The Young Epidemiology Scholars Program (YES) is supported by
The Robert Wood Johnson Foundation and administered by the College Board.

An Association:
TV and Aggressive Acts

Mark Kaelin,
Department of Health Professions
Montclair State University
Upper Montclair, New Jersey

Mona Baumgarten,
Associate Professor in the
Department of Epidemiology & Preventative Medicine
at the University of Maryland
School of Medicine

An Association: TV and Aggressive Acts

These *PowerPoint*® slides are accompanied by teacher notes that are essential for teaching the module.

To access the teacher notes
click on View and then click on Notes Page.

Next Slide

Epidemiology is …

… the study of the distribution and determinants of health-related states or events in specified populations and the application of this study to the control of health problems.

Leon Gordis, *Epidemiology*, 2000

The root of the word epidemiology is epidemic. Originally, epidemiology was the study of infectious diseases. In more recent times epidemiology has come to be applied to a wide variety of areas, e.g., chronic diseases, occupational health, health services, clinical medicine.

Epidemiology is not the study of the outer skin layer. That would be called “epidermiology.”

Next Slide

Epidemiology is …

… the study of how and why diseases are distributed in the population the way they are … in other words, the study of why some get sick and some don't.

Donald F. Austin and S. Benson Werner,
***Epidemiology for the Health Sciences*, 1974**

Next Slide

Worksheet

Name: _____ Date: ____/____/____

Worksheet: An Association: TV and Aggressive Acts

1. **What does it mean?**

2. **Draw and label a diagram.**

3. **Draw and re-label the table.**

4. **Express it in numbers.**

5. **Draw and complete the table.**

6. **Complete the statement.**

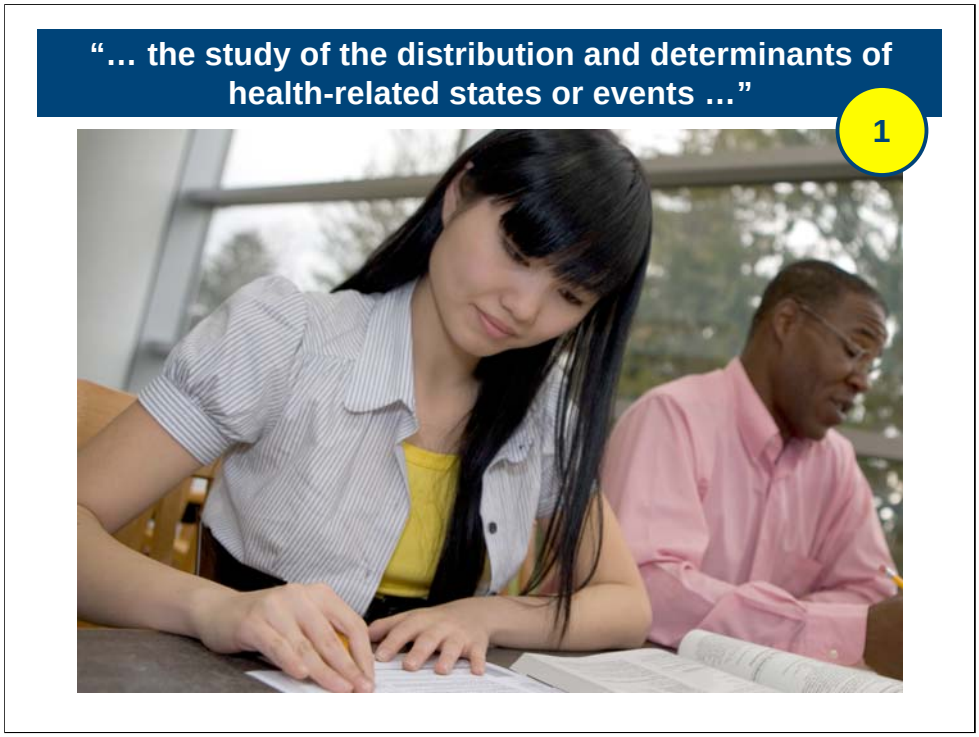
7. **What does it mean?**

8. **What is the difference?**

9. **Assessment**

Give each student a worksheet on the article “A Study Finds More Links Between TV and Violence.”

Next Slide



A newspaper headline: "A Study Finds More Links Between TV and Violence"

On the New York Times Web site *http://www.nytimes.com*, locate and download a copy of the article entitled, "A Study Finds More Links Between TV and Violence," by Gina Kolata, dated March 29, 2002, and ask students to read it. This article is based on Johnson JG, et al. Television viewing and aggressive behavior during adolescence and adulthood, Science, 2002; 295: 2468–247.

Ask students to answer Question 1 by explaining what the headline "A Study Finds More Links Between TV and Violence" means to them. Tell students we will return to their explanation at the end of the class.

Next Slide

Study Designs

Experimental Studies

Randomized Controlled Trials

Other Experimental Studies

Observational Studies

Cohort Studies

Case–Control Studies

Cross-Sectional Studies

Ecologic Studies

Tell students that epidemiologists have several different study designs they can use to test a hypothesis. The study design described in this article is called a cohort study.

Next Slide

Cohort Study

- **A study in which a group of people is followed over time**
- **The group is made up of people who have the exposure of interest and people who do not have the exposure of interest**
- **Exposed and unexposed people are followed over time to determine whether they experience the outcome**

Tell students that in a cohort study a group of people is followed over time. The group is made up of two subgroups: people who have the exposure of interest and people who do not have the exposure of interest. Both subgroups are followed over time to determine whether they experience the outcome.

Note: When we say people are "followed," we do not mean that the researcher knows the study participants' locations at all times during the study period. Follow-up means that the researcher is able to ascertain whether the study participant did or did not experience the outcome during the study period. This information can be obtained by keeping regular contact with the study participant or, in some cases, through the use of records or documentation (e.g., medical records, insurance claims).

Next Slide

Cohort

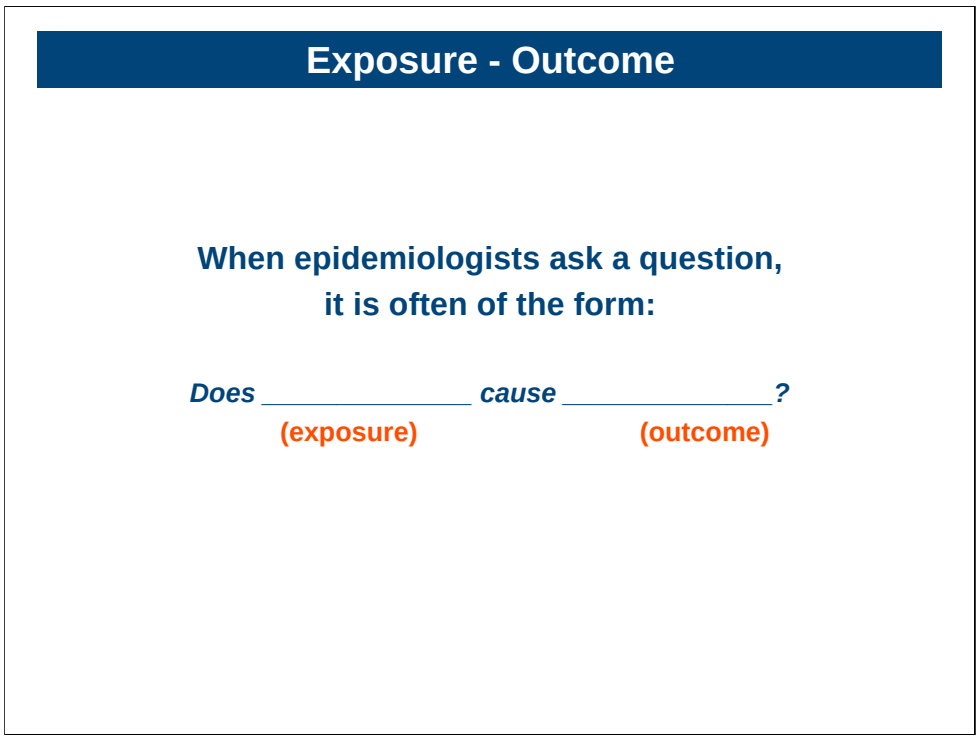
Latin: Warriors, 1/10 of a Legion

Epidemiologist: A designated group of persons who are followed or traced over a period of time

Tell students that the word cohort comes from the Latin and originally referred to a group of warriors numbering 1/10 of a legion. In epidemiologic terminology, a cohort is a group of persons who are followed or traced over time in order to determine whether they experience a particular outcome.

Source:http://commons.wikimedia.org/wiki/Image:Roman_soldiers_with_aquilifer_signifer_centurio_70_aC.jpg

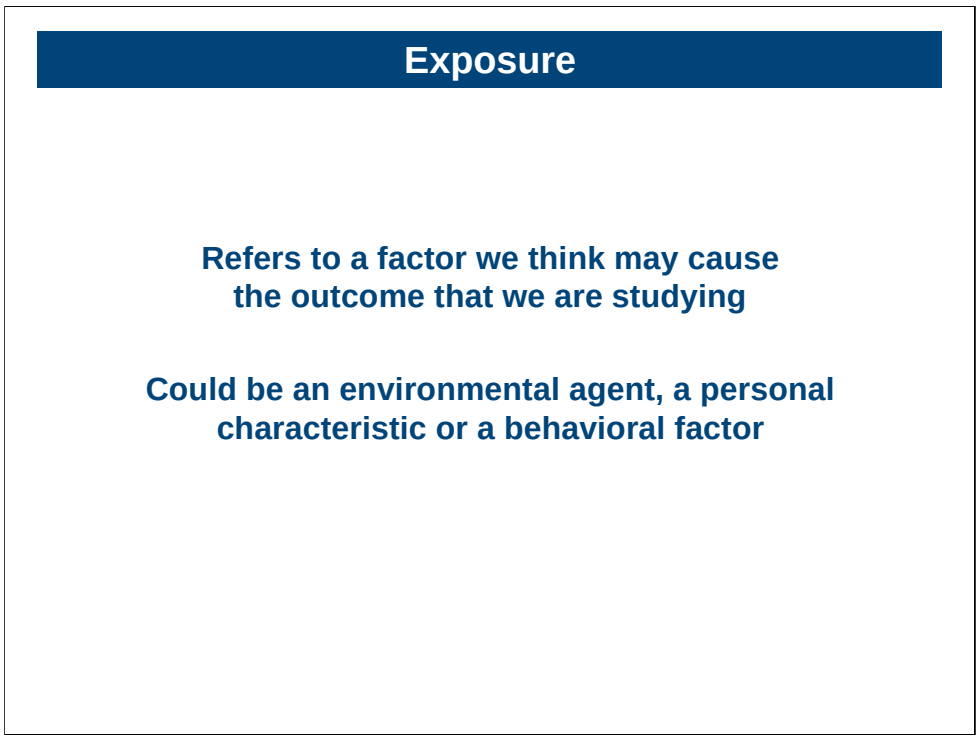
Next Slide



Tell students that when epidemiologists ask a question, it is often of the form: Does a particular exposure cause a particular outcome?

Note: Sometimes research questions are expressed in terms of association rather than causation. For example, is a particular exposure associated with a particular outcome? This may reflect the reluctance of epidemiologists to base conclusions about causality on the results of a single study. However, epidemiologists are almost always interested, ultimately, in causal relationships between exposures and outcomes.

Next Slide



Tell students that exposure is an epidemiologic term referring to a factor that we think may cause the outcome that we are interested in.

Note: The term exposure is used broadly. It can refer to an environmental agent (such as ionizing radiation or air pollution) but can also refer to a personal characteristic (such as genotype, age or gender) or a behavioral factor (such as smoking or eating a high-fat diet). Even a medical condition (such as hypertension or obesity) can be thought of as an exposure if it is being studied as a possible cause of another outcome (such as heart disease).

Note: Many times epidemiologists study factors they think might be harmful, that is, those that might be related to a negative outcome. However, the term exposure can also be used to refer to a factor that might be beneficial, that is, one that might be related to a positive outcome. For example, regular exercise is an exposure that we believe is related to a lower risk of heart disease.

Next Slide

Outcome

Refers to a factor we think may be a consequence of the exposure that we are studying

Could be any kind of medical or social problem

Tell students that outcome is an epidemiologic term referring to a factor we think may be a consequence of the exposure that we are interested in.

Note: The term outcome is used broadly. It can refer to a disease (e.g., cancer) or other physical problem (e.g., hair loss) but can also refer to psychiatric or social problems (such as schizophrenia or domestic violence). Outcomes can also be positive factors, such as recovery from an illness or full-term birth.

Next Slide

Exposure - Outcome

When epidemiologists ask a question, it is often of the form:

Does* _____ *cause* _____*?

(exposure) (outcome)

For example:

Do diesel exhaust fumes from school buses cause asthma?

Does eating chocolate cause acne?

Are males at higher risk of automobile accidents?

Does immunization with the measles vaccine prevent measles?

Does acupuncture result in pain relief?

Tell students that these are some examples of questions that epidemiologists might ask about the relation between an exposure and an outcome.

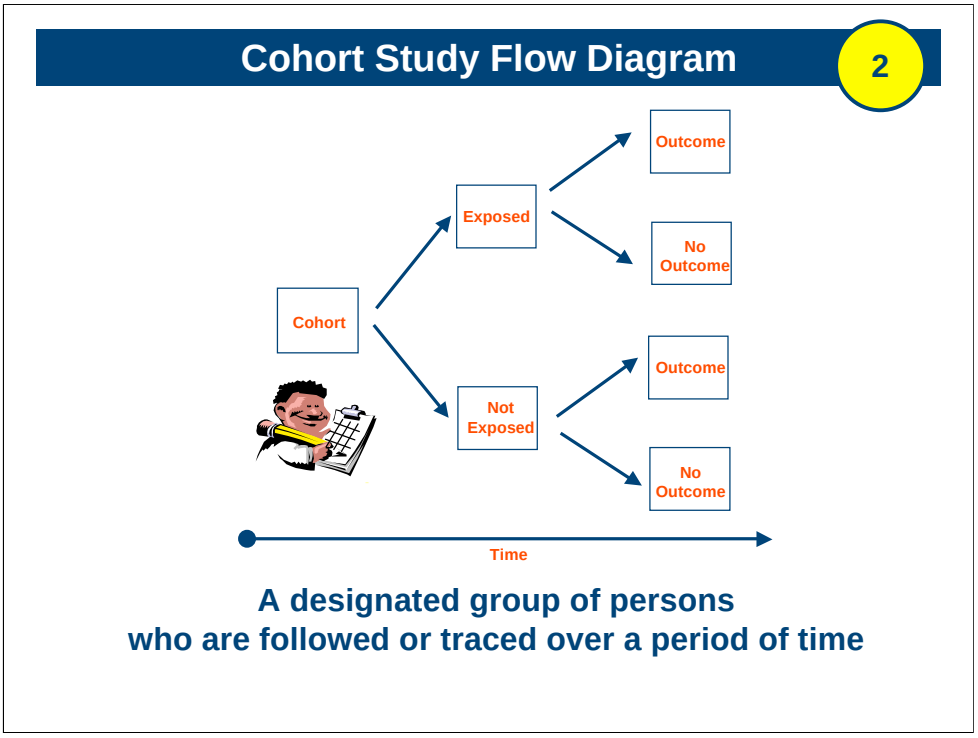
Next Slide

Exposure - Outcome

Exposure	Outcome
Diesel exhaust	Asthma
Eating chocolate	Acne
Male gender	Automobile accidents
Measles immunization	Measles
Acupuncture	Pain relief

Note: Some of these can be expressed in more than one way. We can say that male gender is associated with more auto accidents or that female gender is associated with fewer auto accidents. We can say that acupuncture decreases pain or that it increases pain relief.

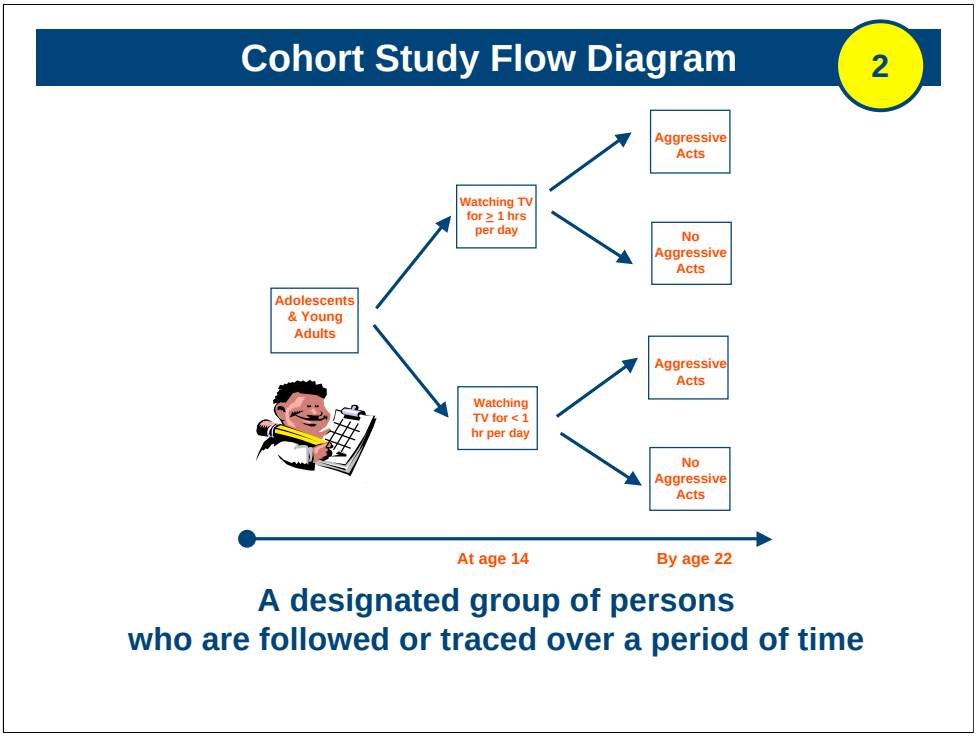
Next Slide



Ask students to answer Question 2 by drawing the flow diagram and labeling the diagram by replacing the Cohort, Exposure, Outcome, and Time with the actual cohort, exposure, outcome and time as described in the article.

Note: The arrows on the slide suggest that there is a time lag between identifying the cohort and the ascertainment of exposure. In fact, identification of the cohort and ascertainment of exposure are often done at the same time. Conceptually, however, the order of events is to first assemble a cohort, then determine exposure status and then follow the cohort over time to determine the outcome.

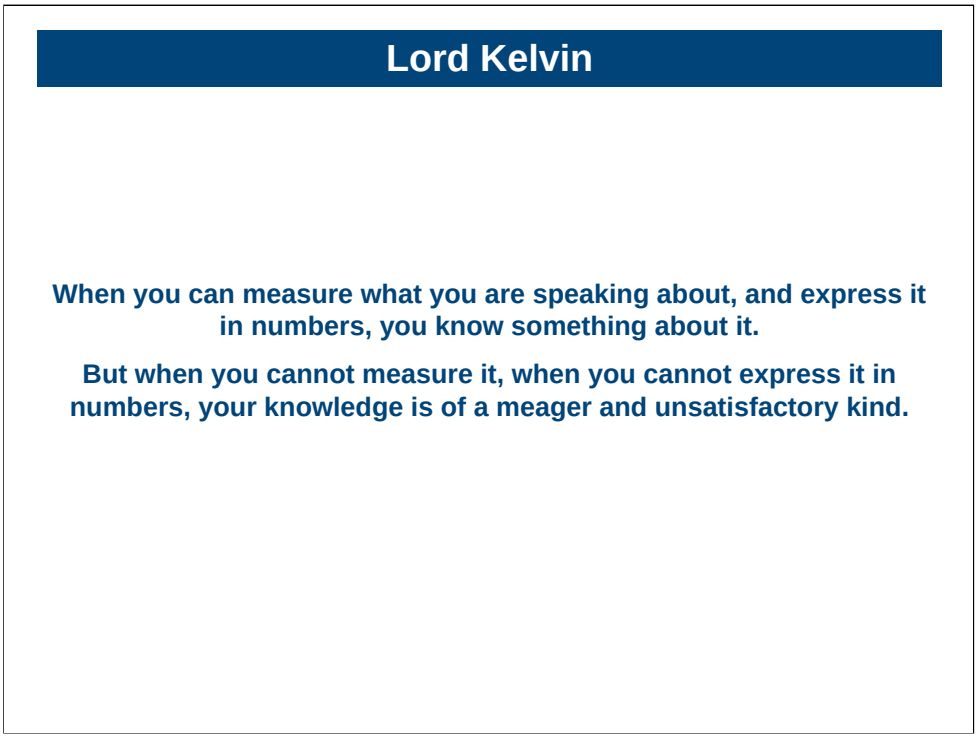
Next Slide



Note: The diagram gives the impression that the cohort was identified before age 14 and exposure was ascertained at age 14. In the case of this particular study, the cohort actually had been identified at an earlier age. But in some cohort studies, cohort identification and determination of exposure status are done at the same time.

Note: Although epidemiologists are often concerned with outcomes such as disease or death, any outcome can be studied with the methods described here. For example, the outcome could be something favorable, like recovery from a disease. The outcome does not have to be a health-related phenomenon; for example, we could be interested in graduation from college as the outcome of interest.

Next Slide



Tell students that Lord Kelvin said, “When you can measure what you are speaking about, and express it in numbers, you know something about it. But when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind.”

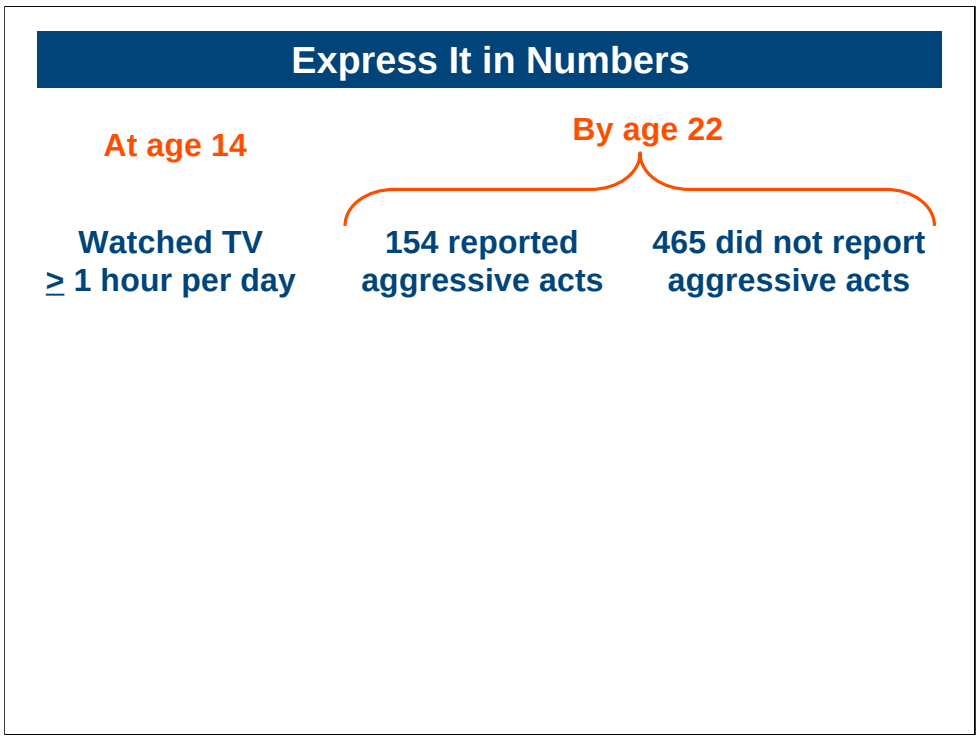
See the following Web sites for more about Lord Kelvin: Eric Weisstein’s World of Science Web site, Available at: http://www.energyquest.ca.gov/scientists/kelvin.html

The Irish Research Scientists’ Association Web site. Available at: http://www.irsa.ie/Resources/Heritage/WThom.html

The Energy Quest™ Web site. Available at: http://scienceworld.wolfram.com/biography/Kelvin.html

Note: Quantification is a basic component of the scientific method.

Next Slide

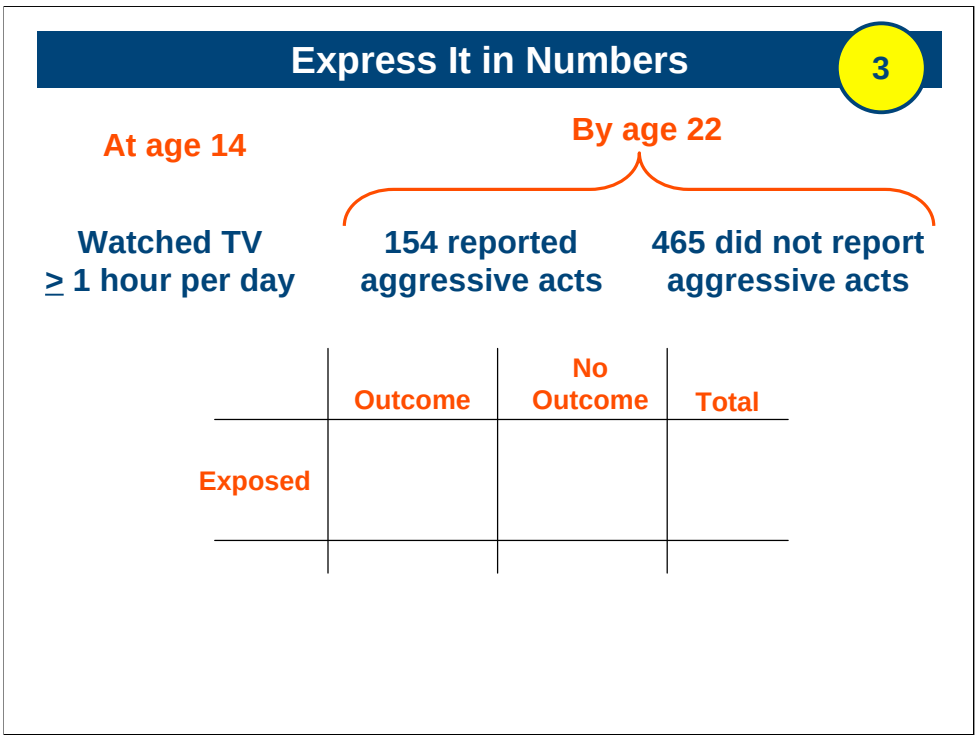


Explain to students that among adolescents who reported watching TV for 1 or more hours at age 14, 154 reported one or more aggressive acts and 465 reported no aggressive acts by age 22.

Ask students how they would summarize these results. Ask questions until they uncover that by calculating the risk (that is, the proportion, among all adolescents who watched TV for 1 hour or more, who reported aggressive acts) they can measure what they are speaking about and express it in numbers.

Ask students how they would calculate the risk. Ask questions until they uncover that the denominator is the sum of the number of participants who did and did not report aggressive acts and the numerator is the number of participants who reported aggressive acts.

Next Slide



Ask students to answer Question 3 by drawing the table above, relabeling it for the study described in the article “A Study Finds More Links Between TV and Violence” and placing the numbers in the appropriate sections of the table.

Ask students questions until they conclude that the answers are similar to those on the next slide.

Next Slide

Express It in Numbers

3

At age 14 — **By age 22**

Watched TV ≥ 1 hour per day — **154 reported aggressive acts** — **465 did not report aggressive acts**

	Aggressive Acts	No Aggressive Acts	Total
Watched TV ≥ 1 hour per day	154	465	619

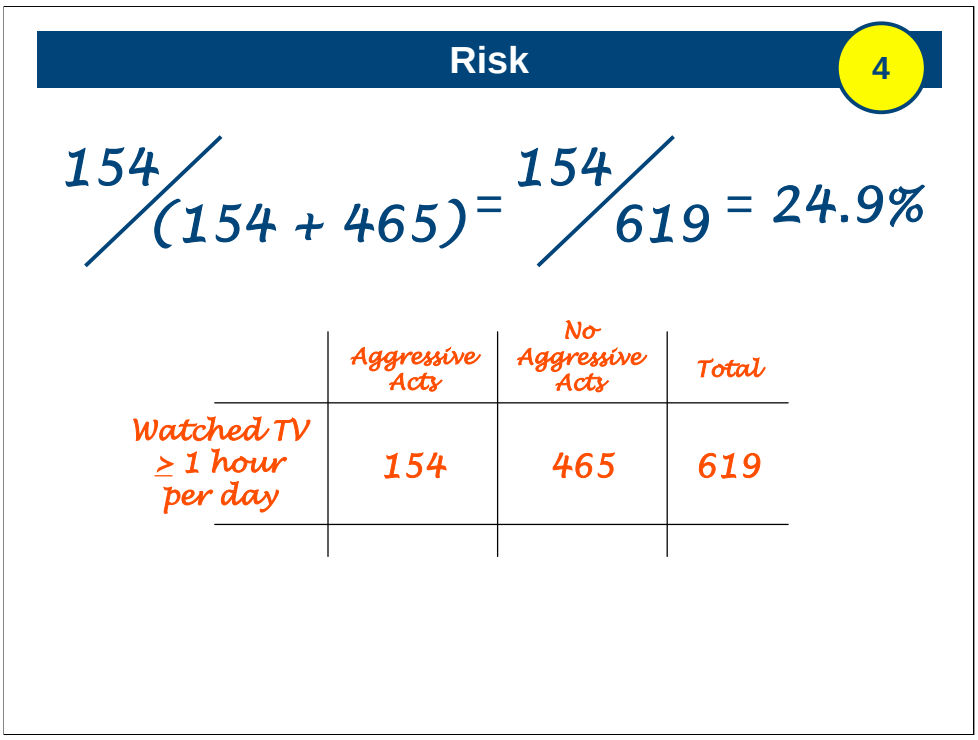
Next Slide

Risk

The probability that an event will occur, for example, that an individual will become ill or die, within a period of time

Note: Risk is a proportion. It varies from 0 to 1 (or from 0% to 100%). It is the proportion of persons in a group who experience a particular outcome within a specified period of time (e.g., 1 year). It is also equal to the probability that an individual will experience the outcome within a specified period of time. For example, if it is found that the annual risk of acne among boys aged 12–17 is 1.5%, that means that 1.5% of boys aged 12–17 will develop acne over the year. If I am a boy in this age group, my probability of developing acne over the year is 1.5%.

Next Slide

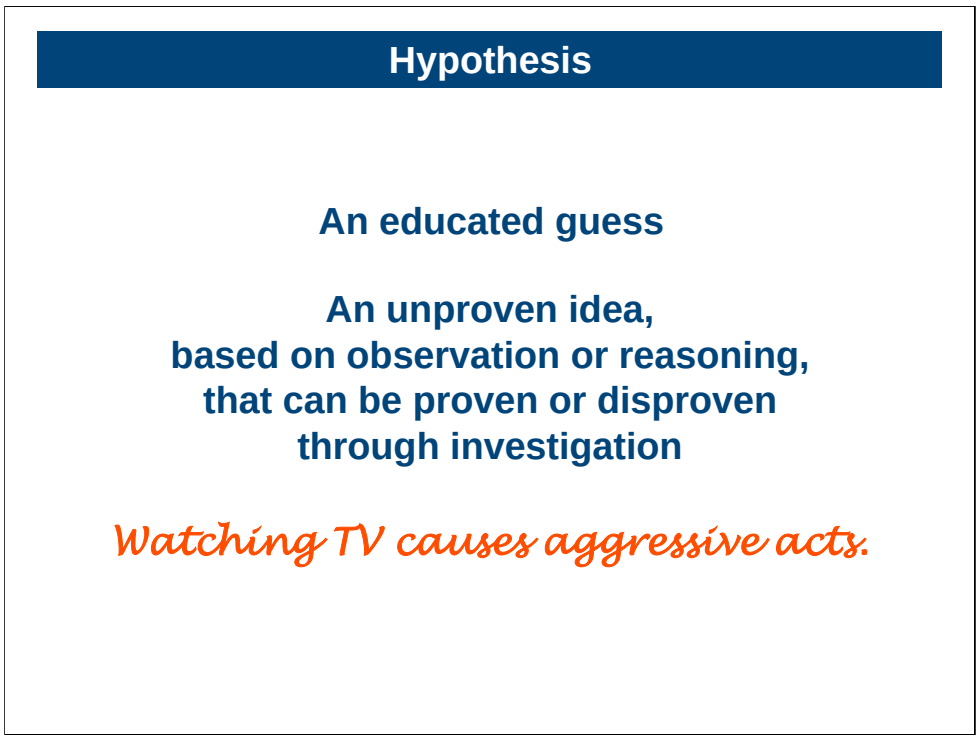


Ask students to answer Question 4 by calculating the risk of committing an aggressive act among the members of the cohort who watched TV for 1 or more hours per day.

Ask students to explain their answers.

Note: 154 / 619 = 0.249. Multiply by 100 to get the percentage.

Next Slide



Remind students that a hypothesis is an educated guess. A hypothesis is an unproven idea, based on observation or reasoning, that can be proven or disproven through investigation.

Ask students what hypothesis was being tested in the study described in the article "A Study Finds More Links Between TV and Violence."

Ask students questions until they uncover the hypothesis: Watching TV causes aggressive acts.

Note: The goal of most epidemiologic investigations is to discover whether there is a causal relationship between two (or more) phenomena, an exposure and an outcome, although this is not always made explicit in the study hypothesis.

Note: Formal scientific hypotheses are always presented as statements. Hypotheses can also be expressed in terms of a question that guides the scientific investigation. In the following slides, we present our hypothesis as a question: Does watching TV cause aggressive acts?

Next Slide

Does watching TV cause aggressive acts?

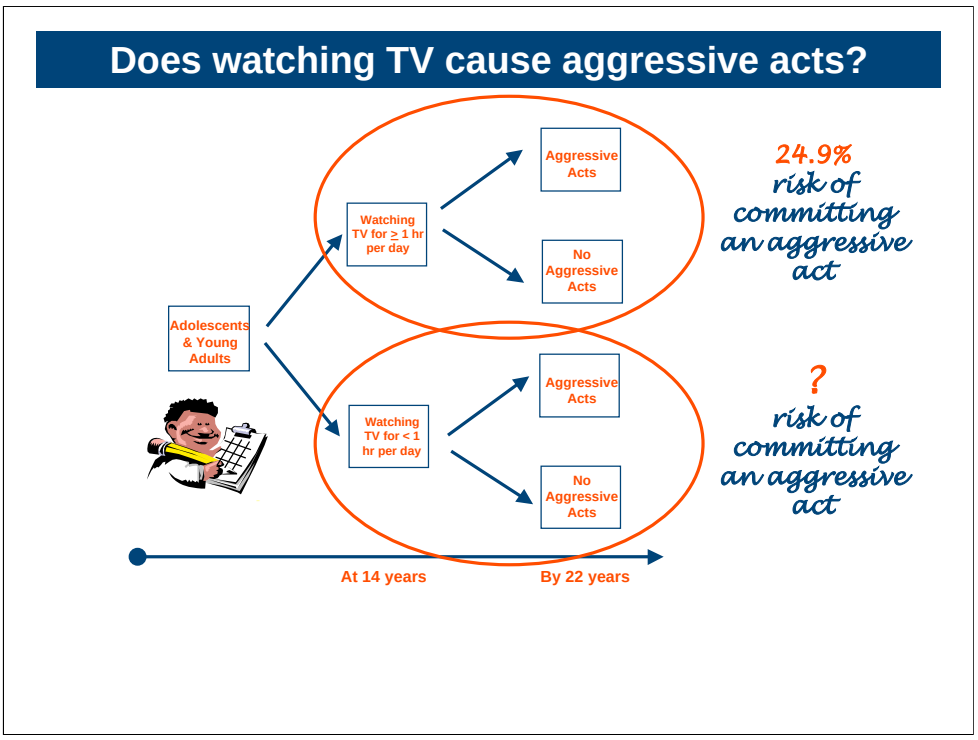
$$154 / (154 + 465) = 154 / 619 = 24.9\%$$

	Aggressive Acts	No Aggressive Acts	Total	Risk
Watched TV ≥ 1 hour per day	154	465	619	24.9%

Ask students to explain whether or not the 24.9% risk of committing an aggressive act among the children who watched TV for 1 or more hours per day supports the hypothesis that watching TV causes aggressive acts.

Probe until students uncover that they need to know the risk of committing an aggressive act among the children who had *not watched* TV for 1 or more hours per day.

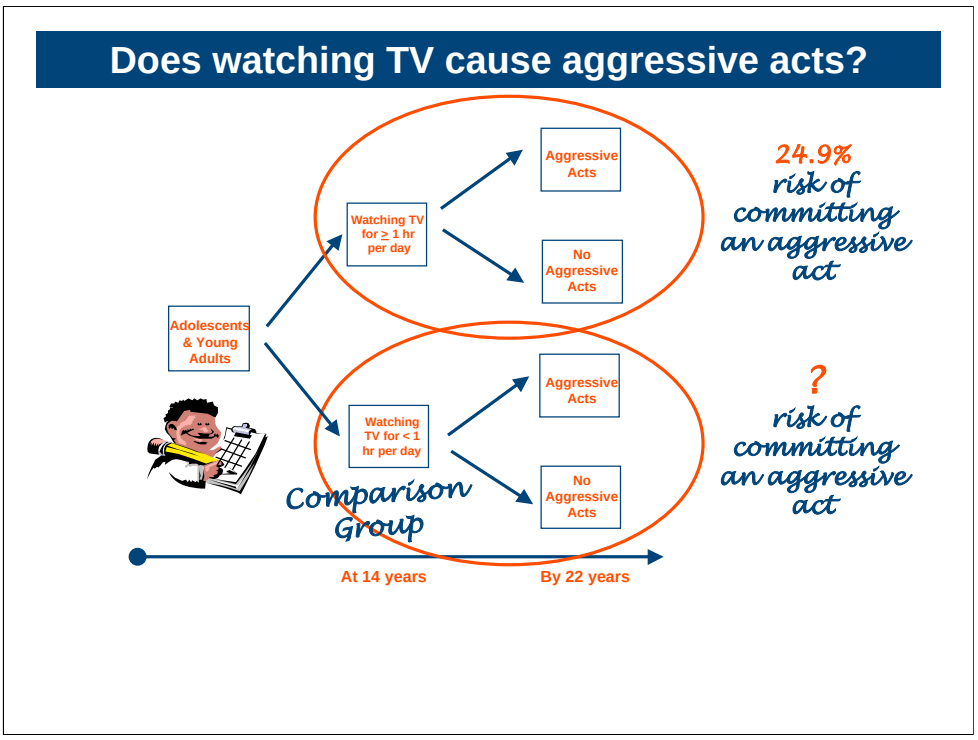
Next Slide



Tell students that in order to test the hypothesis that watching TV causes aggressive acts, they need to compare the risk of committing an aggressive act among the children who had watched TV for 1 or more hours per day with the risk of committing an aggressive act among the children who watched TV for less than 1 hour per day.

Note: In this slide, we state that there is a 24.9% risk of committing an aggressive act. We could also say that there is a 24.9% probability of committing an aggressive act. Or it could be said that 24.9% of persons who watched 1 or more hours of TV per day committed an aggressive act. All these statements derive from the same mathematical quantity and are all correct ways to interpret the 24.9% result.

Next Slide

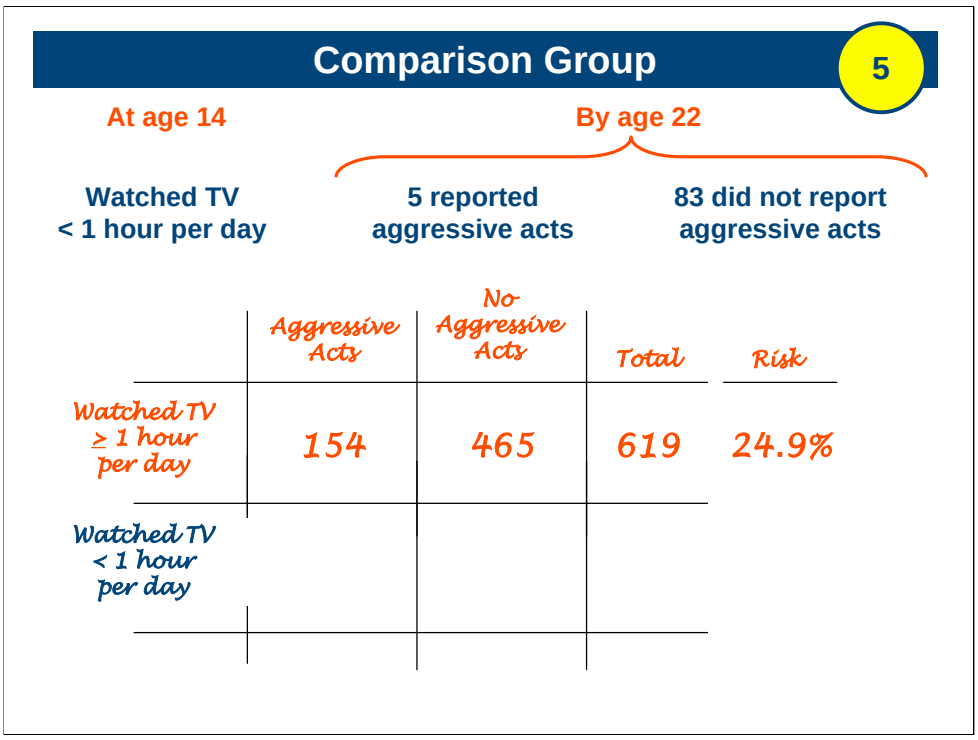


Tell students that we call the other members of the cohort, those who had watched TV for less than 1 hour per day, a comparison group, a group of people with whom comparisons are made.

Note: A comparison group is sometimes called a control group. In cohort studies the comparison group is often referred to as the unexposed group.

Note: A comparison group is needed because even if TV watching causes aggression we would not expect that the risk of aggression in the unexposed group would be 0. We would expect some level of aggression even among those not exposed to 1 or more hours of TV watching per day. The risk in the unexposed group tells us what the background level of aggression is. By comparing the risk in the exposed with the risk in the unexposed, we are able to "tease out" the part of aggressive behavior that may be attributable to TV.

Next Slide



Ask students what they could do to include the comparison group in the table.

Probe until students uncover that they could add another row for the comparison group, the members of the cohort who watched TV for less than 1 hour per day.

Explain to students that among adolescents who reported watching less than 1 hour of television per day at age 14, 5 reported aggressive acts and 83 reported no aggressive acts by the age of 22.

Ask students to answer Question 5 by drawing the table above and placing the numbers in the appropriate sections of the table for the comparison group.

Ask students questions until they conclude that the answers are similar to those on the next slide.

Next Slide

Comparison Group

At age 14 — **By age 22**

Watched TV < 1 hour per day

5 reported aggressive acts | **83 did not report aggressive acts**

	Aggressive Acts	No Aggressive Acts	Total	Risk
Watched TV ≥ 1 hour per day	154	465	619	24.9%
Watched TV < 1 hour per day	5	83	88	5.7%

Tell students that what they just intuitively drew is called a contingency table.

Next Slide

Contingency Table

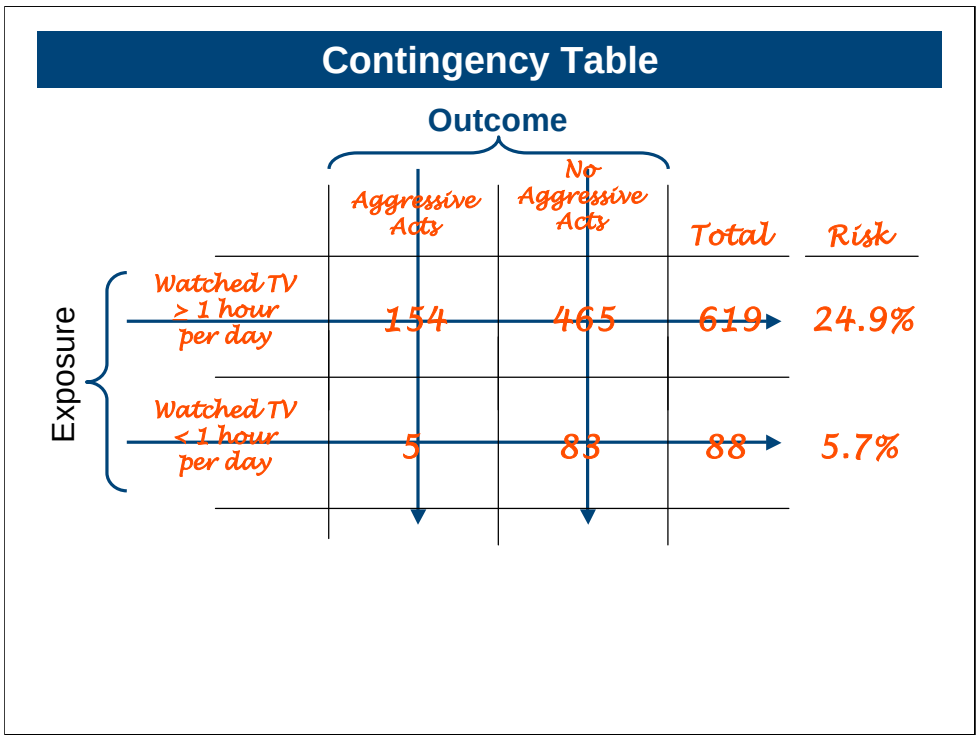
A cross-classification of data in which categories of one variable are presented in rows and categories of another variable are presented in columns.

Tell students that a contingency table is a cross-classification of data in which categories of one variable are presented in rows and categories of another variable are presented in columns.

Note: It is called a contingency table because the cell in which a study participant is placed in the table is contingent on that individual's status concerning two variables, the exposure and the outcome.

Note: In this example the exposure (TV viewing) is actually a continuous variable. A dichotomous variable is created by selecting a cutoff (1 hour or more of TV viewing per day) and classifying individuals into one of two categories of TV viewing (less than 1 hour per day or 1 or more hours per day). Thus, in this study the exposure is defined as TV viewing of 1 or more hours per day. In other studies the exposure variable is inherently categorical, for example, injection drug user versus non-injection drug user or coal miner versus non-coal miner.

Next Slide



Tell students that the simplest contingency table is a 2 x 2 (said two-by-two) table. The exposure variable is displayed in the two rows, one row for those who have been exposed and the other for those who have not, or in this case those who watched 1 or more hours of TV per day and those who did not.

The outcome variable is displayed in the two columns, one column for those who have the outcome and the other for those who do not, or in this case those who committed an aggressive act and those who did not.

Ask students: How many of the adolescents in this study watched TV for 1 hour per day or more and committed aggressive acts? (Answer: 154) How many watched TV for 1 or more hours per day and did not commit aggressive acts? (Answer: 465) How many watched for less than 1 hour per day and committed aggressive acts? (Answer: 5) How many watched for less than 1 hour per day and did not commit aggressive acts? (Answer: 83) How many watched TV for less than 1 hour per day? (Answer: 88) How many committed aggressive acts? (Answer: 159)

Note: The 2 x 2 table shown here is a common form of the contingency table. It is called 2 x 2 because it has two rows and two columns. However, a contingency table can have any number of rows and columns. For instance, in this example, we could have had three exposure categories (less than 1 hour, 1–3 hours and more than 3 hours of TV viewing per day). Or we might have classified the outcome into three categories, according to the severity of aggressive acts (no aggressive acts, minor aggressive acts, major aggressive acts), using appropriate definitions of minor and major aggression.

Note: In this example, we have chosen to display the exposure in the rows and the outcome in the columns. However, it would have been equally appropriate to display the exposure in the columns and the outcome in the rows. If students understand the principles of the 2 x 2 table, they will be able to calculate and compare risks, regardless of how the data are presented to them. If students are asked to summarize data in a 2 x 2 table, it is essential that they label the rows and columns appropriately.

Next Slide

Does watching TV cause aggressive acts?

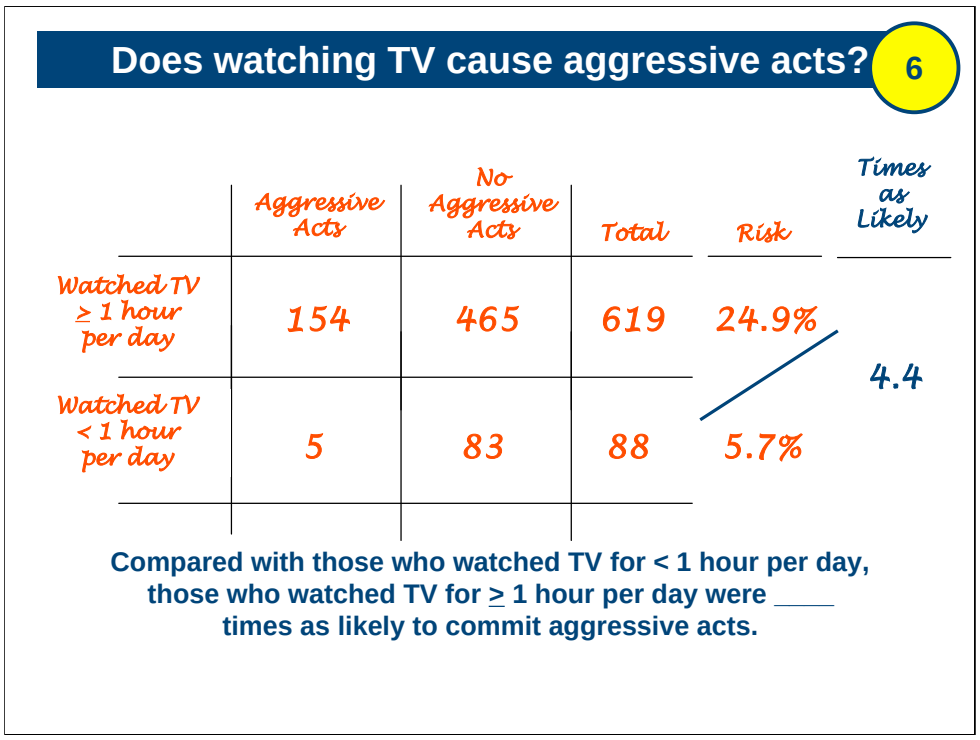
	Aggressive Acts	No Aggressive Acts	Total	Risk
Watched TV ≥ 1 hour per day	154	465	619	24.9%
Watched TV < 1 hour per day	5	83	88	5.7%

Ask students how they might express, in numbers, the degree to which the risk of committing aggressive acts among members of the cohort who watched TV for 1 or more hours per day differed from the risk among those who watched TV for less than 1 hour per day.

Ask questions until the students uncover the idea that they can divide one risk by the other to obtain the relative risk, which is one way of expressing the difference between the risks in the two groups.

Note: The students may suggest subtracting one risk from the other as a way to quantify the difference between the groups. Subtracting the smaller risk from the larger risk provides a measure of the absolute difference in risk. This is not incorrect, but its interpretation is different from that of the relative risk. With this measure, a difference between risks of 95% and 90% is identical to a difference between risks of 10% and 5%. Relative risks are the conventional measure of association between an exposure and an outcome in studies of etiology.

Next Slide



Ask students to answer Question 6 by completing the following statement: Compared with those who watched TV for < 1 hour per day, those who watched TV for ≥ 1 hour per day were ____ times as likely to commit aggressive acts.

Ask students for their answers.

Ask a student who gives the answer "4.4 times as likely" to explain how she or he calculated the answer. (Answer: By dividing the risk of committing aggressive acts among those who watched TV for ≥ 1 hours per day [24.9%] by the risk of committing aggressive acts among those who watched TV for < 1 hour per day [5.7%].)

Next Slide

Risk

The probability that an event will occur, for example, that an individual will become ill or die, within a specified period of time

Remind students that a risk is the probability that an event will occur within a specified period of time.

Next Slide

Relative Risk

A way of quantifying the relationship between two risks

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

Tell students that what they just calculated is called a relative risk, a way of expressing in numbers the relationship between two risks. The relative risk tells us the number of times one risk is larger or smaller than another.

Note: Relative risks (RR) vary from 0 to infinity. When RR = 1, there is no association between exposure and disease. When RR > 1, the exposure is a risk factor for the disease, i.e., increases the risk of disease. When RR < 1, the exposure is a protective factor for the disease, i.e., decreases the risk of disease

Note: If an exposure is harmful, the relative risk will be greater than 1 because more exposed people than unexposed people will get the disease. However, if an exposure is protective or beneficial, the relative risk will be less than 1 because fewer exposed people than unexposed people will get the disease. For example, imagine that the risk of heart disease among people who exercise regularly is 1 per 10,000 and the risk of heart disease among those who do not exercise regularly is 5 per 10,000. The relative risk of heart disease associated with *not* exercising is 5, indicating that lack of exercise is a risk factor for heart disease. Another (equally valid) way to express the same result is that the relative risk of heart disease associated with exercising is 0.2, indicating that exercise is a protective factor.

Next Slide

BREAK

Next Slide

Epidemiology is ….

… the study of the distribution and determinants of health-related states or events in specified populations and the application of this study to the control of health problems.

Leon Gordis, *Epidemiology*, 2000

Remind students that epidemiology is the study of the distribution and determinants of health-related states or events in specified populations and the application of this study to the control of health problems.

Emphasize that the ultimate goal of epidemiology is the control of health problems.

Next Slide

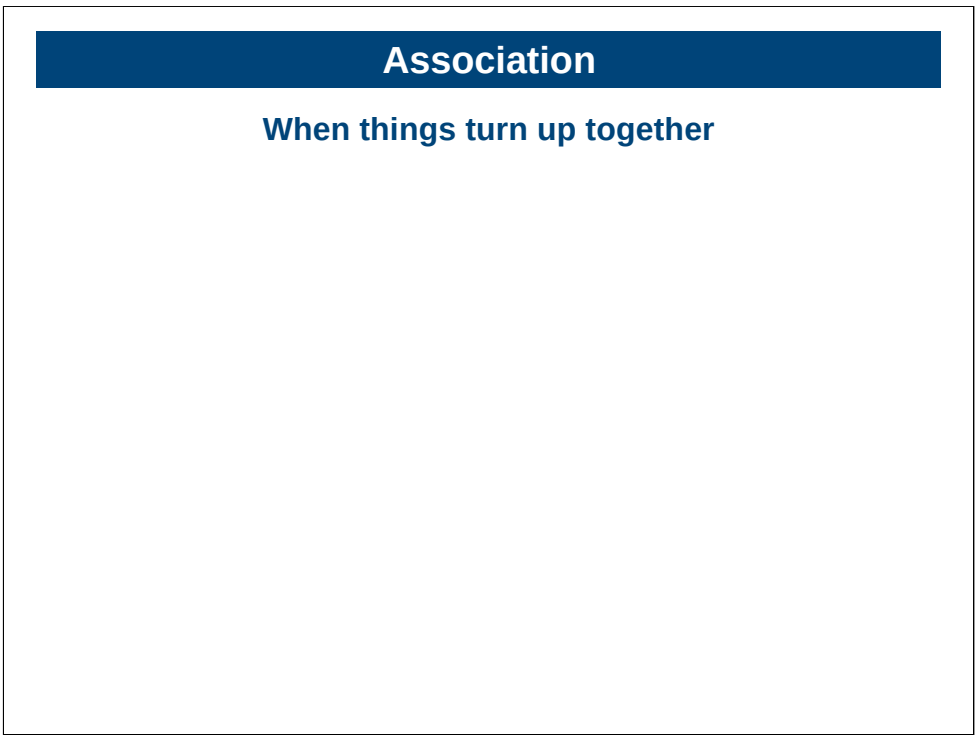
"… the control of health problems"

What should be done?

	Aggressive Acts	No Aggressive Acts	Total	Risk	Relative Risk
Watched TV ≥ 1 hour per day	154	465	619	24.9%	4.4
Watched TV < 1 hour per day	5	83	88	5.7%	

Ask students, given the evidence of an association between watching TV for 1 or more hours per day and committing aggressive acts, what they think should be done to control the problem of aggression.

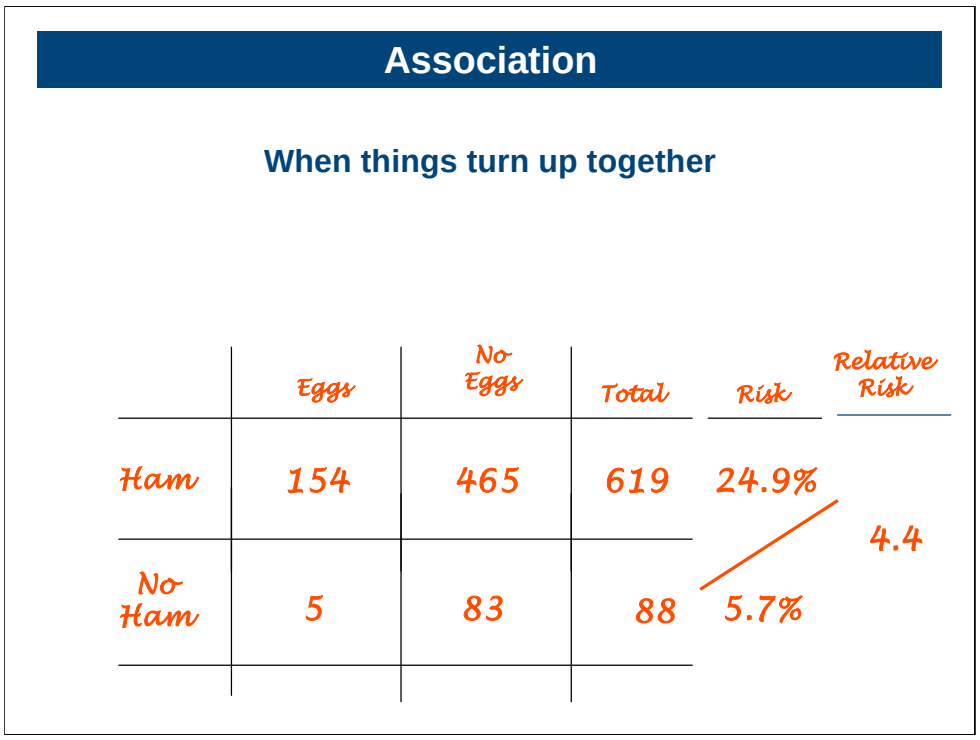
Next Slide



Tell students that when two things turn up together, we say that there is an association between them.

Ask students to identify things that tend to turn up together.

Next Slide



Ask students if ham and eggs tend to turn up together.

Ask students, if they followed a cohort and collected data about the members' ham and egg consumption, whether they might find risks and a relative risk similar to this.

Ask students to express the results in the table in words. For example, there were 154 people who ate ham and eggs, 465 who ate ham but not eggs, 5 who ate eggs but not ham, and 83 who ate neither ham nor eggs.

Ask students why they think ham and eggs turn up together. Does eating ham cause people to eat eggs?

Note: There can be a strong association between an exposure and an outcome even when a large number of those exposed do not experience the outcome as long as the proportion of the exposed who experience the outcome is higher than the proportion of the unexposed who experience the outcome. Similarly, there can be a strong association between an exposure and an outcome even when a large number of those unexposed experience the outcome as long as the proportion of the unexposed who experience the outcome is lower than the proportion of the exposed who experience the outcome.

Next Slide

Association

When things turn up together

	Thunder	No Thunder	Total	Risk	Relative Risk
Lightning	154	465	619	24.9%	4.4
No Lightning	5	83	88	5.7%	

Ask students if lightning and thunder tend to turn up together.

Ask students, if they followed a “cohort of days” and collected data about lightning and thunder, whether they might find risks and a relative risk similar to this.

Ask students why they think lightning and thunder turn up together. Does lightning cause thunder?

Next Slide

Association

When things turn up together

	Ball on Red	No Ball on Red	Total	Risk	Relative Risk
Bet on Red	154	465	619	24.9%	4.4
No Bet on Red	5	83	88	5.7%	

Ask students if betting on red and the ball's landing on red tend to turn up together when people play roulette.

Ask students, if they followed a cohort of gamblers and collected data about betting on red and the ball's landing on red, what they would think if they found risks and a relative risk similar to this.

Ask students why they think betting on red and the ball's landing on red turned up together. Does betting on red cause the ball to land on red?

Next Slide

Association

When things turn up together

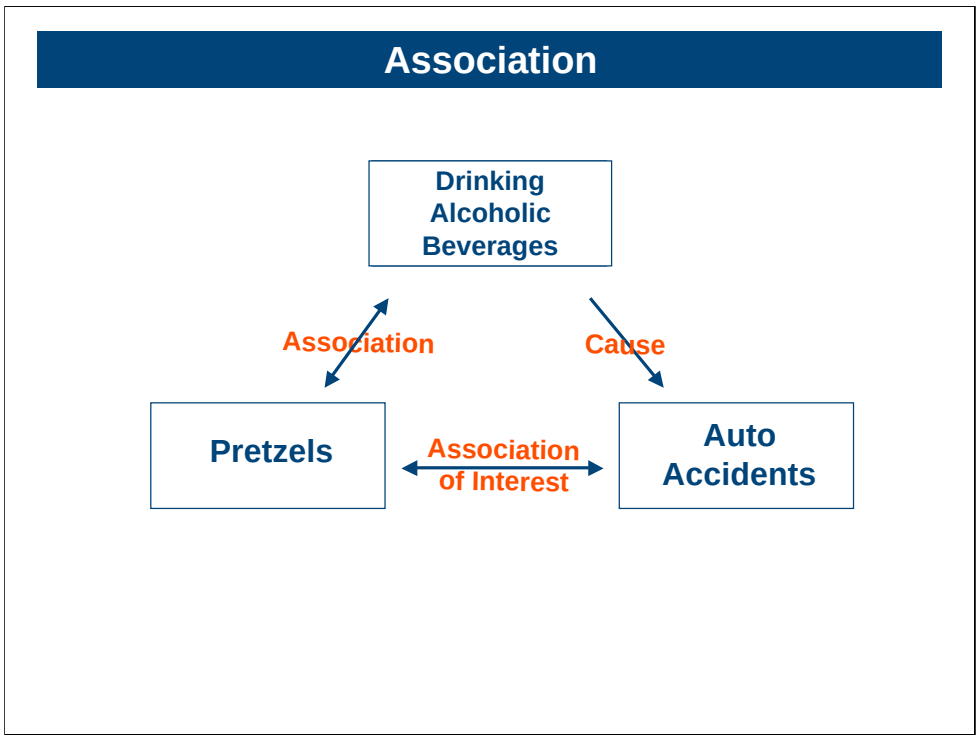
	Auto Accident	No Auto Accident	Total	Risk	Relative Risk
Ate Pretzels	154	465	619	24.9%	4.4
Did Not Eat Pretzels	5	83	88	5.7%	

Ask students if eating pretzels and automobile accidents tend to turn up together.

Ask students, if they studied a cohort of automobile drivers and collected data about eating pretzels and auto accidents, what they would think if they found risks and a relative risk similar to this.

Ask students why they think that eating pretzels and auto accidents turned up together. Does eating pretzels cause auto accidents?

Next Slide



Ask students why they think an association between eating pretzels and auto accidents was found.

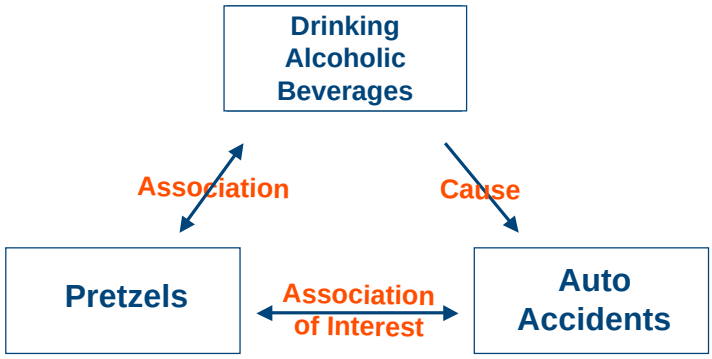
Ask students what would happen if there was another exposure, one that they had not studied, that was associated with eating pretzels and it is that exposure, the unstudied exposure, that is the actual cause of the auto accidents.

Ask students if they can identify an exposure that is associated with pretzels and might be a cause of auto accidents.

Ask students questions until they uncover the possibility that drinking alcoholic beverages is associated with eating pretzels and is a cause of auto accidents.

Next Slide

Confounding



When an observed association between an exposure and an outcome is distorted because the exposure of interest is associated with some other exposure that causes the outcome

Tell students that if this happens, it is called confounding.

Tell students that confounding occurs when the observed association between an exposure and an outcome is distorted because the exposure of interest is associated with some other exposure that causes the outcome.

Note: A confounder is a variable that distorts our conclusions about the association between an exposure and an outcome.

Next Slide

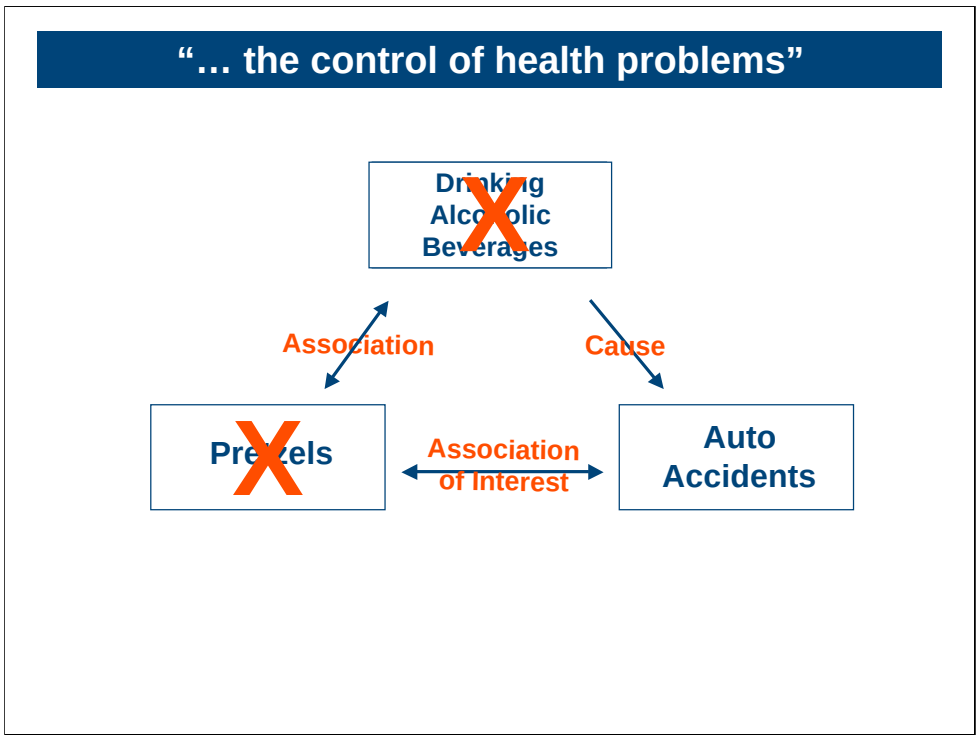
Confounding

- **Confounding is the distortion of an exposure–outcome association brought about by the association of another factor with both outcome and exposure.**
- **A confounder confuses our conclusions about the relationship between an exposure and an outcome.**

Tell students that confounding is the distortion of an exposure–outcome association brought about by the association of another factor with both outcome and exposure.

Tell students that a confounder confuses our conclusions about the relationship between an exposure and an outcome.

Next Slide



Ask students, if the association between eating pretzels and auto accidents was due to confounding, what would happen to auto accidents if pretzels were taken away. (Answer: Nothing, if the association is confounded by drinking alcoholic beverages.)

Ask students, if the association was due to confounding, and they wanted to prevent auto accidents, what could be done. (Answer: Stop the drinking of alcoholic beverages.)

Next Slide

Association

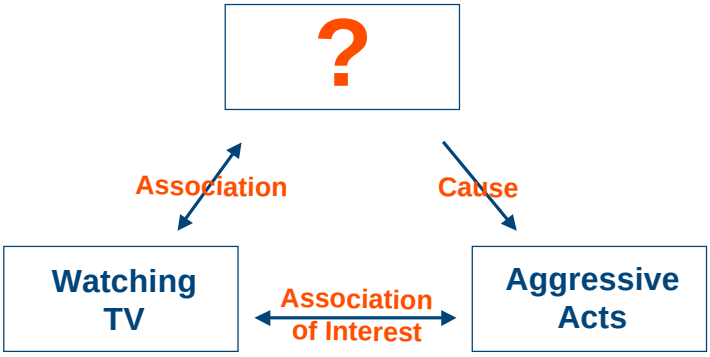
When things turn up together

	Aggressive Acts	No Aggressive Acts	Total	Risk	Relative Risk
Watched TV > 1 hour per day	154	465	619	24.9%	4.4
Watched TV < 1 hour per day	5	83	88	5.7%	

Ask students if watching TV and aggressive acts tended to turn up together.

Next Slide

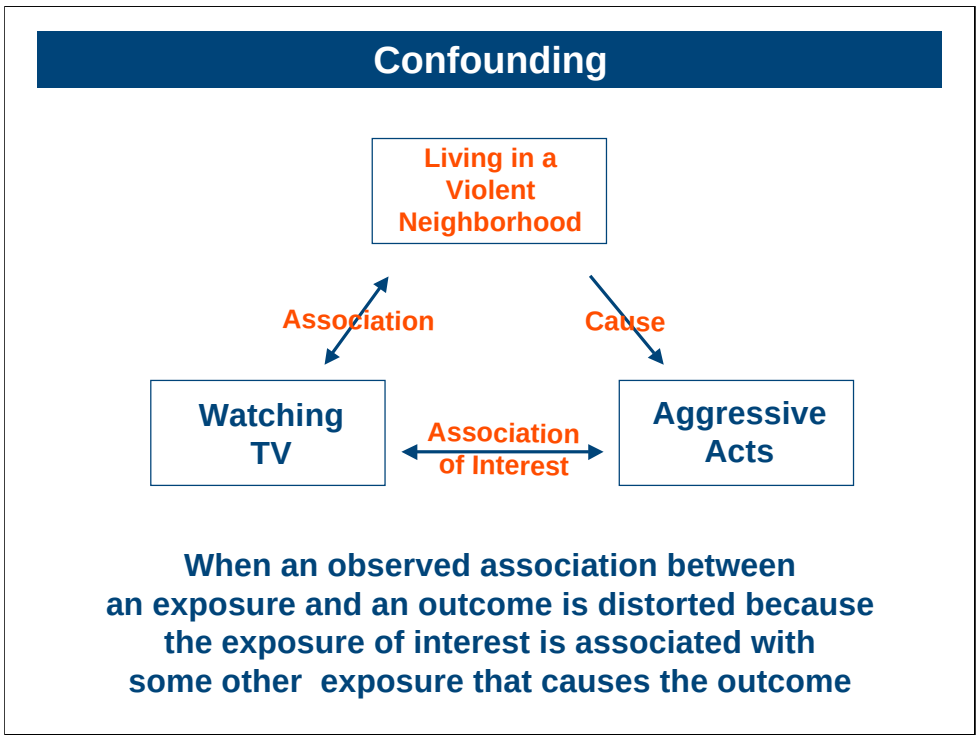
Confounding



When an observed association between an exposure and an outcome is distorted because the exposure of interest is associated with some other exposure that causes the outcome

Ask students if they think the association between watching TV and aggressive acts could be due to confounding.

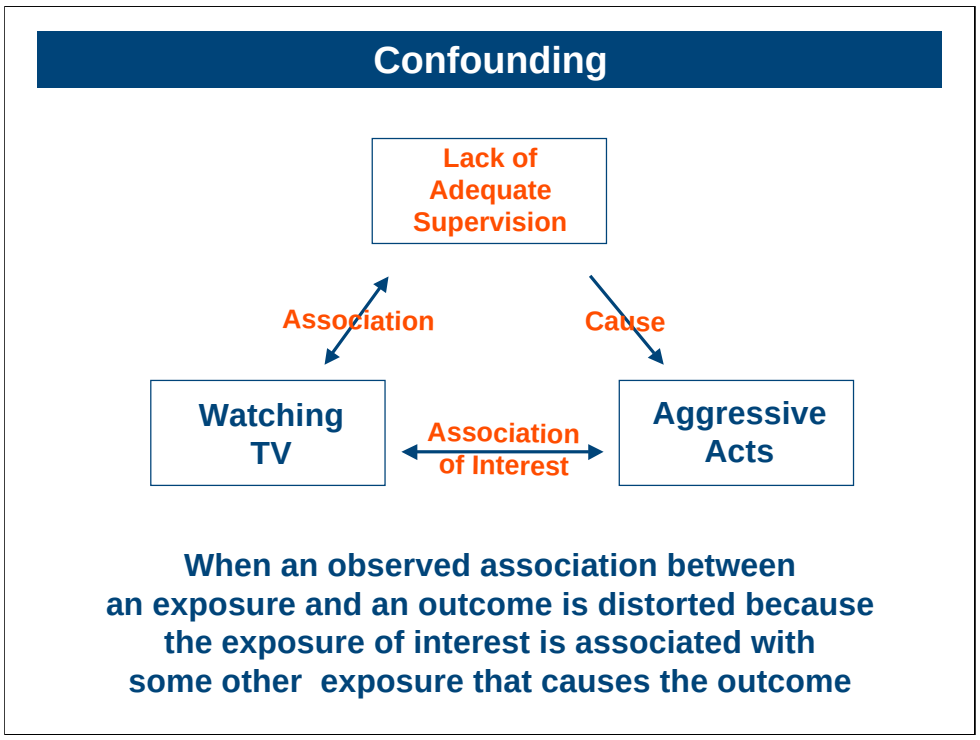
Next Slide



Ask students questions until they uncover the possibility that living in a violent neighborhood might be associated with watching TV and might be the cause of aggressive acts.

Note: Students may identify other explanations, such as a personality predisposition or a genetic predisposition both to watching TV and to aggressive behavior.

Next Slide

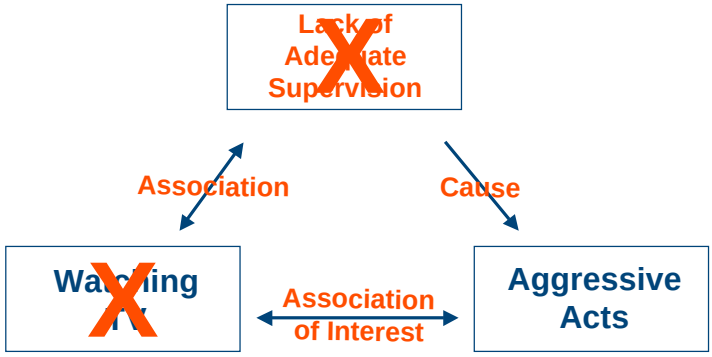


Ask students questions until they uncover the possibility that a lack of adequate supervision might be associated with watching TV and might be the cause of aggressive acts.

Note: The goal is to get students to look critically at any reported associations that they encounter. They should always ask the question, is this association causal or has it been found because of the existence of some third factor that could lead us to draw a faulty conclusion?

Next Slide

"… the control of health problems"



When an observed association between an exposure and an outcome is distorted because the exposure of interest is associated with some other exposure that causes the outcome

Ask students, if the association between watching TV and aggressive acts was due to confounding, what would happen to aggressive acts if watching TV was taken away. (Answer: Nothing, if the association is confounded by a lack of adequate adult supervision.)

Ask students, if the association was due to confounding, and they wanted to prevent aggressive acts, what could be done. (Answer: Provide adequate adult supervision.)

Next Slide

Control of Confounding

At Design Stage:

- **Randomization**
- **Matching**
- **Restricting study to certain groups**

At Analysis Stage:

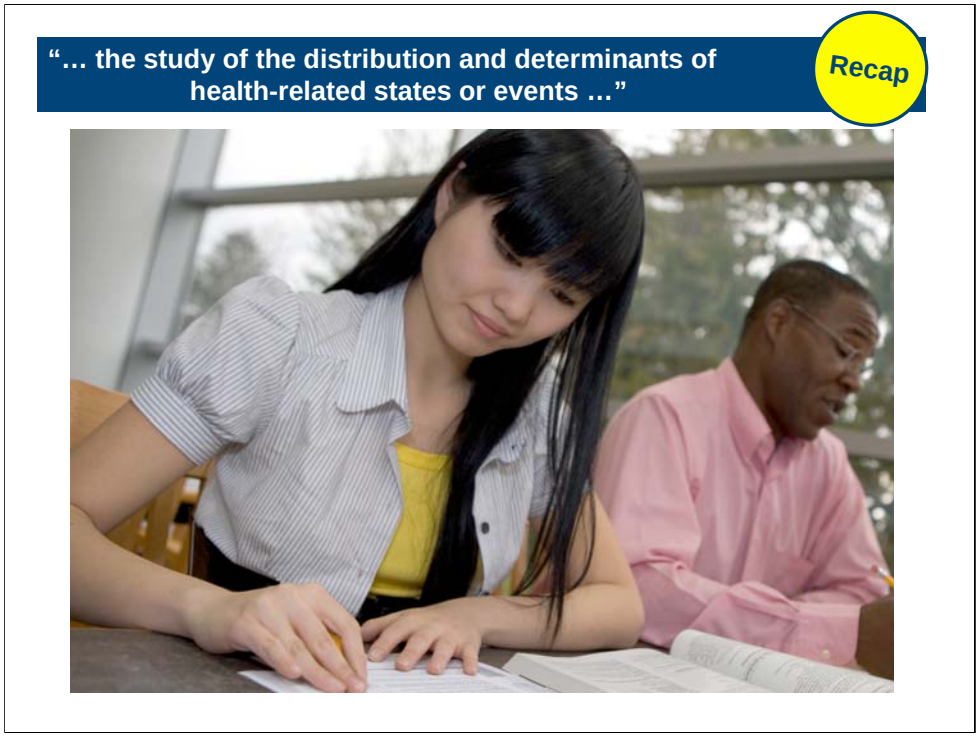
- **Quantitative methods**
  - **Stratification**
  - **Standardization**
  - **Regression**

Tell students that studies whose results are obscured by confounding are not useful. Epidemiologists have various ways to deal with confounding. One is by designing studies in a way that reduces or eliminates confounding. Randomization, matching and restriction of the study to certain groups may all reduce the likelihood (probability) of confounding. Another approach is to apply quantitative methods to results of studies so that the effects of confounding are reduced or eliminated after the results of the study have been obtained. Quantitative methods that can be used are stratification, standardization, or regression.

Another module will explore confounding more thoroughly.

Note: Randomization reduces the probability of confounding because potential confounding variables will tend to be distributed more or less equally between the groups being compared. Matching on a potential confounding variable makes the groups comparable with respect to that variable, reducing the possibility of confounding. Restricting the study to certain groups can also reduce confounding. For example, if gender is a potential confounder, restricting the study to females will eliminate the possibility of confounding (but will also limit the generalizability of the study).

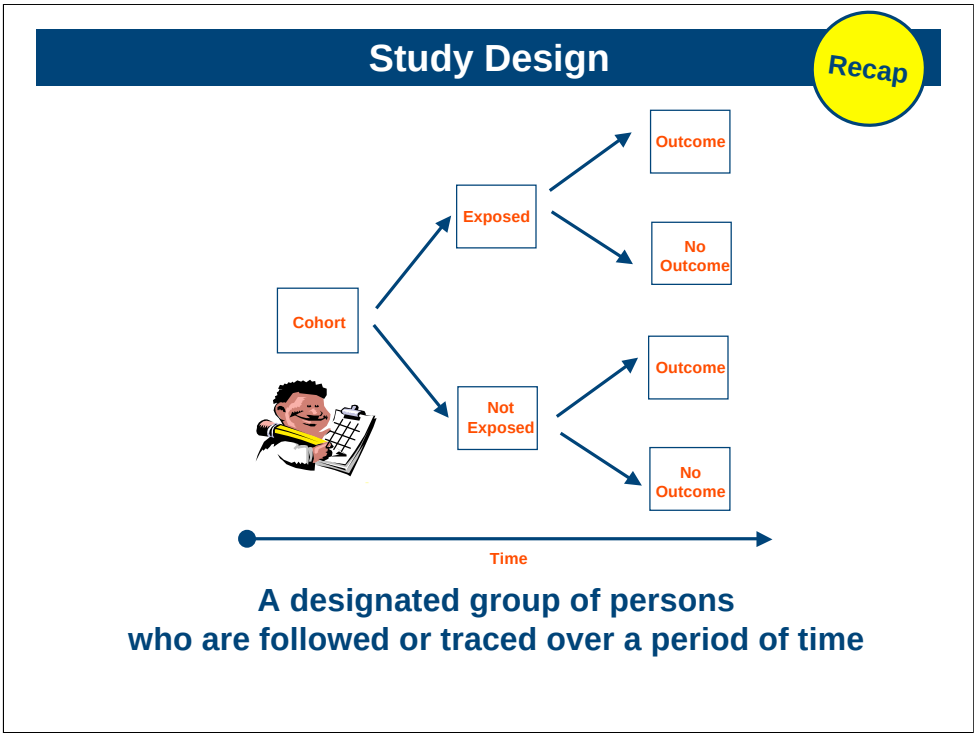
Next Slide



Refer back to the beginning of this lesson when students were asked to explain the headline, "A Study Finds More Links Between T.V. and Violence."

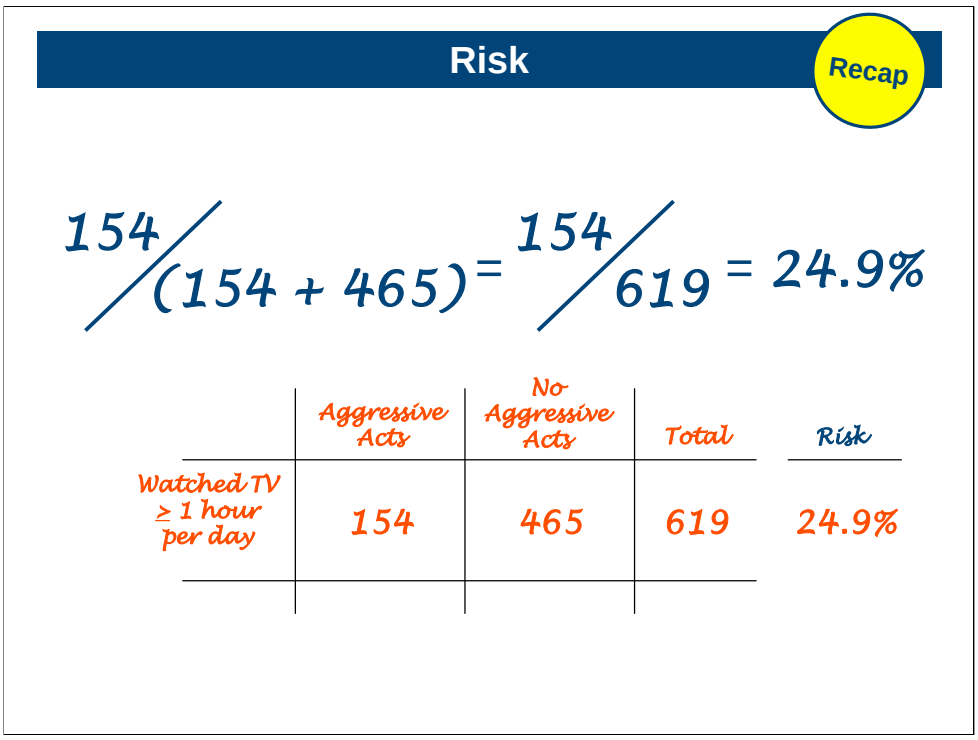
Tell students that although they focused on a study about watching TV and aggression, the epidemiologic principles that they learned can be used to study the distribution and determinants of other health-related states or events as well. The link between watching TV and aggression is just an interesting "for instance." What are the epidemiologic principles to which they have been introduced?

Next Slide



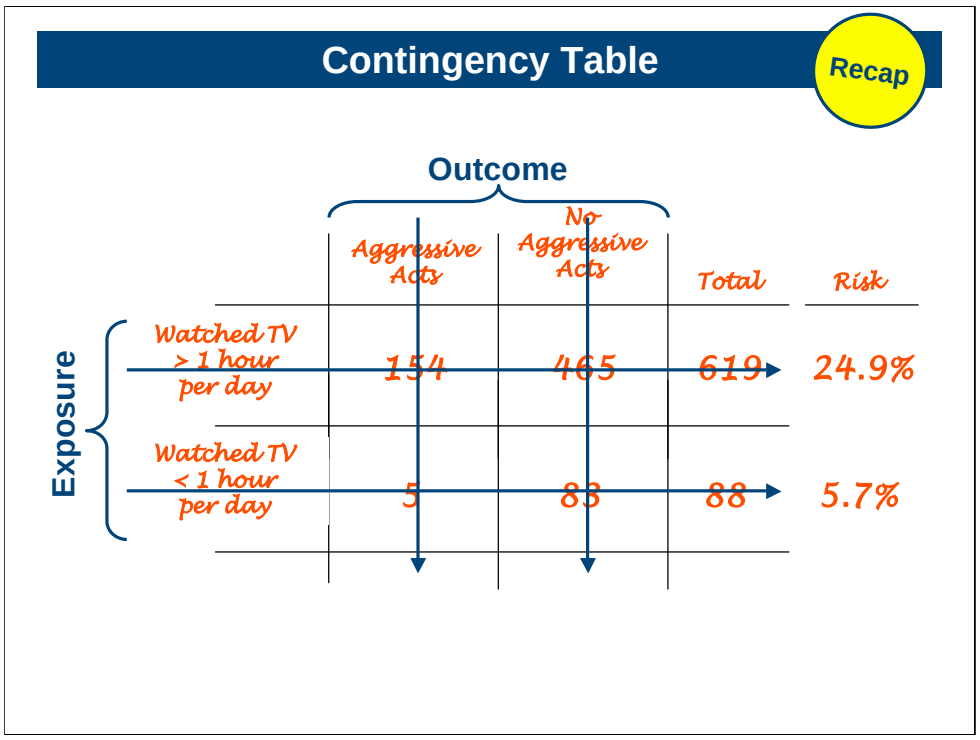
They have been introduced to the cohort study design, one of several study designs that epidemiologists employ to test hypotheses.

Next Slide



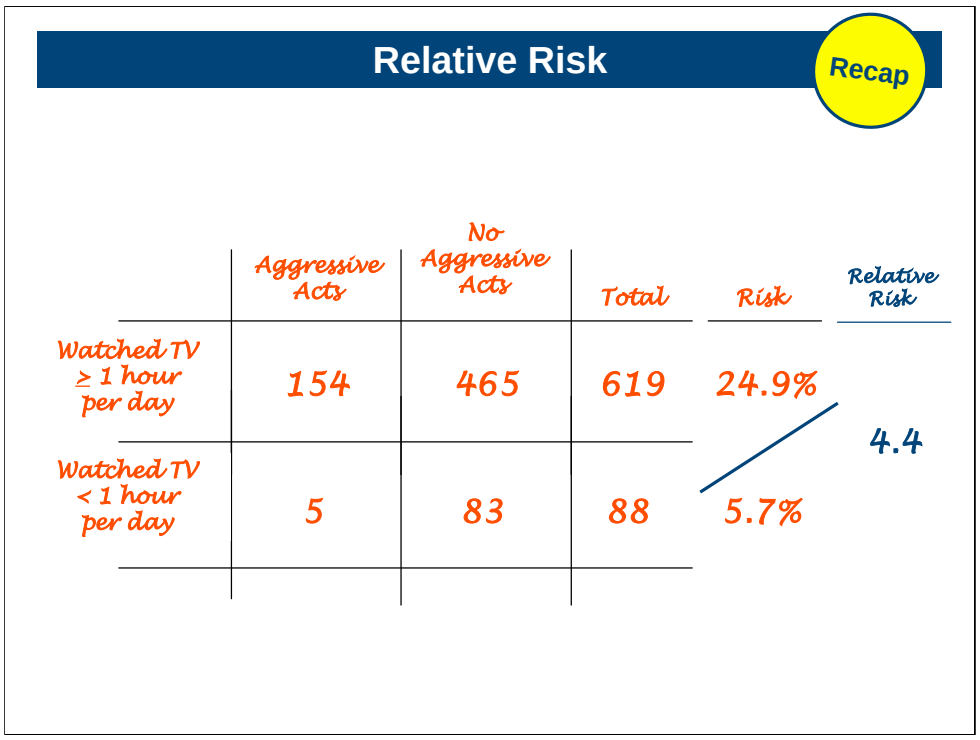
They have been introduced to the calculation of a risk, one way epidemiologists can express in numbers the frequency with which an outcome occurs in a population.

Next Slide



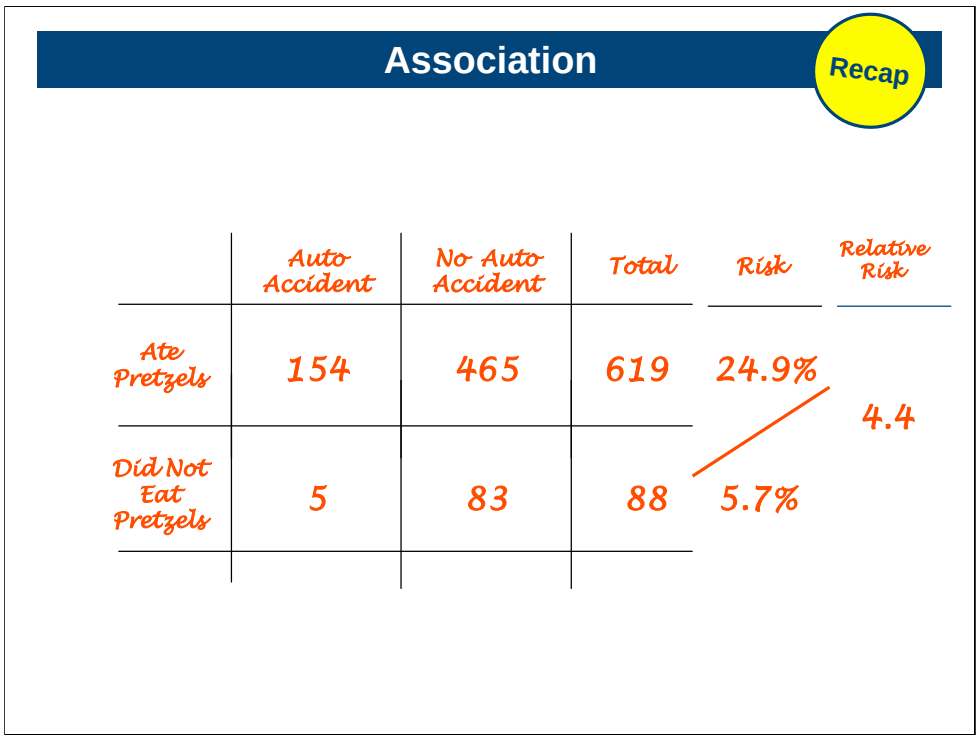
They have been introduced to the contingency table, one way epidemiologists can display and analyze data about an exposure and an outcome.

Next Slide



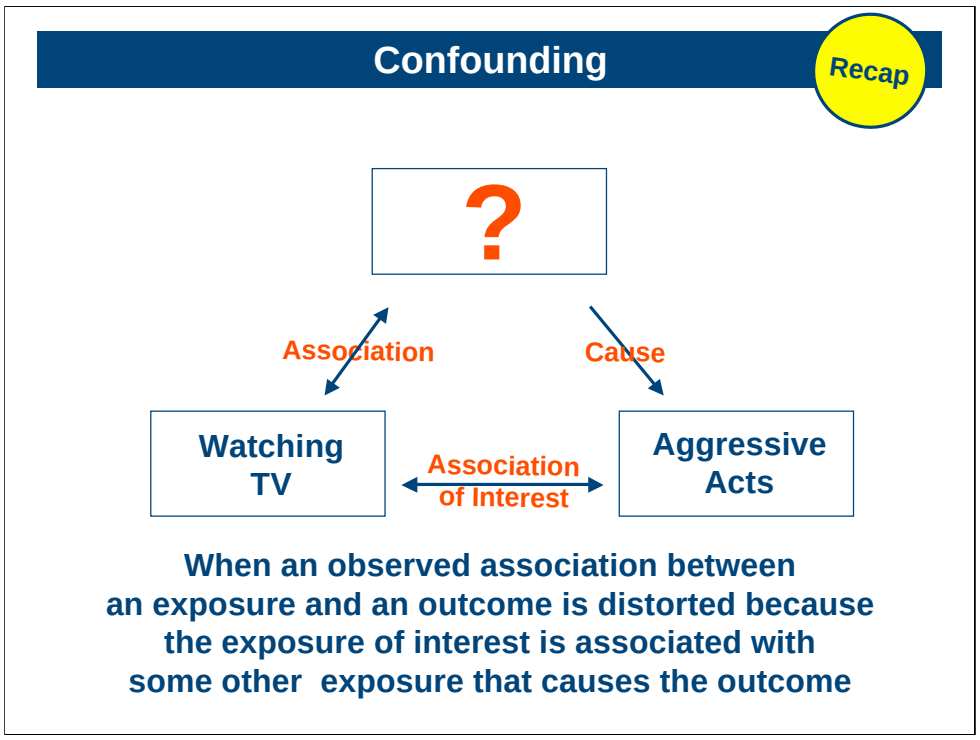
They have been introduced to the calculation of a relative risk, one way epidemiologists can express in numbers how two risks compare with each other by quantifying the number of times one risk is smaller or larger than another.

Next Slide



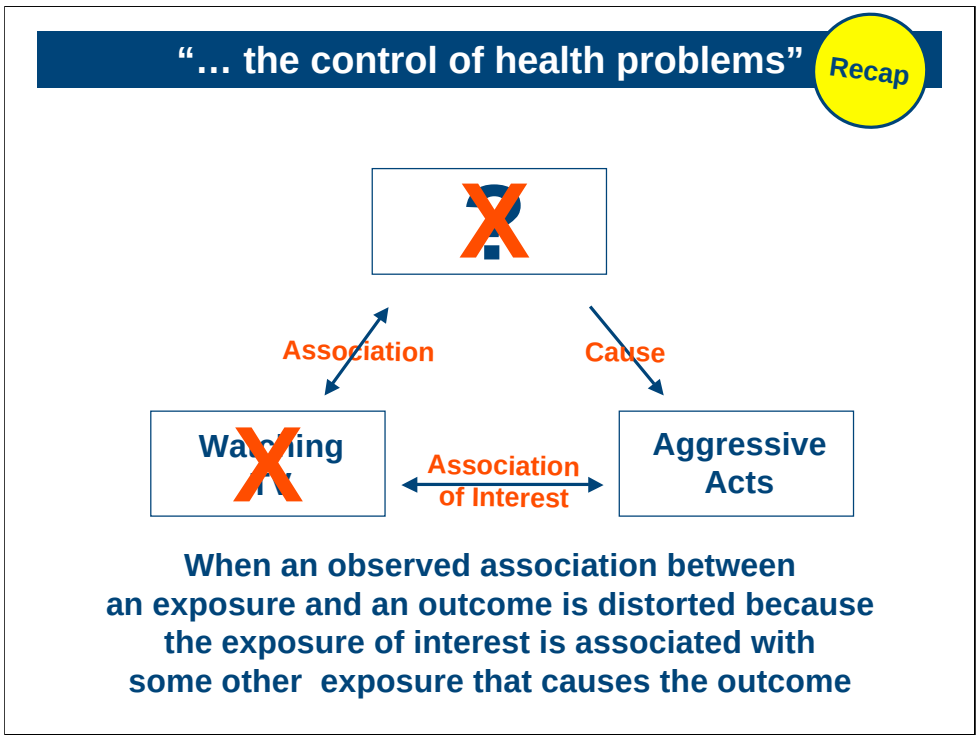
They have been introduced to the concept of association, which simply means two things tend to turn up together. And they understand that just because an exposure and an outcome turn up together does not necessarily mean that the exposure caused the outcome.

Next Slide



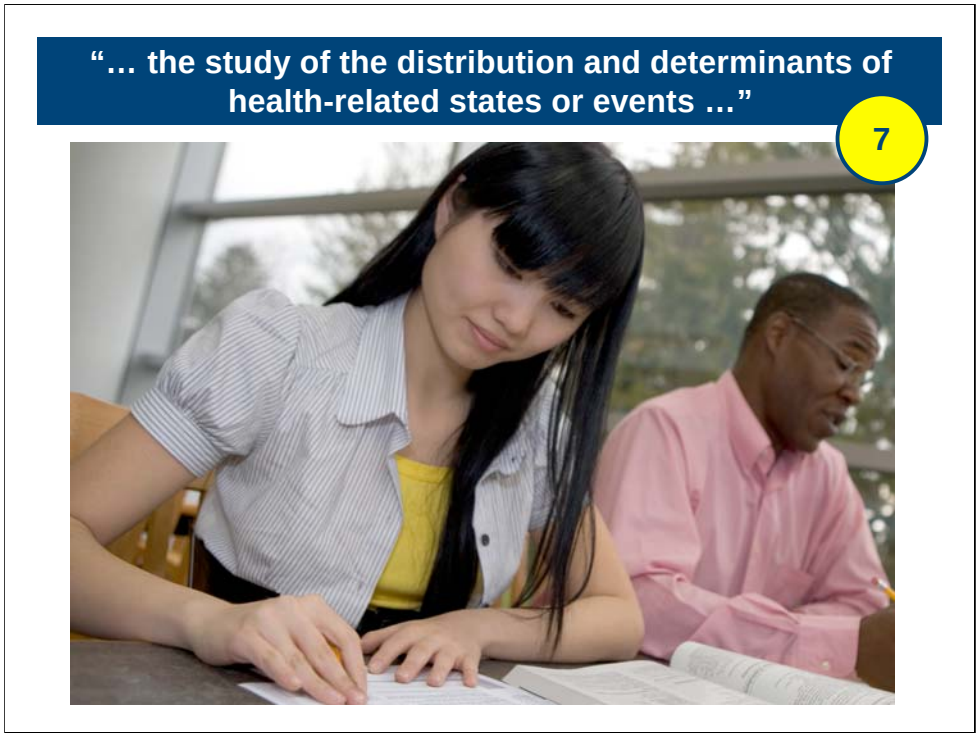
They have been introduced to the idea of confounding, one explanation that epidemiologists consider for an association they have observed.

Next Slide



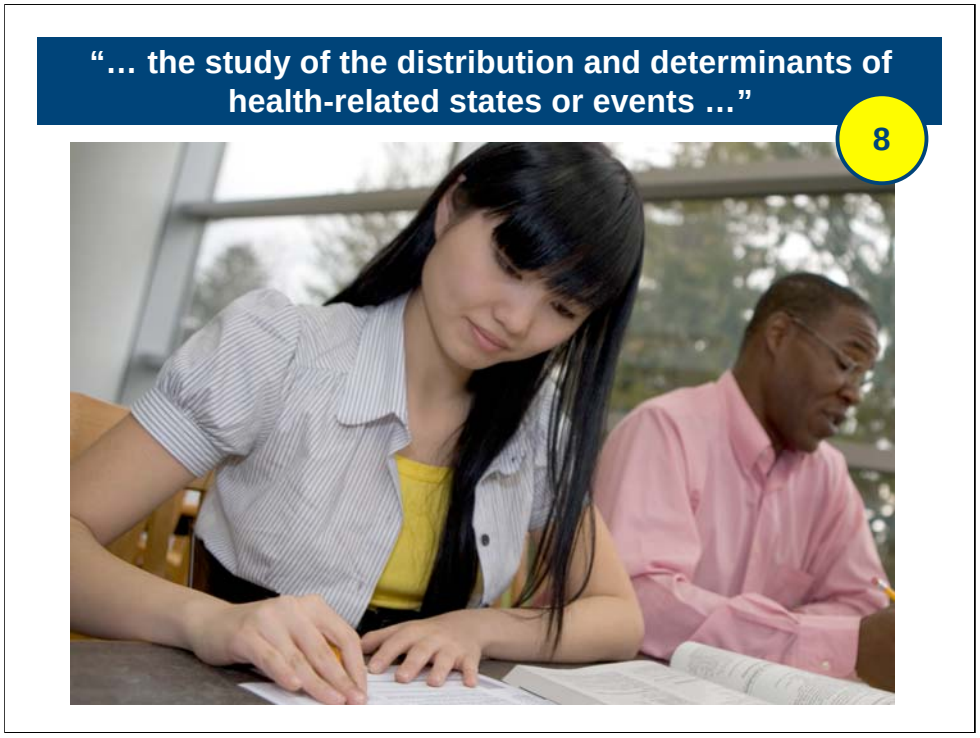
They realize that one of the goals of epidemiology is the control of health problems by identifying and avoiding or eliminating the exposures that cause the problems. And they realize that if an observed association is not causal but the result of confounding, eliminating the exposure will not prevent the outcome.

Next Slide



Ask students to answer Question 7 by explaining again what the headline "A Study Finds More Links Between TV and Violence" means to them.

Next Slide



Now ask students to answer Question 8 by describing how their answers to Questions 1 and 7 differ.

Next Slide

Assessment 9

In a study of the hypothesis that drinking orange juice prevents the flu, 3000 students at Wright High School, who did not have the flu on December 31, 2000, were followed from January 1 through March 31, 2001. By the end of the study, among the 1000 students who drank orange juice, 123 students had developed the flu. Among the 2000 students who did not drink orange juice, 342 students had developed the flu. Display the above data on a 2 3 2 table, calculate the risks of flu, calculate the relative risk, and explain whether or not the results support the hypothesis that drinking orange juice prevents the flu.

To assess their understanding of these epidemiologic principles, ask students to answer Question 9.

end