



# Epidemiology and biostatistics

## Epidemiology

A couple of notes for better understanding... some extra problems I found online , it doesn't cover the material at all, so you have to study the slides.

Epidemiology is one of the fields in public health

During measuring the frequency of the disease there has to be a specified population usually defined by geographic area

Slide 12: Tenets are assumptions, basic concepts in field of epidemiology

The history of epidemiology (slide 17 -19)

\*John Snow is the father of epidemiology

\*The modern methods of epidemiology started after Bradford hill

\*The thought of epidemiology started at the 450BC (at Hippocrates time)

Slides 20-28 the doctor summarized the whole story, she told us to read the slides too.

The story goes like this "John Snow was in London in 1854, at that time a big outbreak happened of cholera in the golden square in London. Too many cases and no one knew what to do or why is it happening.

John had a hypothesis, that water might be the cause of cholera, that there is something in the water people drink from gave them the disease, Mr. Snow drew a map for the golden square (slide 23) as you can see he drew small black dots for the cases of cholera, people at that time used pumps to get out water from wells, so he drew big black dots for the pumps. He noticed that most cases where around these pumps where people usually get their water from, to make sure his hypothesis was right, he went to those pumps and broke their handles, so that people can no more get water from them, after the 8<sup>th</sup> of September (the day he broke the handles), the cases of cholera went down till they disappeared."

Moving on to measurements (slide29)

Incidence: proportion of new cases of a disease

Prevalence: all of the existing numbers of cases at that time

### **A problem on Cumulative incidence (not included in slides, just an example)**

During the 1999 adolescents where 13,750 in NYC schools, the schools recorded 22 new adolescents suicide attempts in the 1999, calculate the Cumulative incidence?

Cumulative Incidence =  $\frac{\text{Number of new cases of a disease during a specified period}}{\text{Population at risk in the same Period of time}}$

So the population at risk is the adolescents in NYC schools in the 1999, since the suicide attempts are from that age who go to NYC schools in the 1999 (has to be at the same period of time).

Now simple calculations ...

$$1) \quad \frac{22 \text{ NEW adolescent suicide attempts (NYC) during 1999}}{13,750 \text{ adolescents in NYC schools during 1999}}$$

$$\text{C.I.} = .0016 = 0.16\% \text{ per year}$$

C.I.= cumulative incidence

Ref: <http://ocw.tufts.edu/Content/1/CourseHome/194069/194119>

### Example on point prevalence (not in slides)

A review of patients reported to the tuberculosis registry in Midvale revealed that as **of July 1, 2005** there were 35 cases that had not yet completed therapy. The most recent population estimate for Midvale was 57,763. The prevalence of TB in Midvale on July 1, 2005 was (notice the question didn't say what type of prevalence it wants, point or period you are supposed to know that yourself from the question, we will differentiate between them later)

Point prevalence rate=All persons with a disease at a point in time/Total population

$$\frac{35}{57,763} \times 10,000 = 6.1 \text{ per 10,000 people}$$

The 10,000 because it's related to maternal which we took last semester it's per 10,000... Not a big deal just understand the example.

Point prevalence is useful in comparing different points in time to help determine whether an outbreak is occurring, so I can calculate the Point prevalence in the 2004 and compare it with 2005 or 2003, 1999...etc. Ref: <http://health.mo.gov/training/epi/PrevalenceRates-b.html>

### Example on period prevalence rate (not in slides)

In Australia **during the, 1995**, there were 4,494 dialysis patients. At that time, there were approximately 9.3 million citizens in Australia (mid-year average) what is the prevalence rate for dialysis patients?

Period prevalence rate=All persons with a disease overtime period/Average (mid-year) population in the same period

Average includes deaths, birth, and migration

Since it's over a period of time (during 1995) then it's a period prevalence

$$\frac{4,494}{9,300} = 4.832(10)^{-4}$$

Now the difference between period and point prevalence I suppose is clear, from the given date in the question you are supposed to know, like the first example it was on the 1<sup>st</sup> of July

2005, and the second example it was over a period of time which was 1995(from January till December )

Remember when comparing years to each other that is point prevalence.

## Incidence and prevalence

example scenarios(not mentioned in slides as examples but in slide 37 you can notice that the change in prevalence and incidence are related here I explained some scenarios to understand how they are related , not for memorizing but for understanding because later on in one of the examples solving it depends on understanding)

\*let's say a company developed a hand washing program during the flu season and it was a successful program , what will happen to each of prevalence ,incidence and duration?

<u>Prev</u>	<u>Inc</u>	<u>Duration</u>
↓	↓	Same

The program will help to decrease the occurrence of the flu and its cases since prevalence includes the new cases, but who ever got the flu the program won't help to reduce its duration.

\*Another scenario is, a virus more infectious, spreads faster what will change?

<u>Prev</u>	<u>Inc</u>	<u>Duration</u>
↑	↑	Same

Prevalence increase as a result of increment in incidence

\*What about if there was a new treatment that would help people recover faster from the flue

<u>Prev</u>	<u>Inc</u>	<u>Duration</u>
↓	Same	↓

Since it will cure people faster, then the duration of the disease will become less, but it doesn't prevent us from having the disease so there should be no change in the Incidence, as for prevalence since there is more people getting cured faster that means there will be less cases.

\*last scenario... new strain of flu that lasts 2 weeks instead of 1

<u>Prev</u>	<u>Inc</u>	<u>Duration</u>
↑	Same	↑

To say I have 4 cases and each week I get new cases, but the 4 cases I already have need more time to get cured so as each new case, that means I will have a lot of patients ill and still increasing each week.

Prevalence = incidence... when it's a fatal disease or it has a short duration.

## Slide 38

Doctor mentioned she will bring like this in the exam, cases (frequency)/ number surveyed

Depending on which age group you are told to calculate its prevalence, in the slide we calculated the total.

## Slide 39

There is a trick in the question and the doctor mentioned there will be like these questions in the exam.

In the example the company wanted to calculate the incidence (cumulative incidence) so there is already two people with the syndrome those won't be counted in the calculations because we want to know the number of new cases among the people who are at risk of developing the disease, not the people who already have it. So we will divide by 10 instead of 12.

### Extra examples

#### *Dental Erosion in 5-Year-Old Children*

	Evidence of Erosion	No Evidence of Erosion	Total
Fluoridated Area	46	30	76
Nonfluoridated Area	77	37	114
Total	123	67	190

- a. What is the incidence rate of erosion over the five years for the two groups of children?  
(You may assume their teeth were free of erosion at birth.)

Notice here there was an assumption that none of them had erosion from birth

So the calculation will be like this

$$\text{For fluoridated area: } \frac{46}{76} = 0.605$$

$$\text{For nonfluoridated area: } \frac{77}{114} = 0.675$$

If the question said that there were 10 kids who had erosion from birth in the non-fluoridated area, then  $114 - 10 = 104$ ... now  $77/104 = 0.74$  because I'm calculating incidence which is looking for new cases not the old ones.

Please this is not a reference just examples and clarification so you have to study the slides

Sorry for any mistake

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