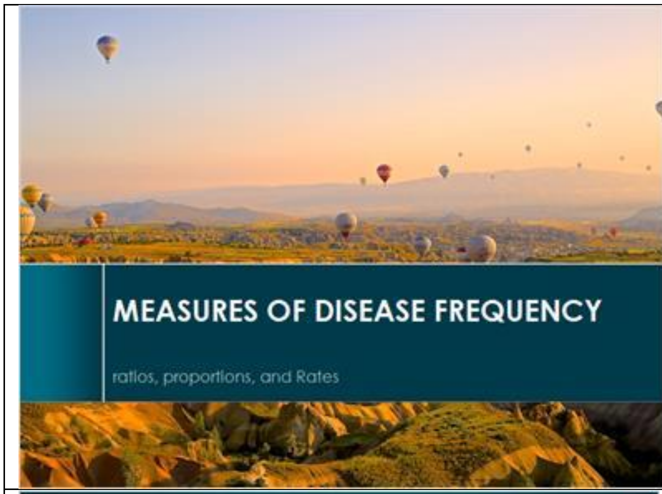
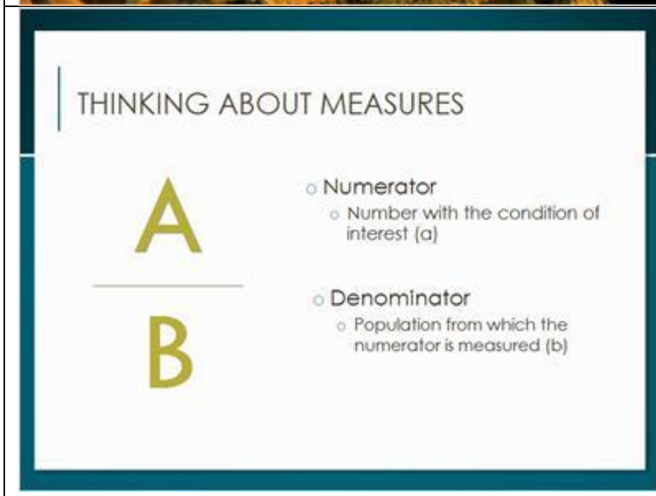
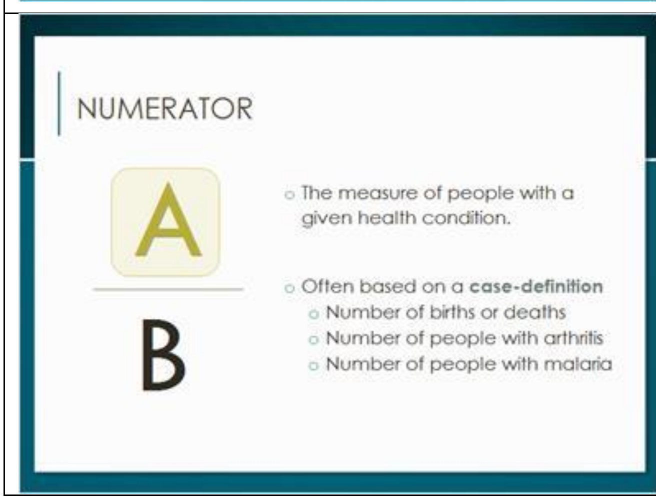
Measures of Disease Frequency Handout



This module will review common epidemiological measures and also explain how to calculate important measures. We will also begin using a statistical program, SPSS, to perform calculations. We will do some of the more basic calculations by hand as well but it is very useful to develop skills in using statistical packages. We have designed a series of videos to walk you through the use of SPSS and in addition, you have a very user friendly manual on the program. Take the time to learn this skill as we will be using it throughout the class and are also incorporating SPSS into Biostatistics 1.

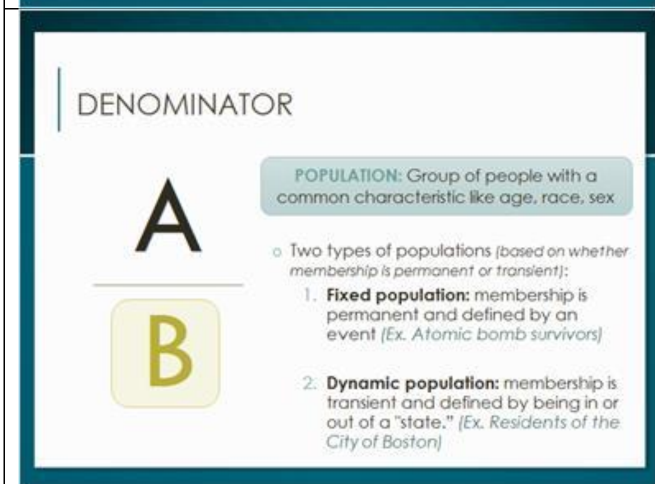


To understand this epidemiology, we need to first learn how to calculate basic measures. I want to remind you of prior math classes in which you studied fractions. I think many of us began this experience in the 4th grade. Do you recall discussion of the numeration and denominator? The fraction on the right a/b includes the numerator "a" divided by the denominator "b". When we study a disease in a population, we usually use the numerator to identify the number of people with the disease and the denominator the number of people in the population we are studying.

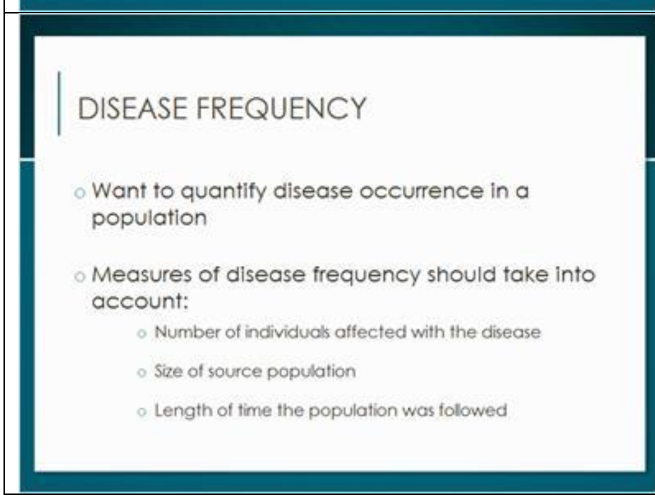


The numerator therefore is obtained by counting people with a disease or other condition. To accurately count people with a disease, we need to have a case definition, i.e., a definition of the disease that allows us to accurately identify people with the disease and exclude people without the disease. Case definitions can be based upon physical symptoms, a diagnostic exam, laboratory tests, or a combination of all three. While this seems rather simple, think of how many people say they had the flu last year and how many of them may have had a bad cold instead

Not everyone who gets sick gets medical treatment so the number of people with a condition may vary greatly depending on where you obtain cases. If you study people with asthma in a hospital, you will likely have smaller numbers but much sicker patients than if you study people with asthma in a hospital. We will look at this in greater detail in a future lecture. I listed a few possible numerators for you.



As I said the denominator is a measure of the underlying population, and obtaining denominator data has its own challenges as well. Populations are groups of people with a common characteristic. As I said previously, some populations are easier to measure than others, and some change over times. When we look at large populations we often use census data, and estimate the population size to the best of our ability.



A common measure we use in epidemiology is a measure of disease frequency. There are three components to this measure: the number of individuals affected with the disease, the size of source population, and the length of time the population was followed.

Now we are going to move onto a discussion of rates, ratios and proportions. Your book has a clear and simple explanation of this. I also find Table 2-4 which describes the type of calculations for each very useful.

This slide presents a brief overview of the differences between ratios, proportions, and rates. These measures are all a means of describing the relationship between disease, the population, and time, but there are some differences between these measures.

INTRODUCTION

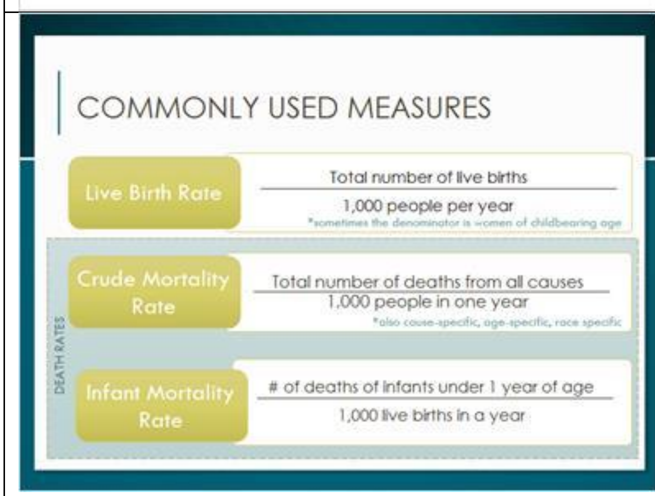
A **ratio** is when you divide one number by another, but there does not need to be any relationship between the two numbers. The easiest example to understand is the ratio of men to women in the COPH. In this case, the numerator is not a subset of the denominator.

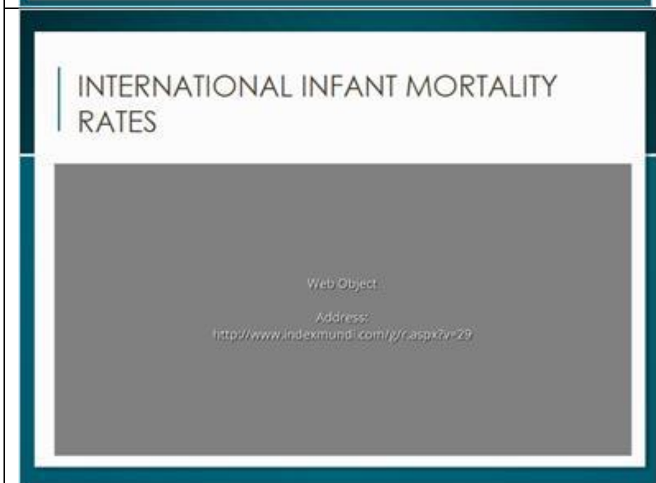
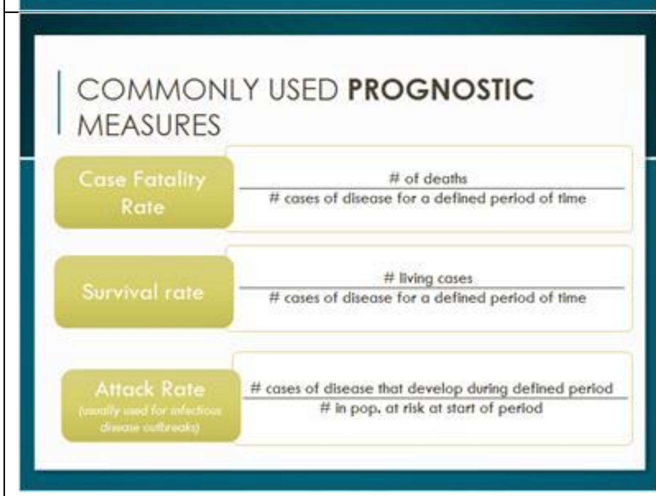
In contrast, in a **proportion**, the numerator is a subset of the denominator. For example number of men among COPH students.

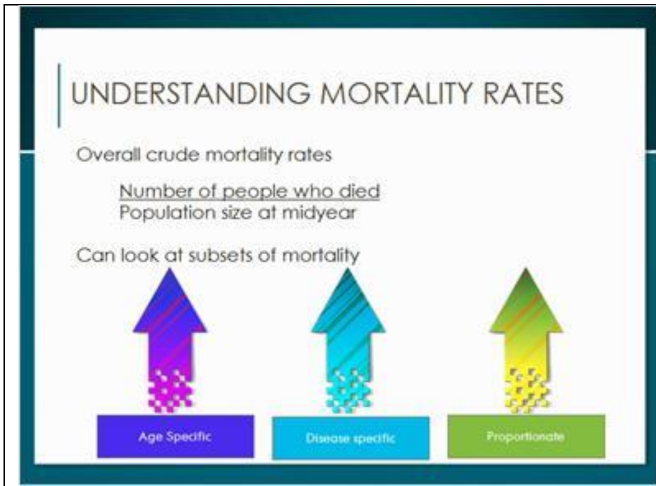
A rate is like a proportion but time is also part of the denominator. E.g., miles per hour.

This slide presents a brief overview of the differences between ratios, proportions, and rates. These measures are all a means of describing the relationship between disease, the population, and time, but there are some differences between these measures.

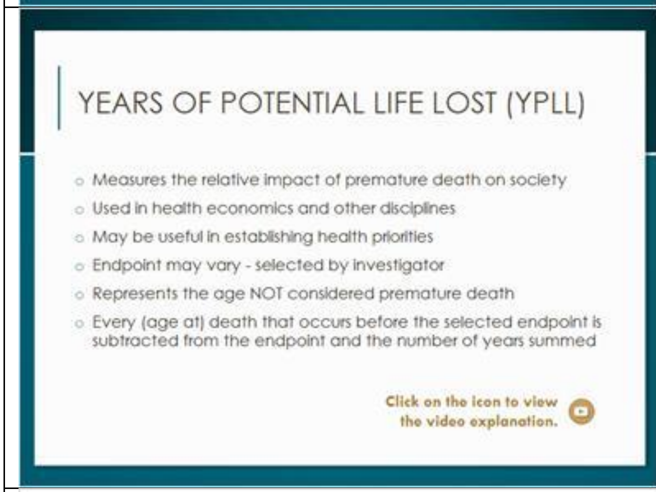
RATIO: I just want to review each of these concepts separately. As I said in a ratio, numbers are mutually exclusive, and there is no implied relationship between the numerator and denominator. For example the number of dogs to cats. Cats would assure you they do not want any relationship with dogs. Ratios are typically used to compare the magnitude of two or more measures. See the example of female to male students.

	PROPORTIONS: Proportions are situations in which the numerator is included in the denominator. We can obtain the fraction of the population that is affected. It also ranges from 0 to 1, essentially giving us a percent. **RATES:** Rates are important epidemiological measures although the term is often misused. You hear about the infant mortality rate, the death rate, etc. The key factor about rates is that time is always used in the denominator. When we calculate disease occurrence, such as stating we have 20 cases of influenza per 1,000 people in one year, this is a rate.
	Let's take a few minutes to review some commonly used measures in epidemiology.
	**Live Birth Rate:** This measure records the number of births per year in a population. Generally the denominator uses 1,000 for birth rates but that is arbitrary. We generally use the entire population as the denominator but when looking at some more specific birth rates, for example number of adolescent births, we may use just the number of adolescent women in the denominator. Death rates or the mortality rate looks at the number of deaths per a given population, and again the denominator usually uses 1,000. We might use different denominators if we are using a rarer death rate. For example when we discuss the maternal mortality rate which is the number of deaths due to childbirth, we usually state this as per 100,000 people since this is a relatively rare cause of death. The infant mortality rate is an important measure of the overall health of a country.

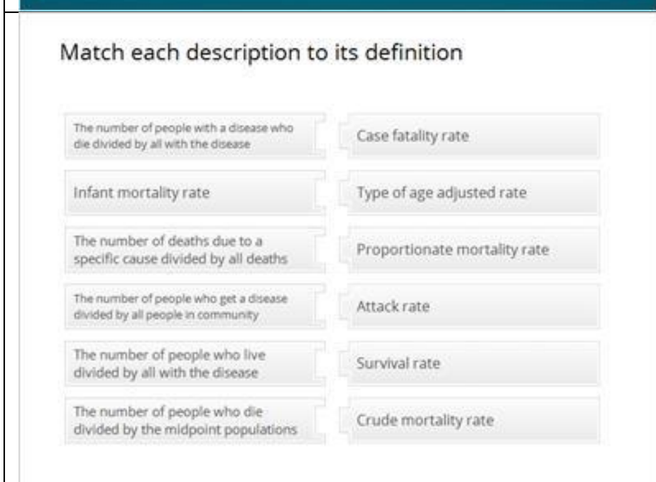
	This is a map of the infant mortality worldwide. If you go to the website for this map, http://www.indexmundi.com/map/?v=29 You can click on different countries to see the rates per country.
	Afghanistan has the highest rate and the US is 173rd out of 221 or 28th in the world. These data came from the CIA World Factbook. http://www.indexmundi.com/g/r.aspx?v=29
	There are also some commonly used prognostic measures, such as the case fatality rate which identifies the number of deaths among people with a certain disease over a defined period of time. And the corollary which is the survival rate over time. Many cancer statistics provide the five year survival rate foe cancer patients. We will be looking at these rates later in the semester. The attack rate is also a commonly used measure when we are studying disease outbreaks. In the attack rate you identify the number of cases of disease by people in the population at risk. This is used to identify the cause of morbidity in food borne outbreaks, for example the attack rate among people who ate potato salad vs. those who did not eat the potato salad.



I want to spend some time reviewing three different types of mortality rates: age specific which includes the infant mortality rate we discussed previously, disease specific mortality rates and proportionate mortality rates. Click on the arrows to obtain more information about each of these. The videos are from Dr. Patwari's video on Specific-mortality rates. The link to the fill video is provided under supplemental materials so you can review the entire video if you wish. It is important to note that there are two different disease specific mortality rates presented. Make sure you understand the difference between them.



Another interesting measure is the years of potential life lost. It measures the relative impact of premature death on society. One calculates this by first identifying the expected age of death for a population and then identifies deaths that occur prior to that age to determine the years of potential life that was lost. Endpoints do vary and deaths at a very young age clearly have a greater impact.



Matching Activity

Advances in neonatology in the early 2000s led to a decrease in the number of deaths due to preterm birth but had little impact on mortality due to congenital anomalies (birth defects). Yet there was an increase in the percent of deaths due to birth defects during that same time period. What is the most logical reason for this increase? ○ The crude death rate was inaccurate, and needed to be age adjusted. ○ There is variation in age adjusted rates when looking at preterm birth ◉ This is a proportionate mortality rate and the increase is due to the decrease proportion of preterm births ○ The case fatality of birth defects increased.	Multiple choice Activity
	This lecture covered a number of measures that are important in epidemiology. Specifically, we look at rates, ratios, and proportions. Rates are often used in epidemiology and we covered some of the more common rates that you will encounter. These include rates relevant to specific diseases.