

Compared to What?



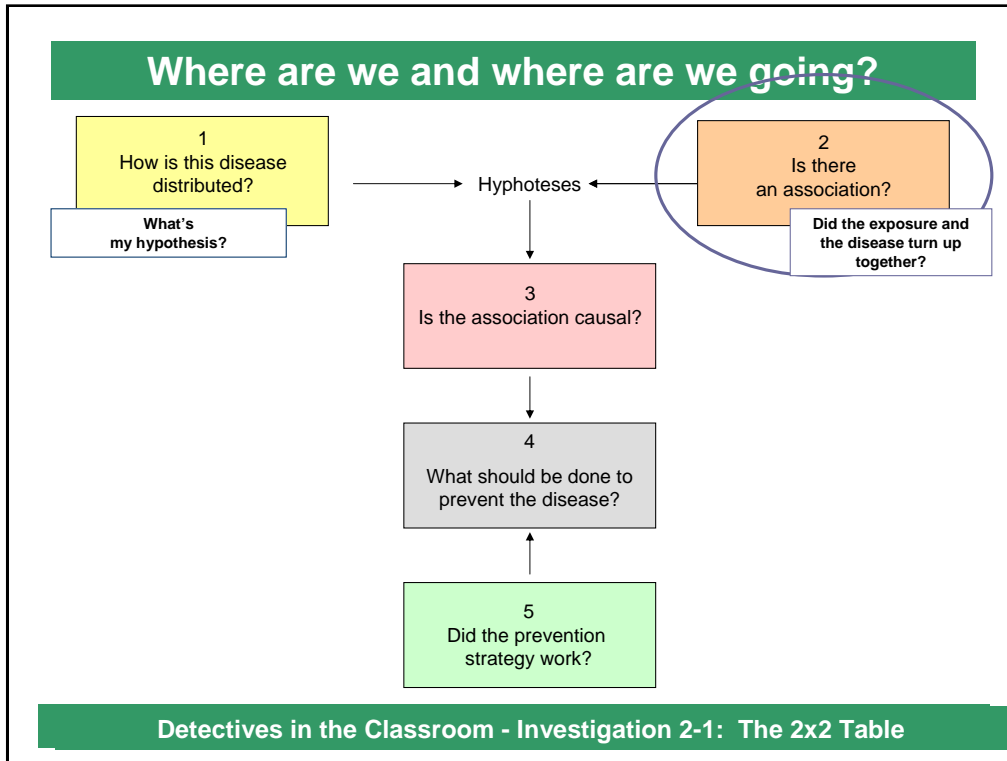
Compared to What?

Detectives in the Classroom - Investigation 2-2: Compared to What?

In **Investigation 2-2: Compared to What?** students will examine the need for a control group and gain more experience using a 2 x 2 table. Students will calculate risks, compare the risks of disease among the exposed and unexposed groups, calculate relative risks, and make inferences based on the similarities or differences between the two risks.

Students should realize that only when the risks of getting disease in exposed and unexposed groups are compared can a hypothesis be tested. The same risk of getting a disease in the *exposed* group (for example, 10%) may lead to different inferences depending on the risk of disease in the *unexposed* group (10%, 1%, or 40%).

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Remind students again that in the Module 2 investigations they are learning how to answer the second Essential Question: “Is there an association between the hypothesized cause and the disease?”

Next Slide

Review

Trial 1

	Acne	No Acne	Total	Acne Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %

Explain what the 10% risk of acne tells you about the hypothesis “AcneMed prevents acne.”

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students:

- What does the 10% risk of acne tell you about the hypothesis “AcneMed prevents acne”? (AcneMed seems to have prevented 90% of the people from getting acne. But 10% of the people who took AcneMed still developed acne.)

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Review

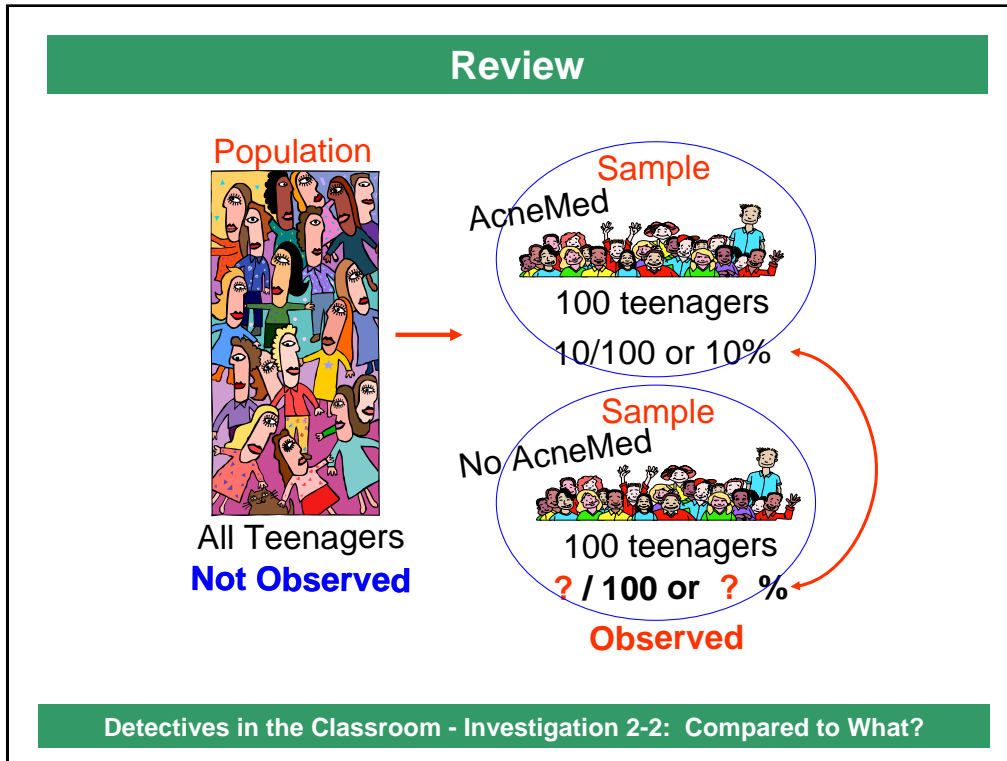
Epi Talk

Control Group
People who participate in a trial, but do not get the treatment.
People whose results are compared to the group that was treated.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students to find “Control group” in the **Epi Talk** list.
Review its definition.

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Ask students:

- How would you change this slide to depict a control group? (Add to the slide a control group of 100 “observed” teenagers who do not get AcneMed. Then the risk of acne for the control group is calculated and compared to the risk of acne in the group treated with AcneMed.)

Next Slide

Review

Identify the cell or cells in 2x2 table in which the following people belong:

	Disease	No Disease	Total
Exposed	a	b	
Not Exposed	c	d	

People who are not exposed

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students to identify the cell or cells in the 2 x 2 table in which the following group of people belongs:

- People who are not exposed.

Compare students' answers with the correct response. (Cells c and d)

Address misconceptions.

Next Slide

Review

Identify the cell or cells in 2x2 table
in which the following people belong:

	Disease	No Disease	Total
Exposed	a	b	
Not Exposed	c	d	

People who are exposed and do not have the disease

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students to identify the cell or cells in the 2 x 2 table in which the following group of people belongs:

- People who are exposed and do not have the disease.

Compare students' answers with the correct response. (Cell b)

Address misconceptions.

Next Slide

Review

Identify the cell or cells in 2x2 table
in which the following people belong:

	Disease	No Disease	Total
Exposed	a	b	
Not Exposed	c	d	

People who are exposed and have the disease

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students to identify the cell or cells in the 2 x 2 table in which the following group of people belongs:

- People who are exposed and have the disease.

Compare students' answers with the correct response. (Cell a)

Address misconceptions.

Next Slide

Risks

Trial 2

	Acne	No Acne	Total	
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %
No AcneMed			100	

a b
c d

Detectives in the Classroom - Investigation 2-2: Compared to What?

Tell students that they are testing the “AcneMed prevents acne” hypothesis again in Trial 2. As in Trial 1, they gave AcneMed to 100 teenagers, but this time they had a control group of 100 teenagers who did *not* take AcneMed.

As in Trial 1, at the end of the 6-month period, 10 of the 100 teenagers who took AcneMed, or 10%, developed acne.

Ask students:

- Do you think that AcneMed prevented acne?

Keep discussing until students understand that the answer depends on what the risk of acne was in the control group.

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Epi Log Worksheet

Detectives in the Classroom Name: _____

Investigation 2-2: Epi Log Worksheet Date: ____/____/____

1. Trial 2 2.

	Acne	No Acne	Total	Acne Risks	Relative Risk
AcneMed	10	90	100	10 / 100 or 10 %	○
	$\frac{a}{c}$	$\frac{b}{d}$			
No AcneMed			100	/ 100 or %	

3. Inference:

4. Trial 3 5.

	Acne	No Acne	Total	Acne Risks	Relative Risk
AcneMed			100	/ 100 or %	○
	$\frac{a}{c}$	$\frac{b}{d}$			
No AcneMed			100	/ 100 or %	

6. The teenagers who took AcneMed were ____ times as likely to develop acne as those who did not take AcneMed.

7. Inference:

Detectives in the Classroom - Investigation 2-2: Compared to What?

Give each student an **Investigation 2-2: Epi Log Worksheet**.

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Risks

1

How would you describe the two risks?

Trial 2

	Acne	No Acne	Total	Acne Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%
No AcneMed	10	90	100	$\frac{10}{100}$ or 10%

Detectives in the Classroom - Investigation 2-2: Compared to What?

Remind students that at the end of the 6-month period, 10 of the 100 teenagers in the control group, who had not taken AcneMed, developed acne.

Students should complete Part 1 of their **Investigation 2-2: Epi Log Worksheets** by completing the 2 x 2 table and calculating the risk of acne in the control group.

Compare students' answers with the correct response. (10, 90, 10/100 or 10%)

Ask students:

- How would you describe the two risks? (They are the same.)

They should think about what these results mean.

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Review

Epi Talk

Risk
A measure of how often an event occurs in a defined group of people in a defined period of time.
The likelihood of developing a disease.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students:

- Can you explain what a “risk” is?

Probe until they describe a “risk” as a measure of how often an event occurs in a defined group of people in a defined period of time. It is the likelihood of developing a disease.

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Epi Talk

Epi Talk

Relative Risk
A way of showing the relationship between two risks.
Tells us the number of times one risk is larger or smaller than another.
Calculated by dividing the risk of an outcome in one group by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students need a way to measure how two risks compare with each other, a way to “express it in numbers.”

Ask students to find “Relative risk” in the **Epi Talk** list.

Review its definition.

Remind the class what Lord Kelvin said about measuring what you are speaking about and expressing it in numbers.

Ask students:

- How would you go about expressing how many times one risk is larger or smaller than another “in numbers”?

Discuss until they realize that this can be done by dividing one risk by the other.

A relative risk is calculated by dividing the risk of disease in one group by the risk of disease in the other.

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Relative Risk

2

Trial 2

	Acne	No Acne	Total	Acne Risks	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 1
No AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	

Note: In the original image, 'a' is above '10' in the AcneMed row, 'b' is above '90' in the AcneMed row, 'c' is above '10' in the No AcneMed row, and 'd' is above '90' in the No AcneMed row. A red arrow points from the 10% risk of the No AcneMed group to the 10% risk of the AcneMed group.

Relative Risk: Risk of an outcome in one group divided by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should complete Part 2 of their **Investigation 2-2: Epi Log Worksheets** by calculating the relative risk.

Compare students' answers with the correct response. (1)

⚙ Teacher Alert: The relative risk is an important measure for understanding the likelihood of an outcome in one group as compared to another. By calculating a relative risk, we are able to say that the risk of disease in the exposed group is X times as likely as the risk of disease in the unexposed group. In this case, the relative risk is 1.

Notice that the relative risk can also be expressed according to a formula:

risk of disease in the exposed group is $a / (a + b)$

risk of disease in the unexposed group is $c / (c + d)$

therefore, relative risk is $\frac{a / (a + b)}{c / (c + d)}$

$c / (c + d)$

Another way to express the difference between two risks in numbers is to subtract one risk from the other. This is called the risk difference. In the above example, the risk difference is zero. In practice, the relative risk is a more common measure because it tells us the number of times one risk is larger or smaller than the other.

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Review

Epi Talk

Relative Risk

A way of showing the relationship between two risks.

Tells us the number of times one risk is larger or smaller than another.

Calculated by dividing the risk of an outcome in one group by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students:

- Given your description of a relative risk, what does a relative risk of 1 mean?

Probe until students conclude that a relative risk of 1 means that the risk of getting acne is the *same* in the group exposed to AcneMed and the control group.

Tell students that Lord Kelvin would be pleased.

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Review

Epi Talk

Inference

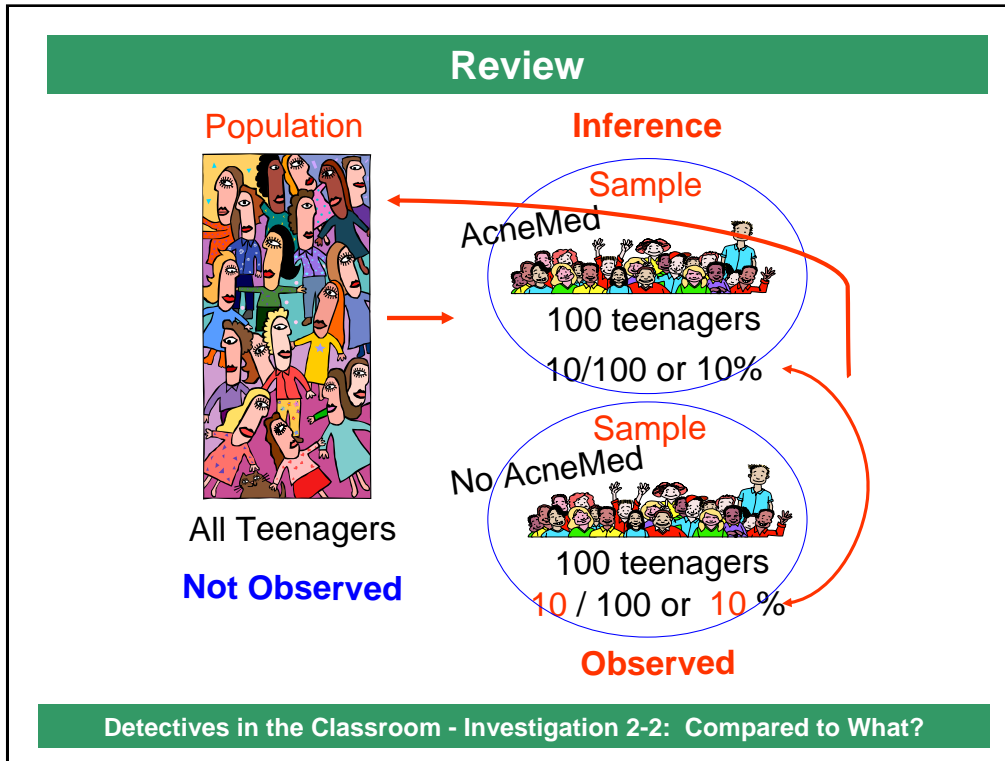
Process of predicting from what is observed in a sample to what is not observed in a population.

To generalize back to the source population.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students to find “Inference” in the **Epi Talk** list.
Review its definition.

Next Slide



Remind students that an inference is the process of predicting from what is observed back to what is not observed.

Review how “observed” and “unobserved” relate to the testing of the “AcneMed prevents acne” hypothesis.

⚙ Teacher Alert: Make sure students realize that *both* groups of 100 teenagers, those who took the AcneMed and those who did not, were “observed.” Teenagers who were not in the study were “unobserved.”

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Inference

3

Trial 2

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 1
No AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	

a b
c d

AcneMed is not associated with acne.

AcneMed prevents acne.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Keeping in mind the hypothesis that “AcneMed prevents acne,” students should complete Part 3 of their **Investigation 2-2: Epi Log Worksheets** by making an inference based on the relative risk of 1 that was found for Trial 2.

Compare students’ answers with the correct response. (AcneMed is not associated with acne.)

Address misconceptions.

⚙ Teacher Alert: Be sure students understand that a “1” means that the risks are the same; that is, there is no difference in the risk of developing acne between the two groups.

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Relative Risk

4

Trial 3

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%	
No AcneMed	1	99	100	$\frac{1}{100}$ or 1%	

$\begin{matrix} a & b \\ c & d \end{matrix}$

Detectives in the Classroom - Investigation 2-2: Compared to What?

Tell students that they are testing the “AcneMed prevents acne” hypothesis again in Trial 3. As in Trials 1 and 2, 10 of the 100 teenagers in Trial 3 who took AcneMed developed acne. But in Trial 3 only 1 of the 100 teenagers who did not take AcneMed developed acne.

Students should complete part 4 of their **Investigation 2-2: Epi Log Worksheets** by completing the 2 x 2 table and calculating the risks of acne in the experimental and control groups.

Compare students’ answers with the correct response. (10, 90, 1, 99)

Compare students’ answers with the correct response. (10, 10%, 1, 1%)

Next Slide

Review

Epi Talk

Relative Risk

A way of showing the relationship between two risks.

Tells us the number of times one risk is larger or smaller than another.

Calculated by dividing the risk of an outcome in one group by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Remind students that a relative risk tells us the number of times one risk is larger or smaller than another.

Next Slide

Relative Risk

5

Trial 3

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%	= 10
No AcneMed	1	99	100	$\frac{1}{100}$ or 1%	

$\begin{matrix} a & b \\ c & d \end{matrix}$

Relative Risk: Risk of an outcome in one group divided by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should complete Part 5 of their **Investigation 2-2: Epi Log Worksheets** by calculating the relative risk for Trial 3.

Compare students' answers with the correct response. (10)

Next Slide

Relative Risk

6

Trial 3

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 10
No AcneMed	1	99	100	$\frac{1}{100}$ or 1 %	

a b
c d

The teenagers who took AcneMed were 10 times as likely to develop acne as those who did not take AcneMed. **!**

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should complete Part 6 of their **Investigation 2-2: Epi Log Worksheets** by completing the statement “The teenagers who took AcneMed were ___ times as likely to develop acne as those who did not take AcneMed.”

Compare students’ answers with the correct response. (10)

Next Slide

Inference

7

Trial 3

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 10
No AcneMed	1	99	100	$\frac{1}{100}$ or 1 %	

AcneMed does not prevent acne. AcneMed may cause acne!

AcneMed prevents acne.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Keeping in mind the hypothesis that “AcneMed prevents acne,” students should complete Part 7 of their **Investigation 2-2: Epi Log Worksheets** by making an inference based on the relative risk of 10 that was found for Trial 3.

Compare students’ answers with the correct response. (AcneMed does not prevent acne. AcneMed may cause acne!)

⚙ Teacher Alert: Remind students that when the relative risk is 1, there is no association between AcneMed and acne. When the relative risk is *greater than 1*, the exposure being studied (in this case, AcneMed) *is associated with an increased risk of the outcome being studied* (in this case, acne).

Address misconceptions.

Next Slide

Relative Risk

8

Trial 4

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%	
No AcneMed	40	60	100	$\frac{40}{100}$ or 40%	

$\begin{matrix} a & b \\ c & d \end{matrix}$

Detectives in the Classroom - Investigation 2-2: Compared to What?

Tell students that they are testing the “AcneMed prevents acne” hypothesis yet again in Trial 4.

As in Trials 1, 2, and 3, 10 of the 100 teenagers in Trial 4 who took AcneMed developed acne. But this time 40 of the 100 teenagers who did not take AcneMed developed acne.

Students should complete Part 8 of their **Investigation 2-2: Epi Log Worksheets** by completing the 2 x 2 table and calculating the risks of acne in the experimental and control groups.

Compare students’ answers with the correct response. (10, 90, 40, 60)

Compare students’ answers with the correct response. (10, 10%, 40, 40%)

Next Slide

Review

Epi Talk

Relative Risk

A way of showing the relationship between two risks.

Tells us the number of times one risk is larger or smaller than another.

Calculated by dividing the risk of an outcome in one group by the risk of an outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Remind students again that a relative risk tells us the number of times one risk is larger or smaller than another.

Next Slide

Relative Risk

9

Trial 4

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%	= 0.25
No AcneMed	40	60	100	$\frac{40}{100}$ or 40%	

$\frac{a}{b}$ $\frac{c}{d}$

Relative Risk: Risk of an outcome in one group divided by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should complete Part 9 of their **Investigation 2-2: Epi Log Worksheets** by calculating the relative risk. This is done by dividing the risk among those using AcneMed by the risk among those not using AcneMed.

Compare students' answers with the correct response. (0.25)

Next Slide

Relative Risk

9

Trial 4

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 0.25
No AcneMed	40	60	100	$\frac{40}{100}$ or 40 %	

$\begin{matrix} a & b \\ c & d \end{matrix}$

Relative Risk: Risk of an outcome in one group divided by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Ask students:

- In Trial 4, which group, the “AcneMed” group or the “No AcneMed” group, was at greatest risk of developing acne? (“No AcneMed”)

⚙ Teacher Alert: Be certain students grasp how this relative risk is different from the one in Trial 3. Remind them that, as always, the relative risk is calculated by dividing the risk of getting the disease in the exposed group (10%) by the risk of getting the disease in the unexposed group (40%). Therefore, in this case the relative risk is 0.25 (or $\frac{1}{4}$). Make sure students notice that this relative risk is less than 1.

Next Slide

Relative Risk

10

Trial 4

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10 %	= 0.25
No AcneMed	40	60	100	$\frac{40}{100}$ or 40 %	

$\begin{matrix} a & b \\ c & d \end{matrix}$

The teenagers who took AcneMed were **0.25** times as likely to develop acne as those who did not take AcneMed.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should complete Part 10 of their **Investigation 2-2: Epi Log Worksheets** by completing the statement “The teenagers who took AcneMed were ____ times as likely to develop acne as those who did not take AcneMed.”

Compare students’ answers with the correct response. (0.25)

⚙ **Teacher Alert:** This may be a difficult concept for students to grasp intuitively. Explain to students that when the relative risk is *less than 1*, the exposure (in this case, AcneMed) is associated with a decreased risk of the outcome being studied (in this case, acne).

There are several ways to express this relative risk: (a) 0.25 times as *likely*; (b) $\frac{1}{4}$ times as *likely*; or (c) 4 times *less likely*.

Address misconceptions.

Next Slide

Inference

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Trial 4

	Acne	No Acne	Total	Acne Risk	Relative Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%	= 0.25
No AcneMed	40	60	100	$\frac{40}{100}$ or 40%	

AcneMed prevents acne.

AcneMed prevents acne.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Keeping in mind the hypothesis that “AcneMed prevents acne,” students should complete Part 11 of their **Investigation 2-2: Epi Log Worksheets** by making an inference based on the relative risk of 0.25 that was found for Trial 4.

Compare students’ answers with the correct response. (AcneMed prevents acne.)

Address misconceptions.

Next Slide

Relative Risk

<u>Relative Risk</u>	<u>Type of Association</u>	<u>Possible Interpretation</u>
1	None	The exposure is not associated with the outcome.
Greater than 1 (>1)	Positive	The exposure is associated with an increase in the outcome.
Less than 1 (<1)	Negative	The exposure is associated with a decrease in the outcome

Relative Risk: Risk of an outcome in one group divided by the risk of the outcome in another group.

Detectives in the Classroom - Investigation 2-2: Compared to What?

Here is a review of the relative risks for Trials 2, 3, and 4, respectively. Since these are not easy concepts when first presented, be sure students are comfortable with them before moving on.

Explain the following to students:

- If the *relative risk* = 1, there is no association between the exposure and outcome being studied.
- If the *relative risk is greater than 1*, there is a *positive association* between the exposure and outcome being studied. That is, the exposure is associated with a *higher risk* of the outcome and may be a cause of the outcome.
- If the *relative risk is less than 1*, there is a *negative association* between the exposure and outcome being studied. That is, the exposure is associated with a *lower risk* of the outcome and may prevent the outcome.

Next Slide

“AcneMed Prevents Acne.”

Trial 1	Acne	No Acne	Total	Acne Risk
AcneMed	10	90	100	$\frac{10}{100}$ or 10%
	a	b		
	c	d		
	Nothing			What do the results of Trial 1 tell us about the hypothesis “AcneMed prevents acne”?

Detectives in the Classroom - Investigation 2-2: Compared to What?

To review, return to this earlier slide for Trial 1 and ask students:

- What do the results of Trial 1 tell us about the hypothesis “AcneMed prevents acne”? (Nothing. For that risk to be meaningful, we need to compare this risk with the risk of acne among the 100 teenagers who did not take AcneMed.)

Next Slide

“AcneMed Prevents Acne.”	
Trial 1	Trial 2
Trial 3	Trial 4

Detectives in the Classroom - Investigation 2-2: Compared to What?

Students should now consider all four trials.

“AcneMed Prevents Acne.”

Trial 1

	Acne	No Acne	Total	Acne Risks
Acne Med	10	90	100	$\frac{10}{100}$ or 10%

Trial 2

Trial 3

Trial 4

Detectives in the Classroom - Investigation 2-2: Compared to What?

Remind students that in Trial 1 they found that 10% of the 100 teenagers who took AcneMed developed acne.

“AcneMed Prevents Acne.”

Trial 1

	Acne	No Acne	Total	Acne Risk
Acne Med	10	90	100	$\frac{10}{100}$ or 10%

Trial 2

	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>		

Trial 3

	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>		

Trial 4

	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>		

Detectives in the Classroom - Investigation 2-2: Compared to What?

Point out that in each of the four trials, they found that the risk of developing acne was 10% among the 100 teenagers who took AcneMed; that is, the treatment group had the same results in each trial.

“AcneMed Prevents Acne.”

Trial 1

	Acne	No Acne	Total	Acne Risk
Acne Med	10	90	100	$\frac{10}{100}$ or 10%

Trial 2

	Acne	No Acne	Total	Acne Risks
Acne Med	10 a	90 b	100	$\frac{10}{100}$ or 10%
No Acne Med	c	d	100	$\frac{10}{100}$ or 10%

Trial 3

	Acne	No Acne	Total	Acne Risks
Acne Med	10 a	90 b	100	$\frac{10}{100}$ or 10%
No Acne Med	1 c	99 d	100	$\frac{1}{100}$ or 1%

Trial 4

	Acne	No Acne	Total	Acne Risks
Acne Med	10 a	90 b	100	$\frac{10}{100}$ or 10%
No Acne Med	40 c	60 d	100	$\frac{40}{100}$ or 40%

Detectives in the Classroom - Investigation 2-2: Compared to What?

Reiterate that a trial needs a control group. Only when students calculated risks among the 100 teenagers in the control group, who did not take AcneMed, were they able to test the hypothesis “AcneMed prevents acne.”

“AcneMed Prevents Acne.”

Trial 1	Acne	No Acne	Total	Acne Risk
Acne Med	10	90	100	$\frac{10}{100}$ or 10%

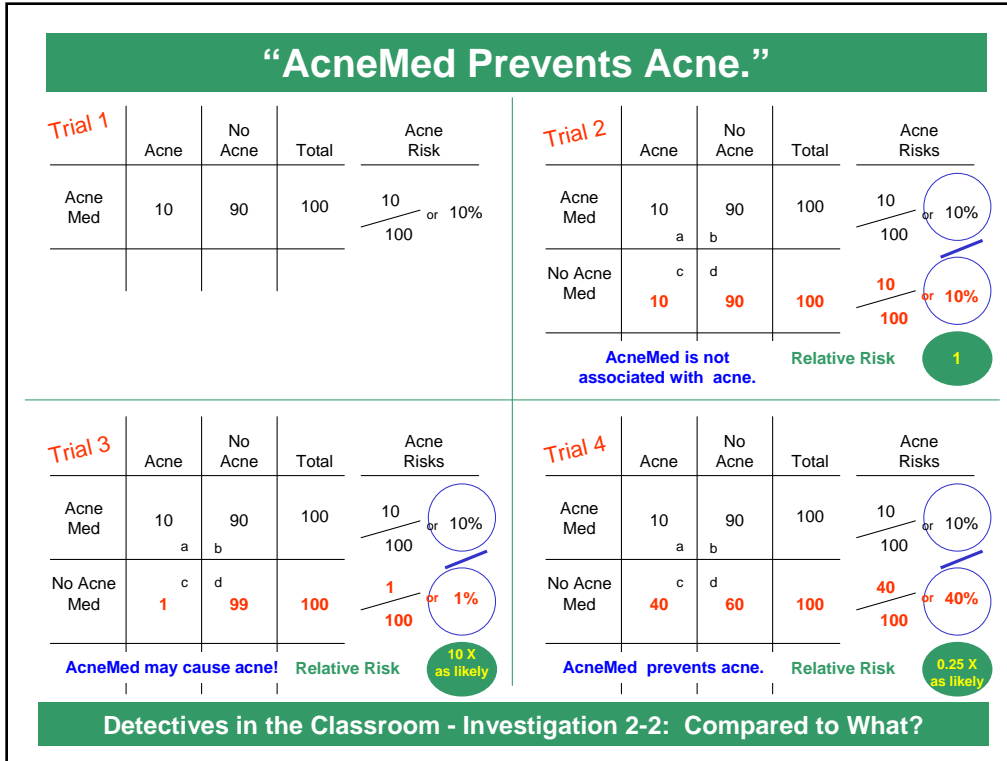
Trial 2	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>	100	$\frac{10}{100}$ or 10%
				Relative Risk ●

Trial 3	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>	100	$\frac{1}{100}$ or 1%
				Relative Risk ●

Trial 4	Acne	No Acne	Total	Acne Risks
Acne Med	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ or 10%
No Acne Med	<small>c</small>	<small>d</small>	100	$\frac{40}{100}$ or 40%
				Relative Risk ●

Detectives in the Classroom - Investigation 2-2: Compared to What?

Only after they compared the risk of acne in the AcneMed group of 100 teenagers with the risk of acne in the control group of 100 teenagers were they able to calculate a relative risk.



Only after they had calculated the relative risks were they able to make inferences about the hypothesis “AcneMed prevents acne.”

“AcneMed Prevents Acne.”

Trial 1	Acne	No Acne	Total	Acne Risk	Trial 2	Acne	No Acne	Total	Acne Risks
Acne Med	10	90	100	$\frac{10}{100}$ or 10%	Acne Med	10	90	100	$\frac{10}{100}$ or 10%
No Acne Med					No Acne Med				

Nothing
Compared to What?

tells us about the results of Trial 1

	Acne	No Acne	Total	Acne Risks
Acne Med	10	90	100	$\frac{10}{100}$ or 10%
No Acne Med	c	d		

Detectives in the Classroom - Investigation 2-2: Compared to What?


Reinforce the point that in each of the four trials, they found that 10% of the 100 teenagers who took AcneMed developed acne.

Ask students:

- What does this tell them about the hypothesis “AcneMed prevents acne” ? (Nothing. We need to know “*compared to what?*”)

CDC

Centers for Disease Control and Prevention



Count Divide Compare

Detectives in the Classroom - Investigation 2-2: Compared to What?

Tell students that the acronym CDC stands for the Centers for *Disease Control* and *Prevention*. The CDC is headquartered in Atlanta, Georgia, and is responsible for protecting our health and safety by providing accurate information to help make decisions about disease prevention. Many epidemiologists (disease detectives) work at the CDC.


Among epidemiologists who work at the CDC, the acronym also stands for *Count*, *Divide*, and *Compare*.

Ask students:

- Why, at the Centers for Disease Control and Prevention, is CDC said to stand for *Count*, *Divide*, and *Compare*?
- How does CDC (*Count*, *Divide*, and *Compare*) relate to what you have just learned in **Investigation 2-2: Compared to What?**

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CDC



	Acne	No Acne	Total	Acne Risks	Relative Risk
AcneMed	10 <small>a</small>	90 <small>b</small>	100	$\frac{10}{100}$ 10 %	0.25 times as likely Compare
No AcneMed	40 <small>c</small>	60 <small>d</small>	100	$\frac{40}{100}$ 40 %	
	Count			Divide	

Detectives in the Classroom - Investigation 2-2: Compared to What?

Point out to students that

- When they completed the 2 x 2 tables for the trials, they *counted*.
- When they calculated acne risks for the exposed and unexposed groups, they *divided*.
- And when they calculated relative risks, they *compared*.

Tell them that they are on their way to becoming disease detectives.

Next Slide

Compared To What?



Detectives in the Classroom - Investigation 2-2: Compared to What?

This concludes **Investigation 2-2: Compared to What?** and students can now put away their Epi Logs.