Incidence Risk and Incidence Rate

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Key points

- Incidence risk is a measure of disease occurrence over a defined period of time. It is a proportion, therefore takes values from 0 to 1 (0% to 100%).
- Incidence rate takes into account the time an individual is at risk of disease. It is not a proportion since it defines the number of cases per animal or farm time at risk.
- Incidence risk and Incidence rate are often confused. Incidence risk and rate are numerically the same when the period at risk does not vary across individuals being studied.

This article is a follow up to the Science Page from the June 2nd, 2017 report

Incidence risk is the total number of new cases divided by the population at risk at the beginning of the observation period. For example, if one hundred sow farms were followed for a year, and during this time 10 sow farms broke with a disease, then the incidence risk for that disease was 0.1 or 10%. In other words, a sow farm has a 10% chance of breaking in a year. This approach works well for closed populations where no additions or subtractions occur during the observation period. In this scenario, all farms have the same time at risk.

The longer the period of time a farm is observed, the greater the chances are for it to experience a break. Therefore, if the time at risk is different across farms, the measure of disease occurrence has to take the time at risk into account.

Now, let's say for example that one hundred farms will be followed for a year but two months into the year 20 farms decided to withdraw from the study. Then, 6 months into the year 50 farms decided to participate and report disease breaks until the end of the year. At the end of the study period, 10 breaks were recorded as shown in table 1. In this scenario incidence risk cannot be calculated since farms were at risk of breaking for different periods of time. Therefore, it is more appropriate to look at the incidence rate of the farm population.

Table 1: Incidence rate calculation

Farms	Observation period (months)	Farm-month at risk	Cases	Incidence rate
20	2	40	4	
80	12	960	4	
50	6	300	2	
		1300	10	0.0077

Incidence rate is the total number of new infections divided by the animal or herd-time at risk during the observation period (farm-month at risk). In Table 1 example, incidence rate is 10 cases/1300 farm-month at risk = 0.0077 cases per farm-month at risk or 0.092 cases per farm-year at risk (0.0077 * 12) or 9 cases per 100 farm-years at risk.

Although interpreting incidence rate can be challenging, it is the preferred measure of disease occurrence when the population being studied is not closed.