

Observational Studies

Observational Studies

Part 1



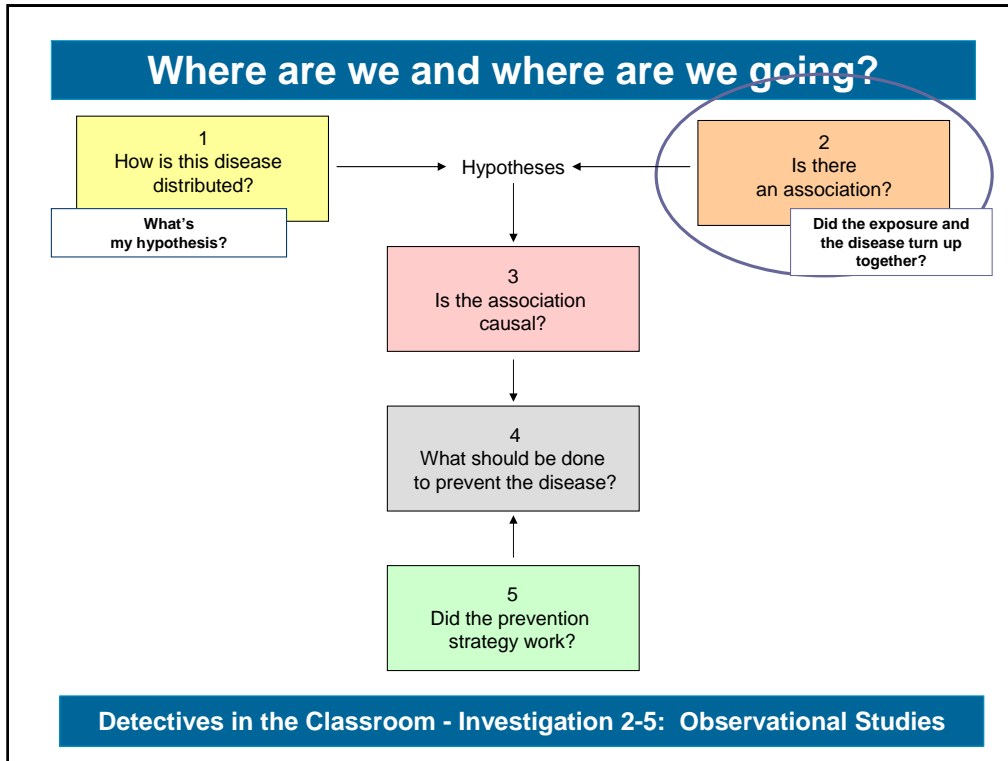
Detectives in the Classroom - Investigation 2-5: Observational Studies

Investigation 2-5: Observational Studies is divided into two parts and takes two class periods to complete.

In Part 1, each Epi Team designs and conducts an in-class observational study of a natural experiment to test a hypothesis.

In Part 2, each Epi Team presents the results of the study to the class.

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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?”

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Review

Epi Talk

Trial

An epidemiologic experiment in which subjects are assigned into groups to receive or not receive a hypothesized beneficial intervention.

Detectives in the Classroom - Investigation 2-5: Observational Studies

Review with students that a trial can be defined as an epidemiologic experiment in which subjects are assigned to groups that will receive or will not receive a hypothesized beneficial intervention.

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Review

Epi Talk

Natural Experiment

Naturally occurring circumstances in which groups of people within a population have been exposed to different levels of the hypothesized cause of an outcome.

Detectives in the Classroom - Investigation 2-5: Observational Studies

Remind students again that a natural experiment can be defined as naturally occurring circumstances in which groups of people within a population have been exposed to different levels of the hypothesized cause of an outcome.

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Review

Epi Talk

Observational Studies

Epidemiologic studies of natural experiments in which the investigator is not involved in the intervention other than to record, classify, count, and statistically analyze results.

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Remind students again that observational studies can be defined as epidemiologic studies of natural experiments in which the investigator is not involved in the intervention other than to record, classify, count, and statistically analyze results.

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Review

Hypothesis: Carrying heavy backpacks causes back pain.



Heavy Backpacks

No Heavy Backpacks

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In the previous investigation, students tested the hypothesis “carrying heavy backpacks causes back pain” in an observational study.

They themselves, not the epidemiologist, decided whether or not they should carry a heavy backpack and, in doing so, put themselves into either the experimental group (exposed) or the control group (unexposed). Then the risks of back pain for each group were calculated and compared. No one was forced to do anything.

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Review

Hypothesis: Carrying heavy backpacks causes back pain.

Epi Talk

Observational Studies

Epidemiologic studies of natural experiments in which the investigator is not involved in the intervention other than to record, classify, count, and statistically analyze results.

Were you involved in the intervention?

Did you observe what others had done to themselves?

Did you record, classify, count, and statistically analyze the results?

Did you carry out an observational study?

Detectives in the Classroom - Investigation 2-5: Observational Studies

Ask students:

- When you tested the hypothesis “carrying heavy backpacks causes back pain,”
 - were you involved in the intervention? (No)
 - did you observe what others had done to themselves? (Yes)
 - did you record, classify, count, and statistically analyze the results? (Yes)
 - did you carry out an observational study? (Yes)

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Observational Study

Step 1	Selecting a Hypothesis
Steps 2-7	Planning the Study
Steps 8-12	Collecting Data
Steps 13-17	Analyzing Data
Step 18	Planning the Presentation

Detectives in the Classroom - Investigation 2-5: Observational Studies

Tell students there are 18 steps in **Investigation 2-5: Observational Studies**. The steps are divided into five parts:

1. Selecting a hypothesis
2. Planning the study
3. Collecting the data
4. Analyzing the data
5. Planning the presentation

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Epi Teams



Detectives in the Classroom - Investigation 2-5: Observational Studies

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

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Selecting a Hypothesis

- Acne
- Auto injuries
- Bad mood
- Cavities
- Cell phones
- Class disruption
- Chewing gum
- Colds
- Drinking soda
- Eating breakfast
- Eating candy
- Eating high fat food
- Eating school cafeteria food
- Exercise
- Foul language
- Getting a good night's sleep
- Good quiz scores
- Good grades
- Having a quiet place to study
- Head aches
- Improves performance
- Indigestion
- Lack of regular exercise
- Listening to music while studying
- Listening to rap music
- Multi-vitamins
- Nightmares
- Overweight
- Poor grades
- Poor quiz scores
- Practicing a sport
- Seat belts
- Skipping breakfast
- Studying
- Too much talking on the telephone
- Violent behavior
- Watching the evening news on TV
- Watching too much TV
- Watching violent movies
- Wearing hats

Detectives in the Classroom - Investigation 2-5: Observational Studies

Each Epi Team will select its own hypothesis (Step 1). Students are to consider the exposures / outcomes shown in the slide for their hypotheses:

✧ **Teacher Alert:** Give students the opportunity to brainstorm possible hypotheses that might interest them. If students need suggestions, consider mentioning the following:

Talking on the telephone and e-mailing for more than 2 hours a day causes obesity.

Studying for more than 1 hour causes better quiz scores.

Getting more than 8 hours of sleep causes good grades.

Chewing gum causes cavities.

Practicing a sport causes improved performance.

Drinking soda causes cavities.

Eating candy causes class disruption.

Listening to rap music causes violent behavior.

Listening to rap music causes the use of foul language.

Eating breakfast causes good grades.

Eating school cafeteria food causes indigestion.

Lack of regular exercise causes obesity.

Skipping breakfast causes a bad mood.

Exercise causes a good night's sleep.

Watching violent movies causes nightmares.

Watching the evening news on TV causes nightmares.

Watching too much TV causes bad grades.

Drinking soft drinks causes obesity.

Having a quiet place to study causes good grades.

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Epi Log Worksheet
1

Detectives in the Classroom
Epi Team Number: _____

Investigation 2-5: Epi Log Worksheet
Date: ____/____/____

Epi Team Members:

1. Select a hypothesis and complete the following statement.
 _____ causes _____
2. Define your exposure.
3. Create a question, which can be answered with a "Yes" or a "No," to gather data about your exposure.
4. Define your outcome.
5. Create a question, which can be answered with a "Yes" or a "No," to gather data about your outcome.

Detectives in the Classroom - Investigation 2-5: Observational Studies

Give each Epi Team an **Investigation 2-5: Epi Log Worksheet** and ask each student on the team to put his or her name at the top of the worksheet.

Ask each Epi Team to select a hypothesis.

Each Epi Team should complete Step 1 on the **Investigation 2-5: Epi Log Worksheet** by completing the statement “ _____ causes _____ ” with the team’s hypothesis.

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Planning the Study

2-7

- Step 2: Define the exposure.
- Step 3: Create a question to gather data about the exposure.
- Step 4: Define the outcome in the hypothesis.
- Step 5: Create a question to gather data about the outcome.
- Step 6: Label 2 x 2 Table Sheet.
- Step 7: Create an informed consent statement for participation in the observational study.



Detectives in the Classroom - Investigation 2-5: Observational Studies

Each Epi Team should complete Steps 2 through 7 on the **Investigation 2-5: Epi Log Worksheet**.

As each step is shown, be sure to address any questions and misconceptions that students might have regarding their responsibilities.

Step 2: Define the exposure in the hypothesis.

Step 3: Create a question to gather data about the exposure.

Step 4: Define the outcome in the hypothesis.

Step 5: Create a question to gather data about the outcome.

Step 6: Label a 2 x 2 table to sort data from classmates.

Step 7: Create an informed consent statement for participation in the observational study.

⚙ Teacher Alert: Keep this slide showing while Epi Teams are working on Steps 2 through 7.

Next Slide

Review

Epi Talk

Informed Consent

Voluntary consent given by a person for participation in a study.

Participants must know and understand the study, give consent without coercion, and know that they can withdraw at any time.

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Remind students that informed consent is a voluntary consent given by a person for participation in a study. Participants must know and understand the study, give consent without coercion, and realize that they can withdraw at any time.

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Collecting Data

Step 8: Read informed consent statement and remind class of right not to participate.

Step 9: Have class label 2 x 2 Table Sheets.

Step 10: Review exposure and outcome questions.

Step 11: Review what cells students “fit” into based on answers to exposure and outcome questions.

Step 12: Instruct class to voluntarily and anonymously place a check in the cell that identifies their exposure and outcome for the hypothesis being tested.



Detectives in the Classroom - Investigation 2-5: Observational Studies

Review Steps 8 through 12. Afterwards, each Epi Team, *one at a time*, will implement the steps with the class.

As each step is shown, be sure to address any questions and misconceptions that students might have regarding their responsibilities.

Step 8: Read the informed consent statement and remind classmates of their right not to participate.

Step 9: Have the class label the **2 x 2 Table Sheets**.

Step 10: Review the exposure and outcome questions.

Step 11: Review the cells that students fit into based on their answers to exposure and outcome questions.

Step 12: Instruct students to voluntarily and anonymously place a check in the cell that identifies their exposure and outcome for the hypothesis being tested.

Allow Epi Teams 5 minutes to prepare for collecting the data.

Next Slide

Collecting Data

Do not write your name on this paper.

Investigation 2-5: 2 x 2 Table Sheet

Label the 2x2 table.

Place a check in a cell (a, b, c, or d) that indicates the exposure and outcome that applies to you.

	a	b
	c	d

Do not write your name on this paper.

Detectives in the Classroom - Investigation 2-5: Observational Studies

Give each Epi Team enough **2 x 2 Table Sheets** to collect data from every student in the class.

Next Slide

Collecting Data

Step 8: Read informed consent statement and remind class of right not to participate.

Step 9: Have class label 2x2 Table Sheets.

Step 10: Review exposure and outcome questions.

Step 11: Review what cells students “fit” into based on answers to exposure and outcome questions.

Step 12: Instruct class to voluntarily and anonymously place a check in the cell that identifies their exposure and outcome for the hypothesis being tested.



Detectives in the Classroom - Investigation 2-5: Observational Studies

Select one Epi Team to take Steps 8 through 12 with the class.

After students have completed their **2 x 2 Table Sheets** for the first Epi Team, collect the sheets and keep them until all the teams have collected the data.

Once the first Epi Team has completed Steps 8 through 12, select a second Epi Team. Continue until all teams, *one at a time*, have completed these steps.

⚙ Teacher Alert: Keep this slide showing while Epi Teams are working on Steps 8 through 12. Emphasize that one Epi Team at a time will complete these steps with the class until eventually all teams have done so.

Next Slide

Analyzing Data

13-17

- Step 13: Sort 2 x 2 Table Sheets and complete the 2 x 2 table that was labeled in step 6.
- Step 14: Calculate the risks of the outcome for the exposed and unexposed groups as fractions and percents.
- Step 15: Calculate the relative risk.
- Step 16: Complete the statement.
- Step 17: Explain whether or not the data support the hypothesis.



Detectives in the Classroom - Investigation 2-5: Observational Studies

All Epi Teams will now simultaneously work on Steps 13 through 17.

Review Steps 13 through 17.

As each step is shown, be sure to address any questions and misconceptions that students might have regarding their responsibilities.

Step 13: Sort **2 x 2 Table Sheets** and complete the 2 x 2 table that was labeled in Step 6.

Step 14: Calculate the risks of the outcome for exposed and unexposed groups as fractions and percents.

Step 15: Calculate the relative risk.

Step 16: Complete the statement.

Step 17: Explain whether or not the data support the hypothesis.

⚙ Teacher Alert: Keep this slide showing while Epi Teams are working on Steps 13 through 17.

⚙ Teacher Alert: In this section of the investigation, the students will be analyzing the data by performing the necessary calculations. Students can refer to **Epi Talk** definitions in their **Epi Logs** if they need help calculating risks or relative risk, or making inferences. Check the accuracy of each Epi Team's calculations of risks and relative risk so that you can focus on the process of scientific inquiry during Part 2 of the investigation.

Next Slide

Presentation Planning

IMRAD

I = Introduction

M = Methods

R = Results

A = and

D = Discussion

Detectives in the Classroom - Investigation 2-5: Observational Studies

Inform students that when the results of epidemiologic studies are published in journals, they often follow an IMRAD format:

Introduction: The reason the authors decided to do the study

Methods: How the authors did the study

Results: What the authors found

and

Discussion: What the authors think the results mean

Next Slide

Epi Talk

Epi Talk

IMRAD

Format usually followed when epidemiological studies are published in medical journals.

Introduction: Why the authors decided to do the study,

Methods: How authors did the study,

Results: What the authors found, and

Discussion: What the results mean.

Detectives in the Classroom - Investigation 2-5: Observational Studies

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

Review its definition.

When students plan their presentations of observational studies, they should follow the IMRAD format.

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Step 18: Presentation Planning

18

IMRAD

I = Introduction

M = Methods

R = Results

A = and

D = Discussion

Detectives in the Classroom - Investigation 2-5: Observational Studies

Each Epi Team should complete Step 18 on the **Investigation 2-5: Epi Log Worksheet** by identifying those members who will present the I, M, R, and D sections of the observational study.

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Presentation Rubric			
<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All participate	Most participate	Some participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Data Collection Methods</u>	All are thorough and accurate	Most are accurate	Some are accurate
<u>Risks, Relative Risk, and Inference</u>	All are identified and accurate	Most are identified and accurate	Some are identified and accurate
<u>IMRAD</u>	All are presented and accurate	Most are presented and accurate	Some are presented and accurate

Detectives in the Classroom - Investigation 2-5: Observational Studies

Ask each Epi Team to plan a presentation that meets the **Presentation Rubric** criteria. Review the **Presentation Rubric** to be used when evaluating the presentation.

- Participation: All participate.
- Epi Talk: All are appropriate and accurate.
- Data Collection Methods: All are thorough and accurate.
- Risks, Relative Risk, and Inference: All are identified and accurate.
- IMRAD: All are presented and accurate.

Give each student a **Presentation Rubric**.

Allow Epi Teams 10 minutes to prepare.

Leave this slide on the screen.

Next Slide

Observational Studies



Detectives in the Classroom - Investigation 2-5: Observational Studies

Tell students that they are becoming Detectives in the Classroom. They have just tested hypotheses by conducting observational studies of the natural experiments their classmates have been carrying out as they go about their daily lives. They asked classmates questions about two things, an exposure and an outcome, to see if they turned up together. They *counted*, *divided*, and *compared* and made an inference based on that comparison.

In Part 2 of **Investigation 2-5: Observational Studies**, they will present and discuss their observational studies with their classmates.


This concludes Part 1 of **Investigation 2-5: Observational Studies** and students can now put away their **Epi Logs**.

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Observational Studies

Observational Studies

Part 2



Detectives in the Classroom - Investigation 2-5: Observational Studies

The slide features a central illustration of a person standing at a podium, gesturing with their right hand. In front of the podium, there are several stylized figures representing an audience, each with two arms raised. The entire slide is framed by a blue header and footer containing the text 'Observational Studies' and 'Detectives in the Classroom - Investigation 2-5: Observational Studies' respectively. The main title 'Observational Studies' and the subtitle 'Part 2' are also present on the slide.

As already noted, **Investigation 2-5: Observational Studies** is divided into two parts and takes two class periods to complete.

In Part 1, each Epi Team designed and conducted an in-class observational study of a natural experiment to test a hypothesis.

Now in Part 2, each Epi Team will present the study to the class using the IMRAD format.

Next Slide

Review

Epi Talk

IMRAD

Format usually followed when epidemiological studies are published in medical journals.

Introduction: Why the authors decided to do the study,

Methods: How authors did the study,

Results: What the authors found, and

Discussion: What the results mean.

Detectives in the Classroom - Investigation 2-5: Observational Studies

Remind students what IMRAD means. (Format usually followed when epidemiologic studies are published in scientific journals—*I*ntroduction: Why the authors decided to do the study; *M*ethods: How the authors did the study; *R*esults: What the authors found; and *D*iscussion: What the results mean.)

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Epi Teams



Detectives in the Classroom - Investigation 2-5: Observational Studies

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

Allow each Epi Team 5 minutes to meet before the presentations begin. Have teams prepare and organize all of the materials they will be using. During the presentations, students should have *only* their own **Epi Logs** and a pen or pencil on their desks. This will increase the likelihood that the presenting Epi Team will have the attention of classmates.

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Presentation Rubric

<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All participate	Most participate	Some participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Data Collection Methods</u>	All are thorough and accurate	Most are accurate	Some are accurate
<u>Risks, Relative Risk, and Inference</u>	All are identified and accurate	Most are identified and accurate	Some are identified and accurate
<u>IMRAD</u>	All are presented and accurate	Most are presented and accurate	Some are presented and accurate

Detectives in the Classroom - Investigation 2-5: Observational Studies

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

- Participation: All participate.
- Epi Talk: All are appropriate and accurate.
- Data Collection Methods: All are thorough and accurate.
- Risks, Relative Risk, and Inference: All are identified and accurate.
- IMRAD: All are presented and accurate.

Give each student a **Presentation Rubric**.

Allow Epi Teams 10 minutes to prepare.

Leave this slide on the screen.

Next Slide

Epi Team Presentation



Detectives in the Classroom - Investigation 2-5: Observational Studies

Ask one Epi Team to present.

Leave this slide showing during the presentation.

Next Slide

Epi Team Questions



Detectives in the Classroom - Investigation 2-5: Observational Studies

After the presentation, instruct students from the other Epi Teams to ask their questions. As appropriate, ask each Epi Team that has presented two of the following questions:

- Do you think your definition and questions about exposure and outcome were precise enough to collect meaningful data?
- Did your Epi Team ensure informed consent and anonymity?
- Did every student answer the question? Why would a student not answer a question? What should be done if answers are missing?
- Did the members of your Epi Team answer the questions about their own hypothesis? Should they?
- How did you arrive at your inference?
- How do you feel about admitting that you would do something differently the next time?
- Why is it important to think about doing something differently the next time?
- Why is it important to tell others about what you would do differently the next time?
- How do scientists (epidemiologists) tell others about what they did, what they found, and what they would and would not do differently next time?

Next Slide

Epi Team Self-Assessment

<u>Criteria</u>	<u>Got It</u>	<u>Getting It</u>	<u>Will Get It Soon</u>
<u>Participation</u>	All participate	Most participate	Some participate
<u>Use of Epi Talk</u>	All are appropriate and accurate	Most are appropriate and accurate	Some are appropriate and accurate
<u>Data Collection Methods</u>	All are thorough and accurate	Most are accurate	Some are accurate
<u>Risks, Relative Risk, and Inference</u>	All are identified and accurate	Most are identified and accurate	Some are identified and accurate
<u>IMRAD</u>	All are presented and accurate	Most are presented and accurate	Some are presented and accurate

Detectives in the Classroom - Investigation 2-5: Observational Studies

After asking and answering questions, have one member of the presenting Epi Team self-assess the presentation in terms of the **Presentation Rubric's** first criterion—Participation: All participate.

Have another member of the same team self-assess in terms of the second criterion—Epi Talk: All are appropriate and accurate.

Have another member self-assess in terms of the third criterion—Data Collection Methods: All are thorough and accurate.

Have another member self-assess in terms of the fourth criterion—Risks, Relative Risk, and Inference: All are identified and accurate.

Finally, have another member self-assess in terms of the last criterion—IMRAD: All are presented and accurate.

Continue the above process until all Epi Teams have self-assessed.

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Observational Studies

Investigation
2-5 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 2-5: Observational Studies

When students really understand something, they will be able to explain, interpret, and apply it while showing insight from perspective, empathy, and self-knowledge.

To have *self-knowledge* means to be aware of what is and is not understood.

Ask students:

- When did you demonstrate self-knowledge in this investigation? (When students discussed what the results of their observational study meant and when they self-assessed their presentations in terms of the **Presentation Rubric**, they were demonstrating self-knowledge of observational studies.)

Collect the **Investigation 2-5: Epi Log Worksheets** from each Epi Team.

⚙ Teacher Alert: Tell students you will make copies of each Epi Team's worksheet and return them at the beginning of the next class.

This concludes **Investigation 2-5: Observational Studies** and students can now put away their **Epi Logs**.