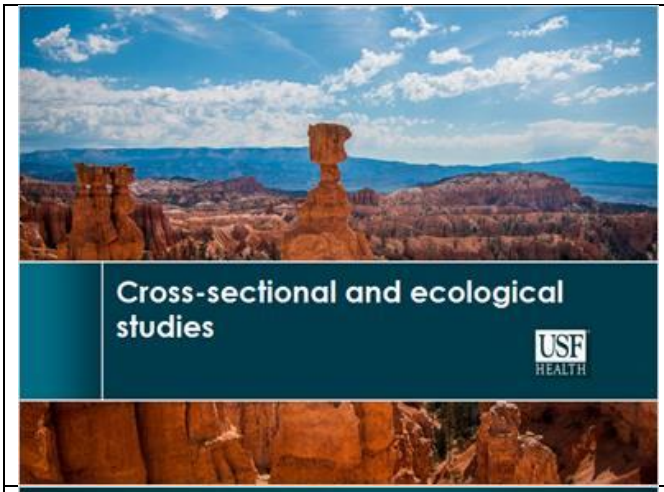
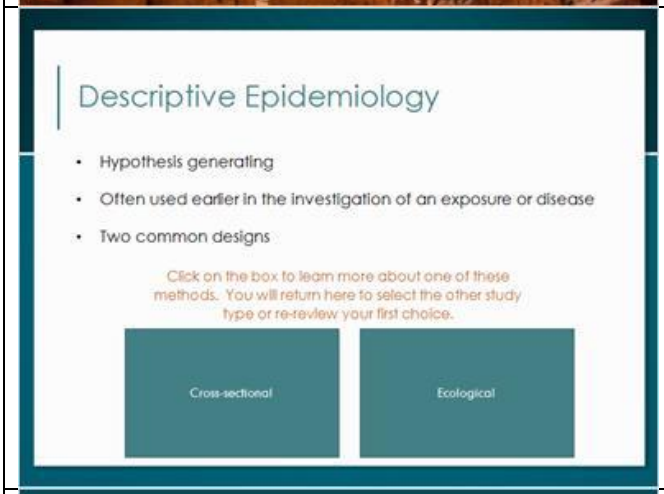
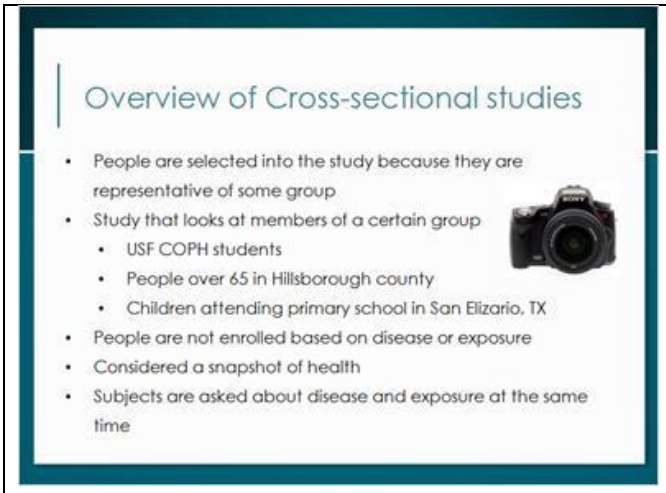
Cross Sectional Studies

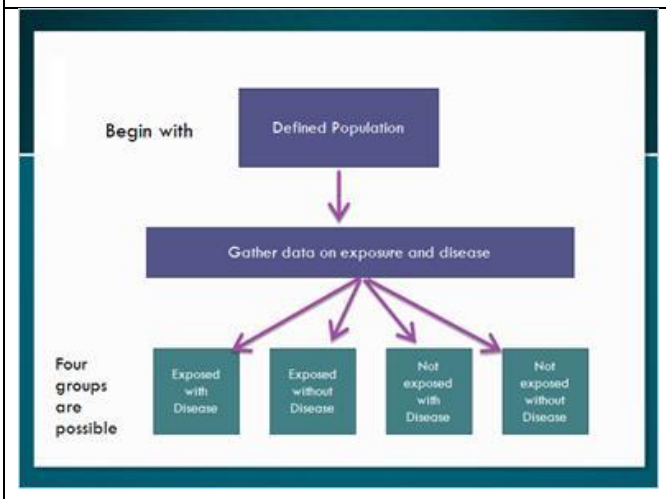
	In this lecture, I am going to review the two major types of descriptive research studies, the cross-sectional and ecological studies. Both of these studies are commonly used and they provide important health information.
	First, let me remind you of the characteristics of descriptive epidemiology. Descriptive studies serve to describe characteristics of disease and exposure and are often used early in a research investigation. They tend to be hypothesis generating, which essentially means they ask more questions than provide answers. They are useful to help us understand possible areas for future research. Descriptive studies include case studies and case series as well as cross-sectional and ecological studies. Results from these studies can be important.
	First let's review cross-sectional studies.



Remember when I spoke about study design before that I said one of the first ways to determine the type of study you have is to look at how people are selected for the research studies. In cross-sectional studies, people are selected for the study based on the fact that they are representative of some group of people. They are not selected based on their exposure or outcome, although we may choose to study a group of people at high risk for a given disease or outcome.

We may choose people who are the members of a certain group, for example USF COPH students, people over 65 in Hillsborough County, or in a cross-sectional study I conducted, children attending a primary school in San Elizario, Texas. I will tell you more about that study later.

A cross-sectional study is considered a snapshot of health as we collect data at one point in time. After we identify people in the study, we then determine exposure and disease at essentially the same time, often using a survey although we can also do physical tests. You can also collect information on multiple diseases and exposures at the same time.

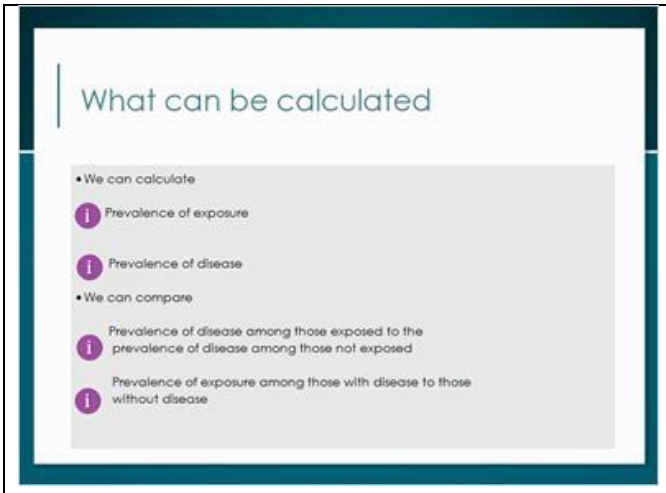


Here is a graphic that describes this study design. You have a defined population and you obtain information on the exposure and disease of interest. Then you categorize the population into four groups:

- Exposed with disease
- Exposed without the disease
- Non-exposed with the disease
- Non exposed without the disease

You can obtain the following information from your study:

- The number of people in the entire population with disease
- The number of people in the entire population who were exposed
- The association of disease and exposure



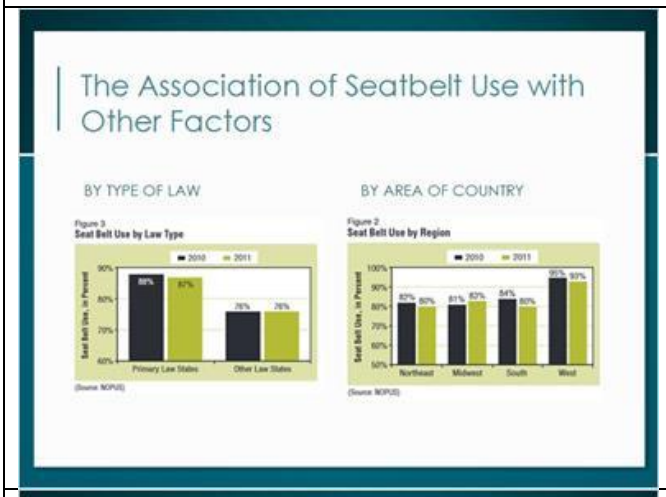
This slide reviews what we can calculate from this type of study.

We can determine the total number of those exposed by dividing the number exposed by the total population.

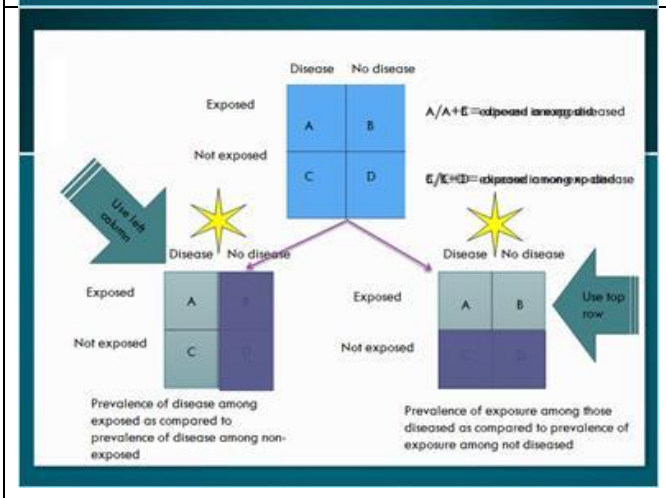
We can determine the total number of those with disease by dividing the number with disease by the total population.

We can compare the prevalence of disease among the exposed with the non-exposed by obtaining the prevalence of disease in each group and dividing the prevalence of disease in exposed by the prevalence of disease in the non-exposed.

We can compare the prevalence of exposure among the diseased with the diseased by obtaining the prevalence of exposure in each group and dividing the prevalence of exposure in those with disease by the prevalence of exposure in the non-diseased.



Here are some more results from the ecological studies, the first showing the association of seat belt use by region, and the second the association of seat belt use with type of law. These data are interesting but again, association does not necessarily mean causation. Let me explain that further.



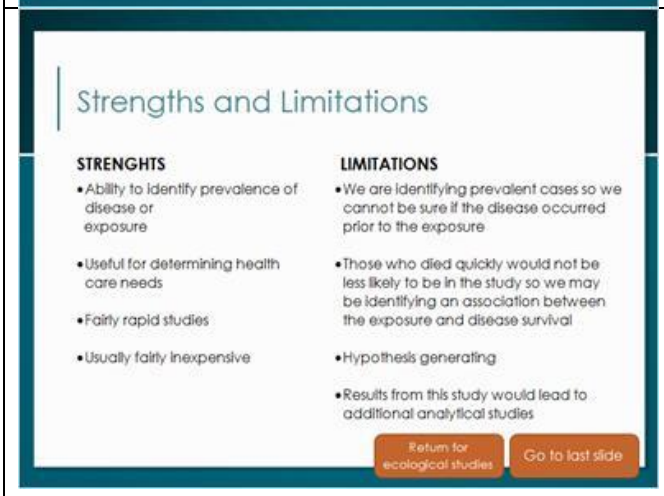
This slide demonstrates the calculations I presented in the prior slide. Take your time going through them as it can be confusing.

How do you use this study to identify the association between disease and exposure?

First, you create a 2 x 2 table using the data from the study. Put disease Yes, No across the top and exposure yes, no along the sides. Then fill in the boxes with the information you have. After you set up a 2 by 2 table, you can analyze it in two different ways, depending on what you want to know.

	If you want to compare the prevalence of disease among those exposed to those not exposed, you are essentially looking down the 2 by 2 table. a/a+b divided by c/c+d The formula looks at the prevalence of disease among those exposed as compared to the prevalence of disease among those not exposed. A statement describing this would say something like 20% of people who smoke cigarettes have asthma as compared to 10% of people who do not smoke. If you want to compare the prevalence of exposure between those with disease and those without disease, you are looking across the 2 x 2 table. a/a+c divided by b/b+d The formula looks at the prevalence of exposure among those with disease as compared to the prevalence of exposure among those without disease. A statement describing this might say, 15% of people who have heart disease are obese as compared to 5% of people without heart disease. So which way do you want to do the analysis? The answer is, as it often is, in epidemiology, it depends. Are you interested in addressing the exposure or disease? Look over your hypothesis to see how you phrased it and you will understand how you want to do the analyses. If your hypothesis is that people with asthma are more likely to be obese than those without asthma, then you want to compare the prevalence of exposure among the diseased. If your hypothesis states that obese people are more likely to have asthma than those who are not obese, then you want to compare the prevalence of disease between the exposed and non-exposed. Often it is not clear in cross-sectional studies which way to look at the data. In other studies, it can be much clearer.

Video

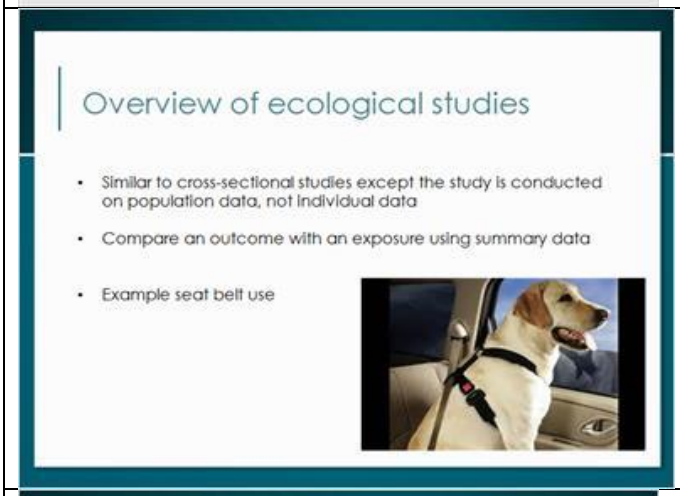
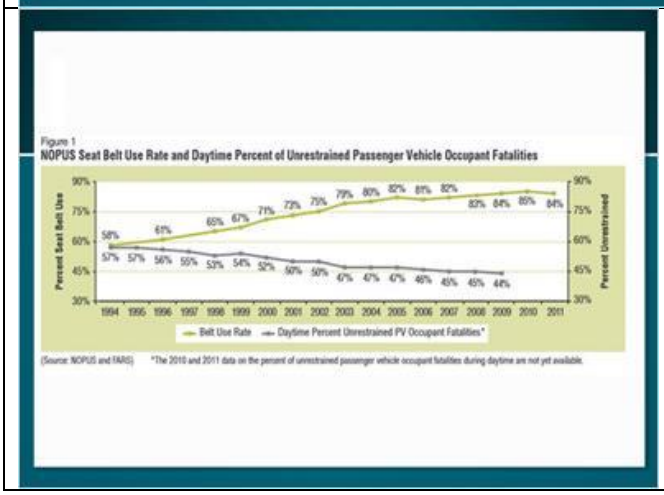


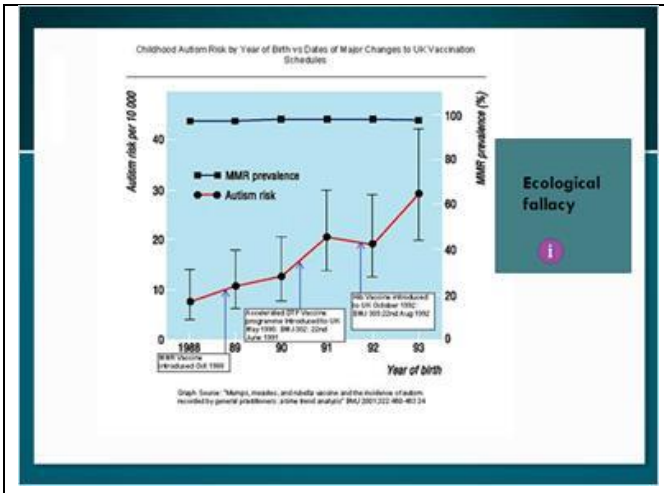
Strengths: Cross-sectional studies can be very useful. Since they can calculate the prevalence of disease, results can be compared to other studies and determine if there is a health problem. In the case of the HAV study, the prevalence of antibodies of 16.9% was higher than that of the US as a whole, and since this study was representative of the community, it was used to add HAV to the Vaccines for Children program.

This study identified a health care need. It was relatively rapid, taking about 6 months to obtain approval, set up the study, draw blood from the children, and obtain the results.

It was also incredibly inexpensive as it was done for $30,000, which was actually not possible. Had I been a more experienced researcher, I would have known it could not be done. Since I wasn't we forged ahead and used many volunteers, only paying the promotors who obtained the surveys, the phlebotomists who drew the blood, and the vaccines we provided to HAV negative children. Everything else was based on the good will of the community, including most notably, the hospital chef who made great cookies for the kids.

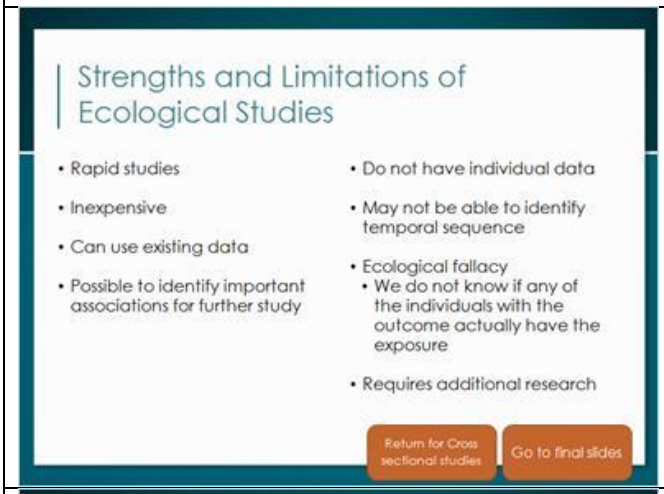
Limitations: There are some limitations. Since the HAV antibodies we measured indicated past infection, we could not know if the exposure of living in Mexico caused the disease or if they were exposed before living in Mexico. Since we measured antibodies of a relatively minor illness in children, we did not likely miss any child who had died from the disease, although that certainly could be true of a study of Hepatitis E which can be much more serious. The value of associations we

	looked at was not very high. But based on this study, we might want to do further research to determine if children who were HAV positive were more likely to eat street foods in Mexico or have greater exposure to people who were infected than those who were HAV negative. This requires a more focused study with more questions on the Mexico experience.
	Title Slide
	Ecological studies are research studies conducted on groups of people and individual level data are not collected. Often these studies utilize already available data collected for other reasons. The main limitation is that without individual data, one cannot be certain that those individuals with the exposure have the outcome. Let me give you an example using research on seat belts.
	This graph shows the association between changes in seat belt use rates and the percent of unrestrained passengers who were killed in automobile accidents. You can see that there is an association between the two factors with a decrease in fatalities of unrestrained passengers as seat belt usage increases. The important thing to remember is that association does not necessarily mean causation. In this case, it seems likely that the decrease in mortality by unrestrained passengers is due to changes in seat belt use but one cannot be sure.



This graph is typical of the type of research used to support an association between autism and childhood vaccination. We know that autism rates have been rising since 1998 and we know that there has been a sharp increase in childhood vaccinations. This association has been largely used by anti-vaccination groups as evidence that vaccine use causes autism. However, multiple analytic research studies have shown on the individual level there is no association.

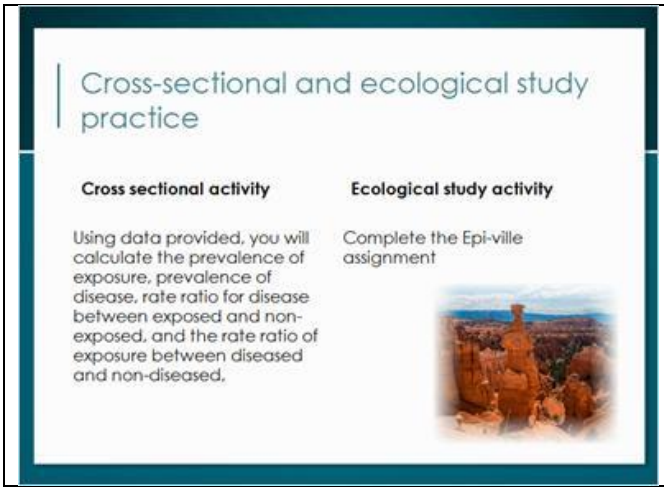
Part of the reason for this discordance in results is the ecological fallacy, a common issue in ecological studies. This fallacy states that while there may be associations between two factors in an ecological study, it is not possible to know if the individuals with the risk factor are the ones who experience the outcome.



The main strength of an ecological study is that these studies are relatively inexpensive and come often be done quickly using existing data. These studies are usually used to generate ideas for future studies but the main limitation is that they do not use individual level data and the ecological fallacy, which states that we cannot know if the individuals who experience the outcome are those who were actually exposed to the risk factor. There could easily be some third variable that caused both the exposure and outcome. One really can't know for sure.

This slides provides a quick review of the two descriptive study designs we discussed: cross-sectional and ecologic. Both are useful for generating hypotheses. They tend to be rapid and fairly inexpensive. But they suffer from potential biases due to difficulty in determining the temporal sequence and for the ecological studies, they are limited by the ecological fallacy.

Please complete the exercise on ecological studies at this point.

	Practice Exercise