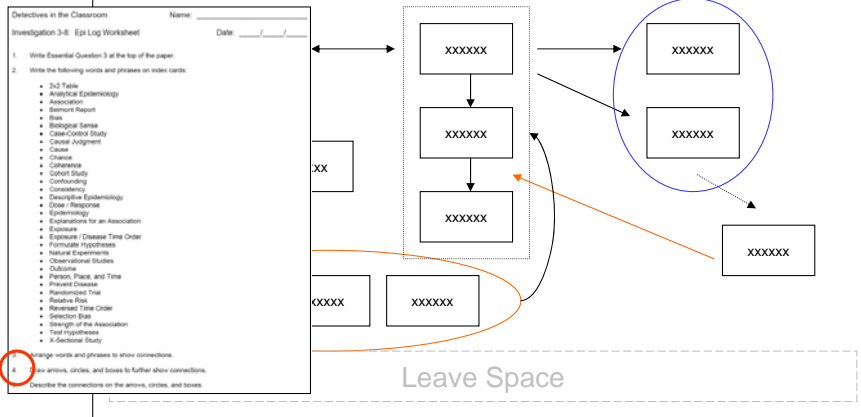
**Next Slide**



# Connections

4

Is the association causal?



**Draw arrows, circles, and boxes to further show connections.**

**Detectors in the Classroom - Investigation 3-8: Concept Connections**

Step 4: Draw arrows, circles, and boxes to further show connections.

**Next Slide**





## Investigation 3-8 Worksheet

Detectives in the Classroom Name: \_\_\_\_\_

Investigation 3-8: Epi Log Worksheet Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

- Write Essential Question 3 at the top of the paper.
- Write the following words and phrases on index cards:
  - 2x2 Table
  - Analytical Epidemiology
  - Association
  - Belmont Report
  - Bias
  - Biological Sense
  - Case-Control Study
  - Causal Judgment
  - Cause
  - Chance
  - Coherence
  - Cohort Study
  - Confounding
  - Consistency
  - Descriptive Epidemiology
  - Dose / Response
  - Epidemiology
  - Explanations for an Association
  - Exposure
  - Exposure / Disease Time Order
  - Formulate Hypotheses
  - Natural Experiments
  - Observational Studies
  - Outcome
  - Person, Place, and Time
  - Prevent Disease
  - Randomized Trial
  - Relative Risk
  - Reversed Time Order
  - Selection Bias
  - Strength of the Association
  - Test Hypotheses
  - X-Sectional Study
- Arrange words and phrases to show connections.
- Draw arrows, circles, and boxes to further show connections.
- Describe the connections on the arrows, circles, and boxes.

### Detectives in the Classroom - Investigation 3-8: Concept Connections

Ask students to complete Steps 1 through 5 on their **Investigation 3-8: Epi Log Worksheet**.

⚙ **Teacher Alert:** Listen to each Epi Team's conversation. Observe their work. Identify misconceptions. Conference as needed.

**Next Slide**

## Concept Connections

### Epi Assignment

Complete Concept Map.

Each Epi Team prepares a 5 minute presentation that:

Describes how the concepts depicted in their Concept Maps connect to each other.

Meets the **Presentation Rubric** criteria.

Due: Next Class

Detectives in the Classroom - Investigation 3-8: Concept Connections

With 5 minutes of class remaining, tell students that their Epi Assignment for next class is to

1. Complete their **Concept Maps**.
2. Prepare a 5-minute presentation that
  - Describes how the concepts depicted in their **Concept Maps** connect to each other.
  - Meets the **Presentation Rubric** criteria.

**Next Slide**

<b>Presentation Rubric</b>			
<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All Epi Team members participate	Most Epi Team members participate	Some Epi Team members participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Arrangement of Cards</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Arrows, Circles, and Boxes</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Labels</u>	Clearly describe all concept connections	Clearly describe most concept connections	Clearly describe some concept connections

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Review the **Presentation Rubric** to be used when evaluating the presentation.

- Participation: All Epi Team members participate.
- Use of **Epi Talk**: All are appropriate and accurate.
- Arrangement of Cards: Clearly depict all concept connections.
- Arrows, Circles, and Boxes: Clearly depict all concept connections.
- Labels: Clearly describe all concept connections.

Give each student a **Presentation Rubric**.

Allow Epi Teams a few minutes to assign presentation responsibilities.

**Next Slide**

## To Understand

To be able to **explain**, interpret, and apply something, while showing insight from perspective, empathy, and self-knowledge.



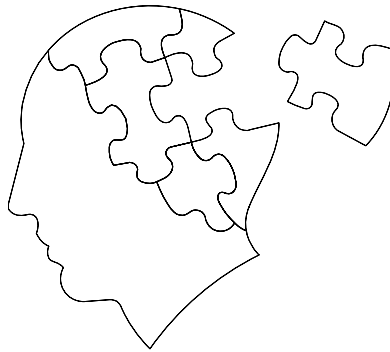
Detectors in the Classroom - Investigation 3-8: Concept Connections

Remind students that they demonstrated their ability to give sophisticated explanations of descriptive epidemiology when they showed how the descriptive epidemiologic concepts connected to each other to answer the third Essential Question: "Is the association causal?"

This concludes Part 1 of **Investigation 3-8: Concept Connections** and students can now put away their **Epi Logs**.

**Next Slide**

### Essential Question 3



## Concept Connections

### Part 2

Detectives in the Classroom - Investigation 3-8: Concept Connections

Remind students that in Part 1 of **Investigation 3-8: Concept Connections**, they identified the important concepts that are needed to answer the third Essential Question—“Is the association causal?”—and created a **Concept Map** that depicted and explained how the concepts connect to each other.

Now, in Part 2, the Epi Teams will present their **Concept Maps** to the class.

At the conclusion of this investigation, students will have developed the third Enduring Understanding of *Detectives in the Classroom*: “Causation is only one explanation for finding an association between an exposure and a disease (or an outcome). Because observational studies are flawed, other explanations must also be considered.”

**Next Slide**

<b>Presentation Rubric</b>			
<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All Epi Team members participate	Most Epi Team members participate	Some Epi Team members participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Arrangement of Cards</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Arrows, Circles, and Boxes</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Labels</u>	Clearly describe all concept connections	Clearly describe most concept connections	Clearly describe some concept connections

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Tell the Epi Teams that their presentation should meet the **Presentation Rubric** criteria.

Review the **Presentation Rubric** to be used when evaluating the presentation:

- Participation: All Epi Team members participate.
- Use of **Epi Talk**: All are appropriate and accurate.
- Arrangement of Cards: Clearly depict all concept connections.
- Arrows, Circles, and Boxes: Clearly depict all concept connections.
- Labels: Clearly describe all concept connections.

**Next Slide**

## Epi Teams



Detectives in the Classroom - Investigation 3-8: Concept Connections

Divide the class into Epi Teams of four or five students per team.  
Allow Epi Teams 5 minutes to get ready for their presentations.

**Next Slide**



## Self-Assessment

<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All Epi Team members participate	Most Epi Team members participate	Some Epi Team members participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Arrangement of Cards</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Arrows, Circles, and Boxes</u>	Clearly depict all concept connections	Clearly depict most concept connections	Clearly depict some concept connections
<u>Labels</u>	Clearly describe all concept connections	Clearly describe most concept connections	Clearly describe some concept connections

### Detectives in the Classroom - Investigation 3-8: Concept Connections

- Participation: All Epi Team members participate.
- Use of **Epi Talk**: All are appropriate and accurate.
- Arrangement of Cards: Clearly depict all concept connections.
- Arrows, Circles, and Boxes: Clearly depict all concept connections.
- Labels: Clearly describe all concept connections.

Compliment when appropriate.

Discuss differences between the teacher's assessment and the self-assessment.

Repeat this process until all Epi Teams have presented and self-assessed their presentations.

Next Slide

## Enduring Understanding 1



### Essential Question

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

### Enduring Understanding

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.

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Point out to students that when they completed the investigations in Module 1, they learned the way a disease detective tries to answer the first Essential Question: “How is this disease distributed and what hypotheses might explain that distribution?” They also uncovered a disease detective’s first Enduring Understanding: “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.”

**Next Slide**

## Enduring Understanding 2

### Essential Question

Is there an association between the hypothesized cause and the disease?



### Enduring Understanding

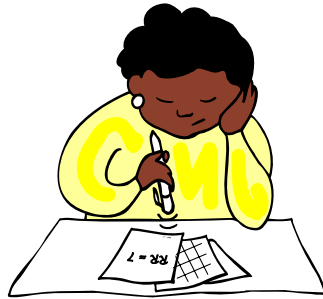
Causal hypotheses can be tested by observing exposures and diseases of people as they go about their daily lives. Information from these observational studies can be used to make and compare rates and identify associations.

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Point out to students that when they completed the investigations in Module 2, they learned the way a disease detective tries to answer the second Essential Question: “Is there an association between the hypothesized cause and the disease?” They also uncovered a disease detective’s second Enduring Understanding: “Causal hypotheses can be tested by observing exposures and diseases of people as they go about their daily lives. Information from these observational studies can be used to calculate and compare risks and identify associations.”

**Next Slide**

## Uncovering Enduring Understanding 3



### Essential Question

Is the association causal?

### Enduring Understanding

Causation is only one explanation for finding an association between an exposure and an outcome.

Because observational studies are flawed, other explanations must also be considered.

Detectives in the Classroom - Investigation 3-8: Concept Connections

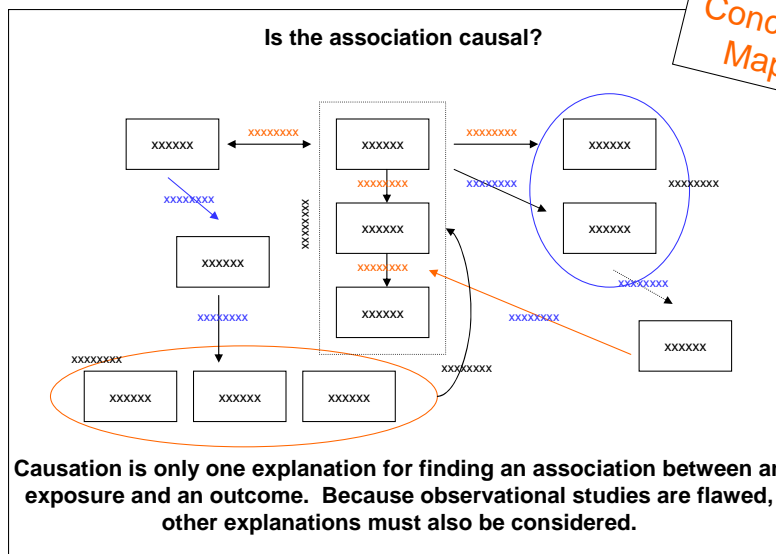
By doing the investigations in Module 3, now completed, students have been learning the way an epidemiologist, a disease detective, tries to answer the third Essential Question: “Is the association causal?”

Ask students:

- Have you uncovered an epidemiologist’s third Enduring Understanding? “Causation is only one explanation for finding an association between an exposure and a disease (or an outcome). Because observational studies are flawed, other explanations must also be considered.”

**Next Slide**

## Enduring Understanding 3



Detectives in the Classroom - Investigation 3-8: Concept Connections

A student from each Epi Team should now write the third Enduring Understanding in the space at the bottom of his or her Epi Team's **Concept Map**.

**Next Slide**

## Self-Assessment

Detectives in the Classroom Name: \_\_\_\_\_

Investigation 3-8: Epi Log Worksheet - Homework Concept Map Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Place the following words and phrases into a Concept Map that depicts how they connect with each other to answer Essential Question 3:

<i>2x2 Table</i>	<i>Confounding</i>	<i>Hypotheses</i>	<i>Relative Risk</i>
<i>Association</i>	<i>Descriptive Epidemiology</i>	<i>Inference</i>	<i>Study Designs</i>
<i>Cause</i>	<i>Dose / Response</i>	<i>Natural Experiments</i>	

Is the association between the hypothesized cause and the disease causal?

Causation is only one explanation for finding an association between an exposure and an outcome.  
Because observational studies are flawed, other explanations must also be considered.

**Epi  
Assignment**

**Detectives in the Classroom - Investigation 3-8: Concept Connections**

Give each student an **Investigation 3-8: Homework Concept Map** form.

Ask students to complete this Epi Assignment for the next class.

Emphasize that the work is to be done individually and not in Epi Teams.

⚙ Teacher Alert: You can show students the **Homework Concept Map Rubric** after they have completed their Epi Assignment.

**Next Slide**

## To Understand

Investigation  
3-8 has ended.

To be able to **explain**,  
interpret, and apply something,  
while showing insight from  
perspective, empathy, and  
self-knowledge.



Detectives in the Classroom - Investigation 3-8: Concept Connections

Remind students that they demonstrated their ability to give sophisticated explanations of descriptive epidemiology when they showed how the descriptive epidemiologic concepts connected to each other to answer the third Essential Question: “Is the association causal?” This concludes Part 2 of **Investigation 3-8: Concept Connections** and students can now put away their **Epi Logs**.