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Measures of Morbidity in a Community

Attack rates

Adapted from Medical Biostatistics, Third Edition (MedicalBiostatistics.synthasite.com)
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Chapman & Hall/ CRC Press, 2012 US$129.95
Available at CRC Press

In the case of acute conditions, particularly infections, it is easier to talk in terms of attacks than incidence. The same person can have two or three attacks of diarrhea or of cold in one year. Some noncommunicable conditions such as angina and asthma also have the same feature. Thus, the emphasis here is on spells rather than on affected persons.

Before attack rates, the following indicator may be useful in some situations.

$$\text{Infection rate} = \frac{\text{manifest cases + cases with inapparent infection}}{\text{exposed subjects}} * 1000$$

Inapparent infection is generally determined by serological examination. The preceding rate is person based rather than spells based; related to a duration of time, say a year; and measures the number of subjects affected when they are exposed for that duration. This can also be understood to measure infectivity and pathogenicity of the infecting agent.

$$\text{Attack rate} = \frac{\text{new spells during a specified time interval}}{\text{total population at risk during the same interval}} * 100$$

The attack rate is based on spells rather than persons. This is generally used when the exposure is for a limited period such as during an epidemic. This can also be calculated per person-year.

Secondary attack rate (SAR)

$$= \frac{\text{new spells within the range of incubation period among those exposed}}{\text{subjects exposed to the primary cases that can spread the disease}} * 100$$

The denominator and the numerator are restricted to the susceptible contacts. This rate is generally used for diseases such as measles and chickenpox that are infective for only a short period. SAR measures the intensity of spread of infection or risk among the susceptible contacts after exposure to an infective case. When the primary case, also called **proband**, is infective for a long period of time such as in tuberculosis, the duration of exposure becomes important. SAR then is computed per 100 person-weeks, person-months, or person-years of exposure.

Secondary attack rate is a useful measure not only for infectious diseases but also for diseases of unknown etiology such as Hodgkin's disease to find out whether it is communicable. SAR is also useful in evaluating the effectiveness of control measures such as isolation and immunization.

Example 1 Secondary attack rate of type-1 diabetes in Colorado families

Diabetes risk in nondiabetic siblings of children diagnosed with type-I diabetes is higher. Steck et al. analysed family history of 1586 patients in Colorado with type-1 diabetes diagnosed before 16 years of age and interviewed during 1999-2002. Probands are those who were initially affected and secondary cases are those who appeared later in the family of probands.

The secondary attack rate by age 20 years in siblings was 4.4 percent but it was significantly higher in siblings of probands diagnosed under age 7 years than in those diagnosed later. In the parents too, the secondary attack rate by age 40 years was higher when proband was diagnosed under 7 years.

Side note: The study found that the median age at onset of type-1 diabetes in the probands was 7.1 years and the median diabetes duration 3.5 years.

Example 1 illustrates the use of the concept of secondary attack rate in a very different context. It also is not related to the repeated episodes, yet delineates the communicability as explained next. Such usage is not uncommon and it is nice to be familiar with different contexts in which a term can be used.