

The measurements of sickness absence – a theoretical perspective

Gunnel Hensing

*Social Medicine, Department of Public Health and Community Medicine, The Sahlgrenska Academy
at the University of Gothenburg, Göteborg, Sweden*

Correspondence: Gunnel Hensing, Social Medicine, Department of Public Health and Community Medicine, The Sahlgrenska Academy at the University of Gothenburg, PO Box 453, SE-405 Göteborg, Sweden

E-mail: gunnel.hensing@socmed.gu.se Telephone: +46317866862

ABSTRACT

The assessment of sickness absence is a challenge in spite of accessible numbers of spells, persons, and days of absence in public and employer registers. Concepts and their definitions are still to a small extent standardized, and clear and explicit definitions need to be provided. In epidemiological studies, the definition of the study base is important, and in sickness absence research a prerequisite is that an individual belongs to a sickness absence insurance scheme. Population at risk can be identified at three levels: the general population, the sickness insured population, and the sickness absent population. Cases in sickness absence studies can be quantified in terms of spell-, person-, or time based measurements. Each of these ways reflects different contents of sickness absence as a phenomenon, and the choice of measurement should be guided by the purpose of the study as well as the target area. Five different measurements (frequency, length, cumulative incidence, incidence rate, and duration) are suggested and their application is discussed. These five measurements can be seen as a summary of measurements used in different studies and an application of epidemiologic methods into sickness absence research. There are opportunities to increase the quality of sickness absence research, with an increased awareness of the importance of the measurements used.

In spite of the obvious quantitative nature of sickness absence, measured as an occurrence or as a period of time, the assessment of sickness absence is a challenge. The complexity is often overlooked. A possible reason for this might be the comparatively easy accessible numbers of spells, persons, and days of absence in employers', insurance companies', and public social insurances' registers. Sickness absence is registered for administrative and economic reasons, and as such the data are often valid, at least when it comes to numbers. The validity of diagnoses recorded in medical certificates is another kind of data, and validity and reliability might vary between registers and certificates [1,2]. Furthermore, sickness absence can be self-reported, and as such shares the pros and cons with other self-reported information, particularly regarding recall bias [3,4]. The purpose of this paper is to give an outline of how register based sickness absence can be assessed or measured, taking basic epidemiological perspectives into consideration. Other methodological and theoretical perspectives will be left aside.

Attempts have been made to review the measurements used in sickness absence research. In 1963, Gaudet reported that he had identified at least 41 different measurements used in earlier studies [5]. Tellnes found that at least 11 different measurements had been used in studies within general practice [6]. He grouped these measurements into "rates" and "duration". Roughly, measurements can be divided into these two major groups, but both rates and duration can reflect

quite different phenomena. A sickness absence rate can be defined as the number of individuals listed as sickness absent in a certain population, but it can also be the number of sickness certificates issued at a primary health care centre during a certain time period and in a defined group of patients [6]. Sickness absence duration can reflect both time lost to absence in a company or the number of days absent per employee. Basically, nothing is wrong with these applications, but, as concluded in a systematic review of sickness absence research by the Swedish Council on Technology Assessment in Health Care (SBU), very often the exact definition of a measurement is left out of the method description, or is vaguely defined, leaving the reader with not much information on how to interpret the findings [3]. An overall conclusion in the review was that evidence was missing in several major areas, and one reason was not the lack of studies but the lack of well done studies with informed assessments of sickness absence [7,8]. Since the concepts, and terminology, used still to a small extent are standardized, clear and explicit definitions need to be provided in articles using sickness absence as an outcome or as a predictor of other events. A growing understanding of sickness absence as a process contributes to an increasing awareness of the possibility that sickness absence can be used to predict other outcomes (for example mortality, career opportunities, alcohol consumption). Specific methodological challenges are associated with such studies.

THE EPIDEMIOLOGICAL PERSPECTIVE

Epidemiology can be regarded both as a theoretical perspective and a methodology. As theory, epidemiology has the population rather than the individual in focus, and measurements used tell us something about the population's health but not much about the individual's health [9,10]. In epidemiological studies, the definitions of the population at risk and of the study base, respectively, are of high importance. In sickness absence research, a prerequisite for inclusion in the study base is that an individual belongs to some kind of sickness absence insurance scheme, either as a citizen, which is the case in Nordic welfare regimes and several European countries such as the UK and the Netherlands, or as an employee, which is the case in US and several other countries [7]. Combinations occur and additional private sickness absence insurance schemes are becoming more common also in the Nordic countries. Also in public insurance schemes there might be certain qualifications regarding age or basic income levels. Thus, to define the inclusion criteria is important and to a high degree dependent on the legislation in different countries or the terms of different private or employer insurance schemes. Unfortunately, the large variation of insurance conditions makes comparisons between countries and systems difficult. Economic incentives have been suggested as important in influencing individual absence behaviour, and in the earlier mentioned systematic review by the Swedish SBU, one of few, and less surprising, evidence based conclusions was that more generous sickness insurance schemes were associated with higher sickness absence [7]. Other factors of importance for sickness absence behaviour are work environment and individual health. The qualification rules for the insurance can be regarded as an important part of the study base, which needs to be taken into account if the study participants have different types of insurance. The degree of generosity of different insurance schemes can introduce selection bias into the study. Most sickness insurance schemes have a further limit. The closer to the further limit that the duration of a sickness absence spell gets, the higher (at least from a theoretical point of view) is the probability that a change will take place. A change might be an entrance into a rehabilitation measure or into different forms of benefits. The probability of a change might also be dependent on individual characteristics such as the opportunity to have complementary income or support from family or network members. Again, there are differences between sickness insurance schemes that need to be taken into account when comparisons are made between countries or work places.

As described above and as in all epidemiological studies, definition of the population at risk (the denominator) is fundamental in sickness absence research, and likewise is the definition of the cases (the numerator) important [11]. Simplified expressed, a case is an

individual who is sickness absent, but contrary to many other epidemiological research areas, the incident sickness absence case defined as the first event of sickness absence is rare compared to repeated events. Most individuals are absent at least a couple of times during a working life. To identify the first event is easiest in the youngest population, but their presence and stability in the work force is lower than for the older employees. Short term infectious diseases, such as upper respiratory infections, are more common in the younger and are often associated with short term sickness absence. Thus, most cases in studies of sickness absence are repeated cases, and experiences of being sickness absent might influence future sickness absence episodes. Few studies take this into consideration, and epidemiological methodology is less suited to analyse repeated cases and possible effects of being repeatedly sickness absent. It seems obvious and logical that the threshold for sickness absence is lower if you have several experiences of such an event.

Furthermore, spells of sickness absence (cases) vary according to the length of the event. In some cases, the event lasts a couple of days, and in other cases, it lasts several months. For the assessment of rates, cases are usually treated as similar entities irrespective of their duration, diagnosis, and if the event is repeated or not [11]. In the first case, duration, the risk population differs, since only those already sickness absent can be at risk for a second, or third, and so on day of sickness absence. Risk populations at different levels are illustrated in the Absence pyramid (Figure 1), where at least three distinct risk populations can be identified.

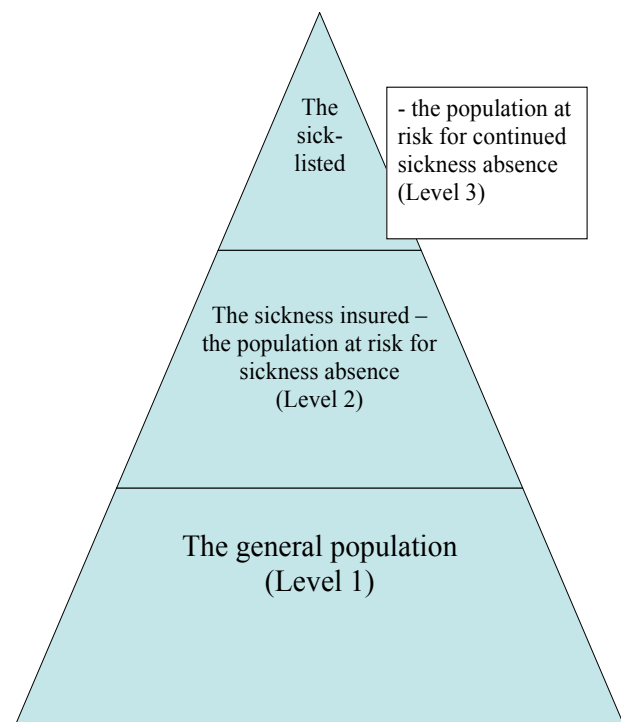


Figure 1. The absence pyramid and risk populations for sickness absence.

Table 1. Five basic measurements of sickness absence suitable for use in epidemiologic studies (Hensing et al, *Scand J Public Health* 1998; 2: 133-144 (page 142)).

Measurement name	Risk population	Cases
<i>Frequency of sickness absence</i> - spell based	Sickness insured including those currently being sickness absent (level 2)*	Current or new <i>spells</i> of sickness absence during study period
<i>Length of sickness absence</i> - time based	Sickness absent in current and new spells during study period (level 3)*	Sickness absence <i>days</i> in current and new spells during study period
<i>Cumulative incidence</i> - person based	Persons at risk (level 2) at the beginning of the study period	<i>Persons</i> with at least one new sickness absence spell during study period (irrespective of duration of that spell)
<i>Incidence rate</i> - spell and time based	Persons at risk (level 2) for a new spells of sickness absence X number of days in study period (excluding sickness absence days in new and current sickness absence spells during study period)	New sickness absence <i>spells</i> during study period
<i>Duration of absence</i> - time based	New sickness absence spells during study period (level 3)	Sickness absence <i>days</i> in new spells during study period

*Levels refer to different types of study populations presented in Figure 1 in this paper

The general population level can be seen as an anomaly, since being sickness insured actually is a necessary requirement for being sickness absent. However, evaluation studies using clinical populations, such as patients at a primary health care centre, often do not know whether patients actually are insured or not, and sickness absence rates are assessed on the whole clinical population. At the second level, assessments of incidence and prevalence are appropriate. At the highest level, the risk population consists of those who already are sickness absent, and a reasonable distinction would be between short and long term sickness absence. Where the limit for short term sickness absence goes can only be decided upon in relation to the actual sickness insurance scheme. As mentioned above, schemes differ according to qualification terms and legislation.

THE MEASUREMENTS

Sickness absence can be quantified in terms of spell-, person-, or time based measurements [3]. Sickness absence spells, often also called sickness absence episodes, are common events in a general population. The distribution of sickness absence spells is skewed, with a large number having short term spells and a small number having long term spells. In an earlier review of measurements of sickness absence, we suggested five basic ways of assessing sickness absence in epidemiologic studies, and terminology to match these five measurements [11]. These were frequency, length, cumulative incidence, incidence rate and duration. The definition of cases and the risk populations of these measurements are presented in table 1.

Frequency was suggested as a basic measure, with the whole population of those sickness insured based on spells of sickness absence rather than number of individuals. It is a measurement suitable for use in studies with an economic or work place perspective. It can give a brief overview over the burden of sickness

absence within a limited study population. In studies with a health perspective, it seems more relevant to use a measurement that is based on persons. It gives further opportunities to analyse risk factors and predictors of ill-health and disease.

Time in sickness absence can be measured as length. Often it is measured as number of days being sickness absent. It is a relevant measure and can be used to assess the burden of illness in a company, region, or society. As mentioned above, sickness absence is skewed, and length is sensitive to this, and analyses often include both the mean and median number of days being absent. Length is a measurement relevant for use in studies of return to work.

The cumulative incidence can be used to assess the proportion of individuals absent during a specified time period (the study period), as described in table 1. Prevalence can be assessed in a similar way by including also ongoing spells of sickness absence at the beginning of the study period. These measurements are as relevant in sickness absence research as in other health related studies, and as such constitute the basis for epidemiological monitoring and for studies of occurrence and causes. How the cases are defined can be changed in relation to the research area. Thus, it is possible to include only those absent with certain diagnoses on the sickness certificates, such as persons with at least one spell of sickness absence with a psychiatric diagnosis on the certificate [12]. It is also possible to limit the cases to those absent in spells of certain duration. In studies of public sickness insurance, there is usually a qualification period, and most epidemiologic studies include spells with a minimum of seven days, or in Swedish and Norwegian studies of 14 and 16 days respectively. Shorter spells in Sweden and Norway are outside the sickness benefit period for employees and is paid by and registered as sick pay by the employer, and are often left out in studies from these countries.

The incidence rate includes an estimation of the frequency per person-time. Such a measurement is intricate, since the estimation of person-time should exclude time in current spells of sickness absence as well as in new spells [13]. In larger study samples and in social insurance schemes not allowing longer spells of sickness absence, the difference in practice might be less important for the accuracy of the estimation. In smaller study samples, and in longer follow-up periods, however, the estimation of person-time need to be thought through.

Finally, duration of absence is an estimate of the mean number of days absent in each sickness absence spell. It is a measure seldom used, but can be of importance for comparisons between different diagnostic groups, and in order to estimate efforts to reduce time in rehabilitation or time to return to work. Additional measures, such as the median, can be needed in insurance schemes where there is no further limit of duration of spells. In epidemiology, the tradition has been to study the occurrence of events and their causes, rather than the duration of an event.

In sickness absence research, there is also an opportunity to study the duration of a single event, and the recommendation should be to include both person based measurements (cumulative incidence or incidence rate) and time based measurements (length or duration of absence) to give a broader picture of a health problem. We found that women had higher incidence of sickness absence with psychiatric disorders compared to men, but when we also analysed the length of absence, we found that there were no differences between the two genders. This could tentatively be explained by men becoming sickness absent in a later

phase of their disease, or by men receiving less appropriate rehabilitation measures at work or within the health care [14]. A similar finding was done in an evaluation and comparison of the above mentioned five measurements of sickness absence and two measurements (unadjusted and adjusted sick-leave rate) often used in official Swedish insurance statistics [15]. The authors concluded that the use of time based measurements, such as length and duration, identified comparable rates of sickness absence in women and men, something that the other measurements failed to do.

The five measurements can be seen as a summary of measurements used in different studies, and an application of epidemiologic methods into sickness absence research [11]. It is of course possible to develop these measurements, and the point to be made is mainly that the complexity of how to assess sickness absence often is ignored. Of importance in future studies would be to better evaluate the appropriateness of different measures in relation to the purpose of a study, and the knowledge sought. An employer might need certain data to estimate the effects of health promoting efforts, while a public health planner might need other data for epidemiologic monitoring of infectious outbreaks, or as a follow up of the long term health related work ability in a population. There are opportunities to increase the quality of studies within sickness absence research, with an increased awareness of the importance of the measurements used. A modest wish for future research is an increased collaboration between sickness absence researchers and other disciplines. This will lead to more and better research on sickness absence through new questions and better answers to these questions.

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