

ERIC Notebook

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Incidence vs. Prevalence

Incidence and prevalence are both measures of the extent of disease in a population. Incidence tells us about a change in status from non-disease to disease, thus being limited to new cases. Prevalence includes both new cases and those who contracted the disease in the past and are still surviving. Incidence rates are favored if the rapidity with which new disease is occurring in the population is of interest. A measure of prevalence is preferred if the focus is on the overall number of cases surviving in the population.

The Numerator

Both measures consist of a numerator and a denominator. The numerator of an incidence measure is a count of the newly developed cases that arise in a population over a specified time interval such as one year. The numerator of a prevalence measure consists of a count of the total number of individuals in a population suffering from the disease at a point in time.

The Denominator

The denominator of both measures consists of the number of persons in the population from which cases of disease arise, for example, the population of a city, county, state or country. Without the denominator, we would have no basis for evaluating the public health importance of the number of disease cases that might be reported.

- 10 cases of rabies reported in one year (the numerator) is of far greater concern if all 10 cases occurred in a

single county of 50,000 people (one denominator), than if these 10 cases were the only ones in the entire world (another denominator).

Incidence

Although they are superficially similar, incidence and prevalence are distinctly different ways to express the amount of disease affecting a population. Incidence is a measure of change from non-disease to disease (which is the numerator) in a "population-at-risk" (which is the denominator) over a specific time period. By "population-at-risk," we mean all persons in the population who have not been diagnosed with the disease of interest at the beginning of the observation period, but who are capable of developing the disease.

Incidence at a glance

- Measures change from non-disease to disease
- Newly diagnosed cases / population-at-risk (or person-time-at-risk)

Measures of incidence describe the occurrence of new disease in the population and have the units of either person-time-at-risk (total amount of time contributed by each individual while he/she remained at-risk) or population-at-risk (the number of non-cases at baseline).

- For example, if the disease under study is ovarian cancer, which obviously only affects women, the denominator should consist only of women in the

population who are not cases and who are capable of developing ovarian cancer at the beginning of the observation period.

Prevalence

In contrast to incidence, prevalence is a static measure of the proportion of a population that is diseased, whether the disease cases occurred recently or at some time in the past. Prevalence measures reflect already existing disease.

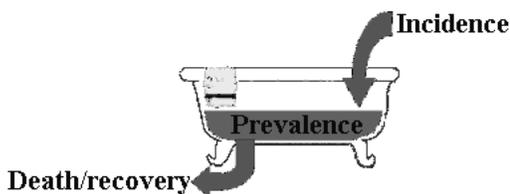
- For example, the incidence of AIDS in North Carolina in 1997 might be 50 cases per 100,000 population (50 new cases of AIDS were diagnosed out of every 100,000 people living in North Carolina in the year 1997). Whereas the prevalence of AIDS in North Carolina in 1997 would be a larger value e.g. 250 cases per 100,000 population (250 out of every 100,000 people in North Carolina are living with AIDS).

<p>Prevalence at a glance</p> <ul style="list-style-type: none"> ▪ Proportion of population which has disease ▪ Existing cases / total population
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The incidence and duration of the disease under study affect prevalence.

- For example, *Vibrio vulnificus*, a disease caused by consumption of raw shellfish, has a low incidence and short duration. Therefore, the few new cases that arise will remain prevalent in the population only a short time before leaving via recovery or death. However, for a disease like diabetes, which has a higher incidence and longer duration, the prevalence will be higher than the incidence.

The picture of the bathtub below graphically represents the relationship between incidence and prevalence.



Incidence is a measure of the flow of water into the tub, while prevalence measures the proportion of the tub (the total population) filled with water (the prevalent cases). Prevalent cases leave the prevalence pool by either recovery or death.

Characteristic	Incidence	Prevalence
What is measured	Rapidity of disease occurrence. Proportion of population developing new cases of disease.	Proportion of population with disease.
Units	Cases/person-time or Cases/population-at-risk	cases/total population (whether newly diagnosed cases or cases developing some time in the past)
Time of disease diagnosis	Newly diagnosed	Surviving cases, whether diagnosed recently or at any time in the past.
Denominator	Number of person-years (or person-months) free of the disease of interest. Number of persons free of disease at baseline.	Number of persons present in the population of interest.

Adapted from Greenberg RS et al. Medical Epidemiology. 2nd ed. Norwalk CT, Appleton & Lange, 1996, p. 20.

Self Evaluation

Q 1: If we wanted to obtain a measure of the incidence of breast cancer among women in North Carolina during 1997, what breast cancer cases would we count in the numerator?

- a. All cases of breast cancer among women in North Carolina in 1997?

- b. Only newly diagnosed cases of breast cancer among women in North Carolina in 1997?

Q 2: Assuming that we begin to measure incidence on January 1, 1997, which North Carolina women would be counted for the denominator of the incidence measure?

- a. All women in North Carolina in 1997.
- b. Only women in North Carolina without breast cancer on January 1, 1997.

Q 3: To measure the prevalence of breast cancer among women in North Carolina for the year 1997, what breast cancer cases would we count in the numerator?

- a. All breast cancer cases reported to the North Carolina Cancer Registry in 1997?
- b. All breast cancer cases ever reported to the North Carolina Cancer Registry?
- c. All surviving breast cancer cases ever reported to the North Carolina Cancer Registry?

Answers

1. Correct answer is: b. Because incidence measures a change from non-disease to disease, only newly diagnosed cases of breast cancer should be counted in the numerator. Surviving women with breast cancer diagnosed prior to 1997 are not part of the change from non-disease to disease in the year 1997.

2. Correct answer is: b. All women in North Carolina who, on January 1, 1997, do not have breast cancer. More specifically, all women who do not have a diagnosis of breast cancer. Some women may have undiagnosed breast cancer on that date, but they would not be counted in the numerator because they cannot be identified as a case. Therefore, they would be at risk for breast cancer and thus be included in the denominator.

3. Correct answer is: c. Only surviving cases of breast cancer are included, since prevalence is a measure of the number of cases of disease present in the population at a point in time (commonly referred to as point prevalence) or during a period of time (commonly referred to as period prevalence).

Glossary

Incidence - The number of instances of illness commencing, or persons falling ill, during a given period in a specified population.¹

Prevalence - The number of events, e.g., instances of a given disease or other condition, in a given population at a designated time.²

¹Prevalence and Incidence, WHO Bull 1966; 35:783-4.

²Last J, ed. A Dictionary of Epidemiology, 3rd ed. New York: Oxford University Press, 1995.

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Epidemiologic Research and Information Center

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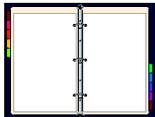
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