Proposal for classifying the different types of descriptive epidemiological studies

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Abstract

Descriptive epidemiological studies are of relevance, given that there are inconsistencies in the literature with regard to their nomenclature and classification. We reviewed 19 international and six national academic textbooks on epidemiology, where the main criterion was to have them available in order to undertake an in-depth review of chapters on descriptive epidemiology and study types. In 11 books, the authors prioritize analytical studies. Twelve foreign texts and two from Brazil include descriptive studies, although the majority did not specifically refer to a category with this name. We propose a classification based on the answers to research questions, including the following types of study: case report, case series, clinical cohort, prevalence study, incidence study (cohort) and descriptive ecological study. We discuss potential uses, implementation of novel data analysis methods and their relevance in health surveillance.

Keywords: Epdemiological Studies; Descriptive Studies; Classification.

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Introduction

According to M. Porta's Dictionary of Epidemiology (*Dicionário de Epidemiologia*),[1] epidemiology is the study of the occurrence and distribution of health-related events among specific populations, including the study of determining factors that influence such events, and the application of that knowledge to control health problems. Studying the occurrence and distribution of events is the object of descriptive epidemiological studies.

> *O estudo da ocorrência e da distribuição de eventos constitui o objeto dos estudos epidemiológicos descritivos.*

In these studies, researchers do not seek to verify the existence or otherwise of association between exposure variables and outcome variables. Traditionally, their overriding characteristic is the fact of their not having a comparison group, commonly referred to as a "control group". Determining the frequency of events and their distribution, according to the characteristics of the people affected or who report a given antecedent, and according to spatial and temporal location, enables identification of population groups, geographical areas and periods of risk (incidence) or of greater presence (prevalence) of the health condition. They also allow hypotheses to be formulated about the factors responsible for their frequency and distribution. These hypotheses can subsequently be tested through analytical epidemiological studies.

The purpose of this article is to characterize the different types of descriptive studies in existence, to propose a classification and to contribute to the appropriate evaluation of their potentialities and limitations in relation to their intended objectives.

Background to the characterization of descriptive studies

We reviewed academic textbooks on epidemiology in the international and national literature; the main criterion was to have them available for in-depth review of chapters on descriptive epidemiology and types of studies. In all, the material that underpins this proposal corresponds to 25 textbooks, of which 19 are foreign and six are Brazilian. The material in question was produced by 27 authors or groups of authors. Two of the books contain two chapters by different authors addressing the theme.

The question of the nomenclature of descriptive epidemiological studies begins with the very recognition of a category that includes such studies. Many authors simply ignore or do not mention any type of epidemiological study other than the analytical type, i.e. a type of study that does not have groups for comparison and which does not test hypotheses.

Figure 1, shows eight foreign textbooks, one of which contains two chapters by different authors, in which there is no detailing of descriptive studies, because absolute priority is given to analytical studies. The books begin with one of the first academic works in the area, namely the text by MacMahon & Plugh (1970),[2] and end with one of the most complete works in terms of its theoretical reflection and in-depth methodological approach, namely the text by Rothman et al. (2008).[3] The texts mentioned only present descriptive epidemiology and differentiate between measures of incidence and prevalence.

In Figure 2, twelve textbooks are presented in which there is some degree of detail on certain descriptive epidemiological studies presented in sections or specific chapters. The titles of these chapters often do not mention descriptive epidemiology or even types of descriptive studies. For example, Gordis (2014)[4] mentions descriptive studies in the chapters entitled "Natural history of disease: ways of expressing prognosis" and "Assessing preventive and therapeutic measures". In general, the authors recognize the difference between descriptive and analytical studies, placing greater relevance on the second kind. In applied field research, despite the value placed on descriptive epidemiology, greater relevance is attributed to analytical studies, in the sense of their potential for enlightening the etiology of outbreaks.[5,6] In the majority of cases in which specific study types are referred to, mention is made of prevalence studies referred to as population-based surveys or *encuestas* or, otherwise, mention is made of case report studies and clinical case series studies. There is frequently inconsistency in the denominations used.

Authors	Year	Reference
MacMahon B, Pugh TE.	1970	Epidemiology, principles and methods. 1st ed. Boston: Little, Brown and Company.
Mausner JS, Bahn AK.	1974	Epidemiology. An Introductory text. 1st ed. Philadelphia: W. B. Saunders Company.
Goodman RA, Peavy JV.	1996[a]	Describing epidemiologic data. In: Gregg MB. Field epidemiology. 1st ed. Oxford: Oxford University Press; p. 60-80.
Buehler JW, Dicker RC.	1996[a]	Designing studies in the field. In: Gregg MB. Field epidemiology. 1st ed. Oxford: Oxford University Press; p. 81-91.
Beaglehole R, Bonita R, Kjellström T.	2001	Epidemiologia básica. 2ª ed. São Paulo: Organização Mundial da Saúde e Livraria Santos Editora.
Friis RH, Sellers TA.	2004	Epidemiology for public health practice. 3rd ed. Mississauga, ON: Jones and Bartlett Publishers.
Hulley SB, Cummings SR, Browner WS, Grady D, & Newman TB.	2008	Delineando pesquisas clínicas: uma abordagem epidemiológica. 3ª ed. Porto Alegre: Artmed.
Rothman KJ, Greenland S, Lash TL.	2008	Modern epidemiology. 3rd ed. Baltimore: Wolters Kluwer/Lippincott Williams & Wilkins; Chapter 6, Types of epidemiologic studies; p. 87-99.

a) chapters in the same book.

Figure 1 – Epidemiology textbooks produced abroad that prioritize analytical epidemiological studies and do not detail descriptive studies

The majority of the Brazilian textbooks on epidemiology, shown in Figure 3, include chapters containing descriptive analysis, always giving emphasis to measurements of disease incidence and prevalence in a given population, according to variations relating to people, place and time. Emphasis is also placed on the form of analysis and data presentation. However, similarly to the books published internationally, their nomenclature does not specifically include descriptive studies. The six authors shown in Figure 3 place emphasis on analytical studies. For example, in the same book, the chapter that deals with study types does not mention descriptive studies,[7] while a chapter specifically about ecological studies separates "exploratory' strategies from "analytical" strategies. Those exploratory strategies could be called *descriptive* strategies.[8]

Figure 4 shows two Brazilian textbooks which make more detailed mention of some descriptive studies. Pereira (1995, p. 278)[9] characterizes descriptive studies as being those which do not have control groups, thus differentiating them from analytical studies. The author lists nine types of epidemiological studies, the first four of which are descriptive: case study, case series, incidence study and prevalence study (descriptive cross-sectional).

Still in relation to the Brazilian publications, Zanetta (2004)[10] recognizes the existence of descriptive studies in contrast to analytical studies. According to this author, descriptive studies "report prevalence rates or describe a situation that appears to be abnormal", and they are useful for health service planning and for generating hypotheses "in the experimental field". When listing the "designs of studies in medicine", she includes the case report, case series and cross-sectional or prevalence studies which she cites as descriptive studies. The remainder are analytical studies.

Classifying descriptive studies: does it make sense?

When reading textbook chapters, it can be perceived that there are different approaches, ranging from complete omission of descriptive studies to their inclusion. When descriptive studies are included, there are different ways of conceptualizing and classifying them. An initial difficulty is the tendency to call descriptive studies only those studies conducted using secondary macrodemographic data or non-clinical data on open populations.

It is also relevant to differentiate between data collection technique and study type. With this in mind it is important to recall the proposal made by Laurenti et al.[11] who consider that "gathering statistical data" is the set of operations that allow collection of data which enable an event to be characterized. From this perspective, collection can be done by using existing recorded data (which the author refers to as data gathering *per se*); or by using existing but unrecorded

Inclusion of descriptive studies	Authors	Years	References	Studies cited	Notes
No separate chapter on descriptive studies; specific descriptive studies are cited in some chapters, or descriptive studies are cited using other names for them.	Gordis L. 2014.	2014	Epidemiology. 5th ed. Philadelphia, PA: Elsevier / Saunders.	The author addresses clinical research without comparison groups which involve patient follow-up (patient cohort), case studies and "case series".	Two chapters, "Natural history of disease: ways of expressing prognosis" and "Assessing preventive and therapeutic measures", address in detail, respectively, clinical studies and their outcomes (cure, control and death), and measurement methods (life table and survival analysis).
	Kleinbaum DG, Kupper LL, Morgenstern H.	1982	Epidemiologic research: Principles and quantitative methods. 1st ed. New York: Van Nostrand Reinhold; Chapter 3, Types of epidemiologic research; p. 40-50.	Mention of descriptive studies is included in "observational studies". In this context, a descriptive study is defined as one which is conducted "when little is known about the occurrence, natural history or determinants of the disease". Its objectives would therefore be to determine the frequency or temporal trend of a disease in a specific population and to formulate etiological hypotheses.	In their conceptualization of epidemiological studies, the authors note that their characterization depends on the level on which they are implemented, whereby this "level" is related to the period of the disease's natural history, adopting Leavell & Clark's model of levels of prevention. The authors recall that epidemiological research has the following objectives: describe, explain, predict and control.
	Abramson JH, Abramson ZH.	2008	Research methods in community medicine. Surveys, Epidemiological research, Programme evaluation, Clinical trials. 6th ed. West Sussex: John Wiley & Sons; Chapter 2, Types of investigation; p. 13-34.	Mention is made of two types of studies in the item entitled Descriptive surveys: longitudinal studies, which examine changes, such as "child growth and development, changes in the suicide rate, natural history of a disease or a study of the occurrence of new cases of a disease or deaths in the population", and cross-sectional studies. The authors include a "clinical studies" category to refer to the study of "characteristics or evolution of a series of patients".	According to these authors, descriptive studies describe the "status of a disease" in the population and its distribution in relation to sex, age, religion, among other variables. The term survey is mentioned, to which the authors attribute the following meanings, among others: "descriptive study of population characteristics", "household survey" or "field survey".
	Jekel JF, Katz DL, Elmore JG.	2005	Epidemiologia, Bioestatística e medicina Preventiva. 2ª ed. Porto Alegre: Artmed; Chapter 5, Delineamentos comuns de pesquisa usados em epidemiologia; p.88-99.	Cross-sectional surveys that collect data on frequency of disease risk factors and disease prevalence; interview surveys; mass screening programs.	The authors indicate the existence of "observational designs for generating hypotheses" without using the term "descriptive".
	Lilienfeld DE, Stolley PD.	1994	Foundations of epidemiology. 3rd ed. Oxford: Oxford University Press.	The authors differentiate between "demographic" studies (of mortality or morbidity) and "epidemiological" studies. The former detect trends over time and different distribution patterns, according to the people and the place in which deaths or cases of a disease occur.	Studies which the authors call "epidemiological" studies, correspond, roughly speaking, to analytical studies (whether they be observational or experimental).

Figure 2 – Textbooks on epidemiology produced abroad which include descriptive epidemiological studies

To be continue

Continuation

Inclusion of descriptive studies	Authors	Years	References	Studies cited	Notes
No separate chapter on descriptive studies; specific descriptive studies are cited in some chapters, or descriptive studies are cited using other names for them.	Szklo M, Nieto FJ.	2007	Epidemiology. Beyond the basics. 2nd ed. Boston: Jones and Bartlett Publishers; Chapter 1, Basic study designs in analytical epidemiology; p. 3-43.	The authors refer to both descriptive epidemiology and analytical epidemiology. Descriptive epidemiology uses available data to examine the way in which rates (e.g. mortality rates) behave in relation to demographic variables (variables obtained via census).	Based on detection of non-uniform distributions, according to the authors, epidemiologists define "high-risk groups" for prevention purposes and also for generating causal hypotheses.
	Fletcher RH, Fletcher SW, Wagner EH.	1996	Epidemiologia clínica: elementos essenciais. 3ª ed. Porto Alegre: Artes Médicas.	There is no section on descriptive studies. However, in the chapter "*Estudando casos* (Studying cases)", the authors mention case reports, case series and case-control studies.	These authors suggest that 10 patients is the number that is the criterion for separating case reports from case series. When describing case series they say that: "it is a study of a larger group of patients (e.g. 10 or more) with a particular disease".
	Olsen J, Basso O.	2015	Study Design. In: Olsen J, Greene N, Saracci R, Trichopoulos D. Teaching epidemiology. A guide for teachers in epidemiology, public health and clinical medicine. 4th ed. Oxford: Oxford University Press; 37-55.	There is no section on descriptive studies. However, in the chapter "Study design", the authors mention surveys, defining them as prevalence studies in a defined population.	Mention is also made of "case-only studies" and "case-cross over studies", without going into their characterization as descriptive studies.
Contains a section on descriptive studies.	Hennekens CH, Buring JE.	1987	Descriptive studies. In: Hennekens CH, Buring JE, Mayrent SL. Epidemiology in medicine. 1st ed. Boston: Little, Brown and Company; p. 101-131.	Correlation studies (equivalent to analytical ecological studies); case reports; case series; and cross-sectional surveys, which can only describe exposures and/or outcomes, or move on to the category of analytical studies in order to test, even with limitations, hypotheses of association.	The publication has a chapter dedicated to descriptive studies, which they define as studies that describe patterns of disease occurrence in relation to people, time and place variables.
	Williams CFM, Nelson KE.	2007	Chapter 3. Study designs. In: Nelson KE, Williams CFM. Infectious epidemiology: Theory and practice. 2nd ed. Toronto: Jones and Barlett Publishers; p. 63-117.	Case reports; case series; and ecological studies (analytical).	The authors differentiate between two dimensions, i.e. clinical and population-based.
	Koepsell TD, Weiss NS.	2003	Epidemiologic methods. Studying the occurrence of illness. 1st ed. New York: Oxford University Press; Chapter 5, Overview of study designs; p. 93-115.	Case reports; case series; "rate-based descriptive studies" (studies in which cases in a given population are combined with denominators of the same population), based on data collected from continuous records (health surveillance and its systems), or from periodical health surveys.	The authors admit the existence of descriptive studies, the main characteristics of which, according to them, is the fact of their being conducted without a specific hypothesis. The authors differentiate between two dimensions, i.e. clinical and population-based.
	Colimon K-M.	1990	Fundamentos de epidemiología. 1ª ed. Madrid: Ediciones Díaz de Santos; Capítulo 6, Estudios descriptivos; p. 87-112.	Morbidity surveys (*encuestas de morbilidad*); prevalence surveys (*encuestas de prevalencia*); population sampling studies; studies of a segment or category not representative of a population; and institutional studies.	No mention is made of studies in the clinical sphere.

Figura 2 – Textbooks on epidemiology produced abroad which include descriptive epidemiological studies

Authors	Years	References
Forattini O.	1970	Epidemiologia geral. São Paulo: Edgard Blucher, Editora da Universidade de São Paulo.
Benseñor IM, Lotufo PA.	2005	Epidemiologia. Abordagem prática. 1ª ed. São Paulo: Sarvier Editora de Livros Médicos. Capítulo 5, Principais desenhos de estudo – conceitos gerais; p. 63-89.
Bloch KV, Coutinho ESF.	2009[a]	Fundamentos da pesquisa epidemiológica. In: Medronho RA, Bloch KV, Luiz RR, Werneck GL. Epidemiologia. 2ª ed. São Paulo: Atheneu. p.173-179.
Medronho RA.	2009[a]	Estudos ecológicos. In: Medronho RA, Bloch KV, Luiz RR, Werneck GL. Epidemiologia. 2ª ed. São Paulo: Atheneu. p.265-274.
Almeida-Filho N, Barreto ML.	2011[a]	Desenhos de pesquisa em epidemiologia. In: Almeida-Filho N, Barreto ML. Epidemiologia & Saúde. Fundamentos, métodos, aplicações. 1ª ed. Rio de Janeiro: Guanabara Koogan. Capítulo 14, Desenhos de pesquisa em epidemiologia; p. 165-174.
Santana VS, Dourado I, Ximenes R, Barreto S.	2011[a]	Modelos básicos de análise epidemiológica. In: Almeida-Filho N, Barreto ML. Epidemiologia & Saúde. Fundamentos, Métodos, Aplicações. 1ª ed. Rio de Janeiro: Guanabara Koogan. Capítulo 21, Modelos básicos de análise epidemiológica: p. 232-251.

a) chapters in the same book.

Figure 3 – Textbooks on epidemiology produced in Brazil that prioritize analytical epidemiological studies and do not detail descriptive studies

Authors	Years	References	Studies mentioned	Notes
Pereira MG.	1995	Epidemiologia: Teoria e Prática. 1ª ed. Rio de Janeiro: Guanabara-Koogan. Capítulo 12, p. 269-288.	The author lists nine types of epidemiological studies, the first four of which are descriptive: case study, case series, incidence study and prevalence study (descriptive cross-sectional).	According to the author, the first two types are not truly epidemiological studies, because there would only be "cases" in the study population. In turn, the next two types would relate "cases" to the respective population.
Zanetta DMT.	2004	Delineamento de estudos em medicina. In: Massad E, Menezes RX, Silveira PSP, Ortega NRS. Métodos Quantitativos em Medicina. 1ª ed. Barueri, SP: Editora Manole. p. 389-421.	When listing "designs of studies in medicine", the author includes case report, case series and cross-sectional or prevalence studies, cited as descriptive studies. The remainder are analytical studies.	Zanetta recognizes the existence of descriptive studies. For this author, descriptive studies "report prevalence rates or describe a situation which appears to be abnormal". They are useful for health service planning and for generating hypotheses "in the experimental field".

Figure 4 – Citation of descriptive epidemiological studies in textbooks on epidemiology produced in Brazil and detailing or characterizing descriptive epidemiological studies

data by means of interviews or laboratory tests (which the author refers to as surveys); or with data that does not exist but which can be generated by an intervention, such as adverse vaccination events (which the author refers to as experimental data). We must highlight, however, that types of data gathering or collection do not determine the type of epidemiological study.

In the face of this multiplicity of points of view, the domain in which a study is conducted is relevant for its classification. Initially there is a population or community-based domain, so that the need arises to understand that any classification must take two situations in this domain into account: (i) there are studies conducted based on macro-statistical data relating to large population clusters, commonly secondary data, prepared using individualized numerators using case or death notifications and denominators based on population estimates; and (ii) studies conducted using primary data in various community domains (workplaces, education facilities, leisure facilities, households, crèches, public libraries, trade unions and community organizations, religious institutions, clubs, among others), in which both numerators and denominators have been addressed or recognized, and computed as individuals.

Regardless of this population or community domain, health care institutions must be included as a specific domain. In principle, it is in this domain that "cases" are concentrated and that care delivery, interventions, procedures and outcomes are registered.

It must be taken into consideration that many of these institutions do not carry out activities only with patients or people who already have a disease or health condition. For example, several types of consultations (prenatal, control of child growth and development, child care, food intake and nutrition, topical dental fluoride application, adult check-ups), in principle involve working with people from "the community", who have been directed or led to attending a care facility without, however, being classified *a priori* as "clinical cases". Other similar environments can be comprised of blood banks or places where other fluids, blood products and organs are donated. It is also relevant to highlight that studies in which the study population is comprised of people assessed in primary care are very close to the household environment. As such, a specific case could be that of studies conducted in Home Hospitalization Services which, in this sense, have clinical characteristics analogous to hospital inpatient care. It must be pointed out that these clinical domain studies are conducted using individualized finite primary data, used as clearly defined numerators and denominators.

We draw attention to the fact that, both in clinical domain studies and population/community-based studies, external validity, understood as the ability to generalize data from a set of subjects that effectively comprise a given study, is not a determinant of classification.

Proposal for classifying descriptive studies

Considering the need for a satisfactory classification, we decided to propose a taxonomy that makes clear potentialities, limitations and consistency among the objectives proposed and the types of studies conducted.

There are several classification possibilities. If the criterion is observation of a reality or measurement of the effects of an intervention that has been conducted by the people in charge of the research, studies can be either observational studies or intervention studies. If the criterion is presence or absence of follow-up of people or groups, studies will be longitudinal (also called follow-up studies) or cross-sectional studies (at a moment in time). With regard to the unit of analysis corresponding to people or clusters, studies can be on an individual basis or an ecological basis. According to the domain in which the study is conducted, studies can be population/community-based or clinical. This classification is not mutually exclusive, i.e. a study can have individual observation units and be observational, or it can be individual and an intervention study, or longitudinal and observational, for instance. The classification proposal is shown in Figure 5.

1. Clinical domain studies

Clinical domain studies provide data to enable an understanding of the characteristics of the natural history of a disease, its diagnosis and outcomes following treatment. The clinical domain can be characterized as primary, secondary and tertiary health care institutions. However, primary care occasionally includes people who do not necessarily have a disease: pregnant women having prenatal check-ups, children children undergoing growth and development control, people with posture and orthopedic problems, in addition to people having check-up appointments. In general, they correspond to what is called bedside epidemiology.

1.1 Case report

In the clinical domain, an initial objective of researchers may be to report the existence of a case or a small number of cases. The research question could be the existence or not of a given health condition or disease in a country or community, the characteristics of a limited number of clinical cases, or the way in which the clinical history of the case occurred, is suspected, diagnostic impression and confirmation. It is indeed in this way that for centuries accumulated knowledge about nosological entities, their characteristics and responses to treatment has been formed. In this case, a study can be limited to describing in detail the manifestations of the disease, data on the main complaint and anamnesis, symptoms reported, clinical signs detected, laboratory test and imaging results and the diagnostic conclusion.

From the epidemiological point of view, its use may be very restricted for measuring frequency in the population or even for characterizing frequency of manifestations or findings. Nevertheless, the usefulness of this type of study in the clinical domain is that it can alert health professionals as to the existence

Study scope		Type of study	Epidemiological measurements
1	Clinical		
	1.1	Case report	–
	1.2	Case series	Proportion of cases
	1.3	Descriptive clinical cohort	Incidence of events, case fatality
2	Population/community-based		
	2.1	Descriptive observational prevalence studies	Prevalence
	2.2	Descriptive observational incidence or descriptive cohort studies	Incidence, mortality
	2.3	Descriptive ecological studies	Incidence coefficients or mortality coefficients in the population

Figure 5 – Proposal for classifying descriptive epidemiological studies

of an event in their midst, for the purposes of diagnosis and differentiation. Reports of this nature serve later for documenting distribution in relation to events that may be cosmopolitan or exist in some regions, even though their occurrence may be rare. A rare event may, however, be the first sign of an epidemic or an emerging disease. There are precedents of descriptions of divergent patterns of development or distribution that have led to the conclusion being reached as to the existence of new events or unprecedented behaviors of existing diseases. As such, these studies are relevant for epidemiological surveillance, since they can reveal preliminary findings of emerging or reemerging diseases that are spreading in new epidemiological scenarios.

Examples of this kind of epidemiological study are case reports on Kaposi's sarcoma and pneumonia due to *Pneumocystis jirovecii*, previously known as *P. Carinii*, which have served as a sentinel event for the existence of AIDS-related imunossupression.[14] Another example can be the way in which new events unknown before this decade behave clinically, such as Chikungunya and Zika in Latin American countries.[15,16] It is important to point out that the most appropriate term is "case report" rather than "case study", since the latter can correspond to other research situations (both among individuals and among groups of diverse sizes), in the domain of nursing, psychology, social service or sociology.

How many individuals can be included in a case report? There may not be an exact answer. Fletcher et al.[17] considered that there could be ten cases at the most. Above this number, it would be considered to be a case series or a clinical cohort. There really is no clinical basis for saying that above ten cases (e.g. a case report on eleven individuals), randomness reduces sufficiently for one to get a notion of the true frequency of a given symptom, clinical sign, laboratory or imaging finding.

1.2 Case series

Still within the clinical domain, the research question can intend to gain knowledge of the behavior of a nosological entity or disease, its natural history and manifestations, distribution of individuals by sex, age, race/skin color, by etiological agent subtype, times and places of greatest frequency, among other possibilities. This type of study describes case "profile" and can be called a "case series" study. It goes further than straightforward "case reports", the importance of which has already been highlighted. In this situation, however, a larger quantity of observations is needed, and it can inform the proportion of individuals who present a given symptom, sign or laboratory or imaging characteristic. This type of study is not population-based and is usually carried out in health care services, most frequently in hospitals.

However, a macro dimension of the case series study is represented by the set of "case" notifications held on information systems for compulsorily notifiable diseases or events (e.g. the Notifiable Health Conditions Information System - Sinan). In this case, duly taking sensitivity and underreporting into consideration, one would be using the "census" of detected cases, which would increase external validity. On the other hand, it would be subject to limitations arising from health care biases, usually present in health care facilities,

such as access problems and problems with referrals between levels of health care complexity.

From the point of view of epidemiological analysis, data obtained on frequency of the distribution of characteristics among ill people (cases) are specific for this population of "cases". The measurement used is the proportion of cases, since it is not a question of prevalence in an open community or population, but rather a very specific situation in which the numerator corresponds to cases that have a given characteristic (e.g. cases reporting fever, male cases or cases with a given laboratory finding) and the denominator corresponds to the total number of patients, assuming that data on the clinical evolution of ill people or cases are not being included. An example is the characterization of 87 cases of Zika virus disease in Pernambuco, highlighting the clinical and imaging characteristics of neurological damage.[18]

1.3 Descriptive clinical cohort

Another research question situation relates to the clinical evolution of cases. In this situation, the presence of "new events" is documented as metaphenomena beyond the disease itself, such as complications, appearance of side effects of treatment interventions, cure, sequelae, or death. These studies can be called descriptive clinical cohorts or descriptive prognosis studies. It can be seen that these studies can be documenting both the evolution of the "natural history" of a disease, and also the effects of an intervention, i.e. in certain clinical studies conducted with a group of individuals, the latter may be having standardized treatment and their follow-up checks for clinical outcomes, such as cure or adverse events. This does not mean that this type of study can be used to measure the efficacy of the intervention, since comparison groups would be needed for this, as in clinical trials which are a kind of analytical study.

From the epidemiological analysis point of view, the frequency with which these new events appear is calculated, behaving as incidence in relation to the total number of people. These incident events can be positive, such as cure or remission. In cases in which death is the incident event, fatality can be calculated.

In these studies, as in other strategies for following up on people, the calculations described in the preceding paragraph correspond to the closed or fixed cohort strategy. The dynamic or open cohort is an alternative analysis strategy, in which it is possible to calculate incidence density. In this case, the sum of people-time (e.g. people-year) is computed, according to individual contribution to follow-up in the cohort. The numerator continues to be the number of cases or deaths.

It is important to remember that the "new" events documented in this type of study are part of the evolution of the clinical picture, even when under treatment intervention. The research question refers to case evolution. Data on incidence of adverse effects systematized by clinical researchers have been fundamental for establishing the expected frequency of these events. An example is the frequency of COVID-19 events (clinical outcomes) when, besides symptoms and signs, authors documented the incidence of complications that led to hospitalization in intensive care units (ICUs), use of ventilators or death, i.e. fatality, among 1099 patients in China.[19]

2. Population/community-based descriptive studies

This group of studies corresponds to research conducted in households in neighborhoods, municipalities, regions or in community gathering places such as schools, churches, factories, among others, where part of the population's everyday activities take place. All these places can be seen as relatively restricted groups. For example, a study can be conducted with a considerable number of individuals, e.g. 2000 students in just one high school or workers in a single factory. The alternative would be to have several units of clusters of people or even entire systems available, which would make some sort of sampling procedure necessary, where the source population (or sample frame), would be all the units or clusters listed: schools in an education system, census tracts, churches of a single faith community, factories producing certain goods, an economic activity sector (transport, for instance). It is assumed that a list or a registry exists, from which a sample can be retrieved using a variety of techniques. In short, these studies have a "healthy" person approach (they could have an undetected or unrecorded condition), which differentiates them from clinical domain studies.

2.1 Descriptive observational prevalence studies

These are observational studies the design of which answers the research question about the existence of a given characteristic at the time the study is conducted or the participants are approached. They correspond to cross-sectional studies, also known in the literature as surveys, which document events existing at a given time, such as cases of a disease and risk or protective factors. These studies include those which determine case frequencies in the population, both existing cases and new cases, according to the characteristics of people or contextual variables traditionally attributed to individuals (age, sex, ethnic origin, socioeconomic status, occupation, marital status, sexual orientation, habits); characteristics of the places of occurrence (streets, neighborhoods, administrative regions, census tracts, urban or rural areas, municipalities, states, countries); and time of occurrence (hour, day, month, year).

The research question refers to the frequency of a disease at a given time, the frequency of a risk factor or a specific characteristic of this population or community segment. It is assumed that there is a momentary snapshot in time (what social sciences call synchrony). The name we are suggesting, descriptive prevalence study, describes what was done without the need for other explanations. Another possible name is survey (*inquérito* in Portuguese), despite the possibility of confusing the study type with a technique for acquiring data by asking questions (the act of inquiring). The term is similar to the word encuesta, used in Spanish (*encuesta epidemiológica*), or enquête in French. These terms are used with the same meaning and with the same possibility of confusion, despite their being widely used for specific purposes (*inquérito epidemiológico* [epidemiological survey], *inquérito nutricional* [nutritional survey], *inquérito alimentar* [food intake survey], *inquérito sorológico* [serological survey]). Indeed, in some academic domains, the French term has been translated into Portuguese as enquete. Notwithstanding, in French and French Canadian epidemiological literature, this term can also be used as a synonym for "study", such as *enquête analytique* and *enquête descriptive*, for instance.[20]

In English, as mentioned above, the term survey is used, originally having the connotation of probing or prospection, and the term opinion survey was used a great deal by Paul Lazarsfeld to refer to studies that became very popular in the United States after the Second World War. Other expressions such as "descriptive cross-sectional study" and "descriptive cross-sectional cohort study" can be synonyms. If their descriptive nature is not specified, this can cause confusion, since in the literature they are widely used to designate the corresponding analytical prevalence studies.

From the analysis point of view, descriptive prevalence studies use calculation of prevalence as the measurement of frequency. Their external validity depends on the sampling strategy.

For the purposes of epidemiological, food and nutrition surveillance, in recent decades the Brazilian State has promoted large-scale prevalence studies which are intended to be repeated periodically, such as the Non-Communicable Disease Risk and Protective Factors Surveillance Telephone Survey (Vigitel), the National School Student Health Survey (PeNSE), the National Survey of Access, Use and Promotion of the Rational Use of Medication in Brazil (PNAUM), the National Health Survey (PNS), among others. These studies are conducted based on complex samples and contact with participants by telephone, household interviews or interviews at school. In principle, through their published reports, these investigations provide the possibility of estimating overall prevalence rates and their distribution and, in this sense, they are descriptive, as shown by the periodical publication reporting on the Vigitel survey findings.[21] They can be used to carry out analytical studies to answer another type of research question which could be solved by testing hypotheses.

2.2 Descriptive observational incidence studies or descriptive cohort studies

These are studies that involve follow-up of population groups in order to investigate the appearance of new outcomes (cases, relapses, deaths or other events), establishing a diachronic dimension analogous to the clinical cohort study.

When the research question refers to the frequency of new events in the "healthy" population that is having

follow-up, the term descriptive cohort study is used. In this case, follow-up will determine the frequency of cases of the disease, deaths or other incident events, such as sexual initiation, seroconversion, relapses, among others. Follow-up is done with a population that has defined characteristics.

From the epidemiological analysis point of view, in descriptive cohorts the frequency of the appearance of these new events is calculated, such as incidence in relation to the total number of people in the community effectively having follow-up (cumulative incidence). In cases of death as an incident event, mortality is calculated. In both cases, the denominators express the population "at risk" of the numerator event happening. For both mortality and morbidity, it is possible to measure incidence density, by creating the person-time artifice in the denominator.

An example is a cohort of elementary school students in Thailand, whose experience is followed up on in order to measure dengue incidence.[22]

2.3 Descriptive ecological studies

Finally, it is also necessary to consider studies based on aggregated data, rates or proportions calculated for a given population group, in which the numerators correspond to the number of events notified or recorded (deaths, cases of notifiable diseases, other events, accidents, violence), and the denominators are intercensal estimates of the population. In this case the numerators are finite, but the denominators correspond to estimates, so that any comparison becomes difficult, both because of differences existing in the population base – which requires rates to be standardized, by having recourse to other data (age distribution, for instance) – and also due to the difficulty of establishing people's exposure status, because they are aggregated when they are assessed. The research question would be: what is the frequency (incidence, mortality) of the event in a given population? How did it evolve over the years? As such, aggregation leads us to an ecological approach, frequently based on secondary data. They could also be used to examine, in an ecological manner, the effects of vaccination on the population level, comparing the incidence rate before and after an intervention.[23]

Conclusion

Descriptive studies have been relegated to ostracism in the general scientific literature and in epidemiological literature in particular. It has been demonstrated previously that they answer valid and relevant scientific questions. The overvaluing of inference methods to answer research questions pertinent to analytical epidemiology methods has led to a systematic rejection of descriptive epidemiology, the recovery of which has been called for in the past.[2] When describing studies, care is taken to use scientific questions that each type of study will answer. These descriptions lead to the formulation of hypotheses to be tested subsequently by means of analytical studies supported by inferential statistics.

By showing that it is worthwhile to reflect on the role of descriptive studies and their classification, other potentialities of these studies can also be seen. Some techniques that support descriptive analysis may have been underused, due to the hegemony of inferential analytical studies. Examples include use of correspondence factor analysis and use of principal component analysis to describe aggregation of individuals according to variables, geographic analyses based on georeferenced data, supported by spatial statistics, time series and survival analysis. Greater use of quantitative techniques and methods would enrich the studies classified above and would contribute to the objective and better use of descriptive epidemiology.

For the purpose of epidemiological surveillance, repetition of prevalence studies, in samples obtained from the same source population or sample frame, can indicate trends in the existence of health-illness outcomes. These can be habits or practices relevant to health, infection (serology markers), or disease.These serial prevalence studies, or panel studies, use the same source population – such as owners of landline telephones, inhabitants registered in census tracts, students enrolled in an education system, among others. Clearly, as time goes by, the real population may change (education system adolescents will no longer be at school five years later), but the target population to be monitored (adolescents) remains the same. For example, repetition of the Vigitel, PeNSE, PNS surveys, or other population-based surveys, produces relevant data, indicating trends or new hypotheses to be tested.

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