

## II – 2. INTRODUCTORY TERMS AND CONCEPTS

*The terms and concepts addressed in sections I – 1. 2, I – 2. 2, and I – 3. 2 above, are subject to criticism by academic physicians, philosophers of science, and statisticians, respectively, more than by epidemiological researchers. By contrast, the terms and concepts in this section – and in sections II – 3-4 and III – 2-4 – are, principally, for epidemiological researchers themselves to weigh and consider (cf. Preface). As in those sections above, an asterisk (\*) attached to a term indicates its inclusion in the I.E.A. dictionary [4].*

*Analytic epidemiology\** – See ‘Analytic versus descriptive epidemiology.’

*Analytic versus descriptive epidemiology\** – The duality in etiogenetic research constituted by hypothesis-testing as distinct from hypothesis-generation and, specifically, with the idea that the unit of observation in the former is an individual, in the latter a population (large).

Note 1: In the framework of these conceptions, analytic studies are epitomized by ‘cohort’ and ‘case-control’ studies; and an example of descriptive epidemiology has been comparison between Jewish and Gentile women in respect to incidence of (the detection of) cervical cancer, leading to the hypothesis that lack of circumcision of a woman’s sexual partner(s) is etiogenetic to cervical cancer.

Note 2: This duality is conceptually untenable. Those ‘analytic’ studies are commonly sources of etiogenetic hypotheses; and population units of observation have been deployed in hypothesis testing – regarding screening for cervical cancer, and in the famous Seven Countries Study, for example.

Note 3: This duality is linguistically untenable besides. In the ‘analytic’ studies – and indeed in all research – the propositions and judgments are *synthetic* rather than analytic (cf. ‘Analysis and synthesis’ in [sect. I – 2. 2](#)). And they too are *descriptive* of experience, even if in such a way as is judged to serve causal inference.

Note 4: Whereas the ‘analytic’ versus ‘descriptive’ duality within etiogenetic research is untenable both conceptually and linguistically, a somewhat related duality of fundamental importance is that constituted by *causal* and *acausal/descriptive* epidemiological research. While both of these inescapably are descriptive of experience, there is a profound distinction in the purpose – and consequently in the nature – of the experience being described. Within causal epidemiological research,

an important duality is constituted by etiogenetic and intervention studies [9], while in the descriptive research there is the ('applied') duality constituted by studies for community diagnosis and prognosis (cf. [sect. II – 1](#)).

*Dependent parameter* – See 'Independent parameter' (Note 2).

*Descriptive epidemiology\** – See 'Analytic versus descriptive epidemiology.'

*Design versus analysis* – In the theory of epidemiological research at present, the perceived overarching duality: design – for data collection – as distinct from analysis – of the collected data. Thus, an authoritative article at the dawn of modern epidemiology – in the research meaning of 'epidemiology' – addressed "design and analysis of studies" [2]. At present, this duality is manifest in both the teaching and the practice of epidemiological research: design expertise is seen to be in the purview of 'epidemiologists,' analysis expertise in that of 'biostatisticians' – the two commonly cohabiting a department of 'epidemiology and biostatistics.'

Note 1: The overarching duality in the theory of epidemiological research should be understood to be that constituted by *ontic* theory on one side and *epistemic* theory on the other side: it is one thing to master the theory that guides the design of *objects* of epidemiological research, of developing plans for *what* to study; and it is quite another thing to master the theory that guides the design of *methods* of such research, of developing plans for *how* to study the designed objects of study (generally occurrence relations). Object design should be understood to be a prerequisite for meaningful methods design, methods of study being the means to study the preset object of study. Yet, remarkably, even the very concept of objects design remains absent from textbooks of epidemiological research; and the I.E.A. dictionary [4] defines study design in what appear to be singularly methodologic terms – as "The 'architecture' of a study: its structure, specific details of the studied population, time frame, method, and procedures, including ethical considerations, all of which should be explicitly stated in a research protocol." (Cf. 'Study design' in [sect. II – 4](#).)

Note 2: Epidemiological research being concerned with *frequency* of occurrence (of phenomena of health), its objects are *statistical* in form (while medical in substance). An epidemiological researcher therefore needs to be statistically self-sufficient (apart from occasional needs to consult a statistician; cf. [sect. I – 3. 1](#)), able to design the statistical form of the object of study all the way to the particulars of the regression model to be fitted to the data that will be collected. With such completeness of object design, 'data analysis' is a piece of trivia (given the availability of modern computer software systems for this). On the other hand, thinking of 'data analysis' as a topic unto itself, not governed by object design, is tantamount to the fallacy that data 'speak' to a researcher in a meaningful way even when the researcher has not developed and implemented a closely-reasoned plan of how to 'interrogate' Nature.

Note 3: An epidemiological researcher may very well be a *statistician*. In fact, it is easier for a statistician to learn the requisite subject-matter than it is for a physician

to learn the requisite statistics. For, the requisite body of statistical knowledge is quite extensive and in some respects challenging to learn, while the subject-matter knowledge for a given line of research, at the relevant depth, needs to be acquired ad hoc even by a physician and can be acquired by a statistician almost as readily.

*Epidemiologic* – If distinguished from ‘epidemiological,’ this word might denote the quality of having to do with epidemiology (as distinct from being in the nature of epidemiology).

Note: This restricted meaning is the one intended throughout this dictionary.

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*Epidemiological research\** – Research intended to advance, potentially at least, epidemiology (practice of it; [16]). (Cf. ‘Clinical study,’ Note 3, in [sect. III – 2.](#))

Note 1: Substantively speaking, epidemiological research is about rates of the occurrence of health outcomes, but statistically speaking it is about the mean of a dependent random variate (Y, usually Bernoulli-distributed); and while epidemiological research substantively is about the occurrence of the outcome as a (joint) function of its determinants, statistically studied is the mean of Y as a (joint) function of a set of independent variates (Xs) based on the determinants. (Cf. ‘Occurrence relation.’)

Note 2: Epidemiological research addresses (the frequency of) the occurrence of a phenomenon (event or state) of health in a (particular type of) *human* population. (See ‘Research’ in [sect. I – 2. 2.](#))

Note 3: The concept of human *population* in the objects of epidemiological research is different from that in clinical research. The meaning of ‘population’ here is that of a (sub)population of a notional community, of people satisfying a defined (a particular type of) state of being. It thus is an open – *dynamic* – population, not a cohort (cf. ‘Dynamic population’ and ‘Cohort’ in [sect. II – 4.](#)). As at issue is research (scientific), the definitional particulars of populations are abstract (with no role for proper names in the objects of study).

Note 4: Epidemiological research, as it is here defined, can be said to be population-oriented medical research – inherently ‘applied’ (by the implication of ‘medical’), quintessentially ‘applied’ when directed to the advancement of the knowledge-base of population/community medicine (epidemiology in this meaning of the term). (Cf. Preface and [sect. II – 1.](#))

Note 5: Epidemiological research does not define epidemiology as a science, as it has no unique ‘material object’ (different from, e.g., neurology and cardiology in the science meanings of these terms). Various medical sciences involve epidemiological objects – such ‘formal objects’ – of study (akin to, e.g. morphological objects of study). (Cf. Preface and [sect. I – 2. 1.](#))

Note 6: An epidemiological study need not be scientific, a piece of research; it can be a project of (mere) fact-finding as an element in practice. (Cf. ‘Study’ in [sect. I – 1. 2.](#))

Note 7: Epidemiological research is *not epidemiology* but, instead, research *for* epidemiology (just as clinical research is not clinical medicine but, instead research *for* clinical medicine; cf. [sect. I – 1. 1](#), ‘Medicine’ in [sect. I – 1. 2](#), and ‘Epidemiology’ below).

*Epidemiologist\** – A physician who practices community medicine, that is, a physician whose (single) client is a ‘community’ – a defined population – as a whole.

Note 1: In recent decades, ‘epidemiologist’ has come to denote, also, a person – quite possibly not a physician – conducting, or otherwise professionally concerned with, epidemiological research and/or meta-epidemiological clinical research.

Note 2: In contrast to this expansion of the concept of epidemiologist, conduct of, or other concern with, clinical research (that of ‘trialists,’ say) has not become definitional to *clinician* (nor is a scholar in the field of music by definition a musician).

*Epidemiologist vis-à-vis statistician* – See ‘Design versus analysis.’

*Epidemiology\** – Community medicine (cf. [sect. I – 1. 1](#) and ‘Medicine’ in [sect. I – 1. 2.](#))

Note 1: In recent decades, epidemiological research has become an added denotation of ‘epidemiology’ – even as clinical research has not become an added denotation of ‘clinical medicine.’ (Cf. ‘Epidemiologist’ above.)

Note 2: Even if epidemiological research is (seen to be) epidemiology, theory of epidemiological research is not epidemiology (just as, say, theory of chess is not chess and theory of gambling is not gambling).

*Exposure\** – See [section I – 1. 2.](#)

*Factor\** – See [section I – 1. 2.](#)

*False negative/positive\** – See [section I – 1. 2.](#)

*Genetics vis-à-vis epidemiology* – Genetical and epidemiological research have areas of overlap. For one, some illnesses are, in their definitions, genetic anomalies (e.g., trisomy 21). Study of the occurrence of these illnesses is as much epidemiological as it is genetical, including occurrence-based study of the etiogenesis of them; it is as much *genetical epidemiology* as it is *epidemiological genetics*. For another, study of genetic factors in the etiogenesis of illnesses, as prognostic markers, or as modifiers of the effects of interventions also is as much genetical epidemiology as it is epidemiological genetics.

Note 1: In epidemiological research one does not study determinants of the occurrence of illness, genetic or other; one studies, instead, the occurrence of illness – the frequency of this – *in relation to* – as a function of – the determinants of this. Study

of the nature of genetic phenomena (states and events) is in the domain of genetics alone, extrinsic to epidemiology.

Note 2: *Population genetics* is genetics and not epidemiology, except when at issue is the occurrence of a genetic anomaly that is definitional to an illness (cf. above).

*Health services research*\* – “The integration of knowledge from clinical, epidemiological, sociological, economic, management, and other sciences in the study of the organization, functioning, and performance of health services. . . . The aim of health services research is evaluation; several components of evaluative health services research are distinguished, namely: 1. Evaluation of *structure*, . . . 2. . . . *process*, . . . 3. . . . *output*, . . . 4. . . . *outcome*, concerned with the results – i.e., whether persons using health services experience measurable benefits, such as improved survival or reduced disability” [4].

Note 1: In part due to its pleonastic nature (nothing uncommon in the I.E.A. dictionary), this definition poses a hermeneutical challenge. Even though the term involves the word “research,” the definition does not specify research – or study – as the concept’s (obvious) proximal genus, and the object of this research as the specific difference (cf. ‘Concept’ in [sect. I – 2. 2](#)). Instead, quite incongruously with the term, the proximal genus is said to be “integration,” and the specific difference then is a matter of what is integrated in what context – namely “knowledge” (*sic*) from a variety of disciplines, and this in the context of studying certain aspects of “health services.”

Note 2: Presumably intended was this: Health services research is research on (the various aspects of) *quality* of health services (for evaluation of the quality). A prime example – generic – of this research is study of the (rate of) occurrence of a given type of malpractice in a particular type of situation in the practice of medicine.

Note 3: It is commonplace to distinguish between quality and *cost* of healthcare, where meant by cost is not the inherent cost of a given type of care (in neonatal intensive-care units, say) but that to which efforts of cost-containment are directed: cost arising from waste, from inefficient practices. Cost in this meaning is not distinct from, but an aspect of, the quality of healthcare: at issue is (wanting) *economic quality*, as distinct from medical quality.

Note 4: Assessment of the quality of a given element of healthcare (e.g., diagnostic testing in the context of a given complaint in the patient presentation) presupposes an agreed-upon *scale* (ordinal) of quality, anchored to definition of good – normative – care. Data on the frequencies of particular degrees of deviation from a particular norm constitute the requisite input to evaluative judgments about the element of care at issue (cf. ‘Evaluation’ in [sect. I – 1. 2](#).)

Note 5: Acquisition of data for evaluative judgments about healthcare is *not research*: rather than scientific inquiry (about the abstract), it is mere fact-finding (about the particularistic) – even if very important at that.

Note 6: ‘Health services’ is a misnomer for healthcare, just as ‘research’ is a misnomer for particularistic inquiries. (Cf. ‘Health services’ in [sect. I – 1. 2](#) and ‘Research’ in [sect. I – 2. 2](#).)

Note 7: “Whether persons using health services experience . . . improved survival and reduced disability” or whatever other “benefits” are questions of actual research, most notably by RCTs, and not of fact-finding for evaluation of quality of healthcare. (Cf. ‘Outcomes research’ in [sect. III – 2.](#))

*Hypothesis\** – In epidemiological research, typically, a conjecture about an etiogenetic effect/role of an antecedent of an illness (when contrasting the antecedent with its defined alternative). (Cf. ‘Hypothesis’ in [sect. I – 2. 2](#) and [I – 3. 2](#), and ‘Null hypothesis’ below.)

*Hypothesis testing* – The conduct of a study intended to serve updating of the degree of credibility/plausibility accorded to a hypothesis. (See ‘Causal inference’ and ‘Causal criteria/considerations.’)

Note 1: Just as any other type of testing – glucose-tolerance testing, say – this hypothesis-testing ends with the attainment of its evidentiary result: just as knowing – diagnosis – about the presence/absence of Type II diabetes is a matter separate from (and subsequent to) the GTT, so *inference* about the correctness/incorrectness of an etiogenetic hypothesis is *not part of the testing* of the hypothesis. Inference about the correctness/incorrectness of the hypothesis is *not* a proper concern for the hypothesis-testing investigators; it is a concern of the relevant scientific community. (Cf. Note 3 under ‘Study’ in [sect. I – 2.2.](#))

Note 2: The testing actually is not directly about the correctness/incorrectness of the hypothesis itself but, instead, about that of the corresponding ‘null hypothesis’ of *no effect*, and the test’s result (evidentiary) pertains in direct terms to something different even from this: it pertains to the corresponding statistical ‘null hypothesis’ of *no association* – in such terms as the association (descriptive) got to be defined by the study’s object and methods designs (and the execution of the latter).

Note 3: For the substantive and statistical ‘null hypotheses’ to cohere, required is all of the following: The conditioning of the comparative parameter (rate ratio) according to the (form of the) designed theoretical occurrence relation must fully account for the alternative to causality (potential confounding, i.e.); the translation of this theoretical occurrence relation into its operational counterpart must not compromise the meaning of the designed theoretical occurrence relation (notably the rate-ratio’s intended conditionality on a particular set of potential confounders); and the methods design (and execution) must assure freedom from descriptive bias in the result of the study (selection and documentation bias; [sect. II – 4.](#))

Note 4: For any intended-to-be hypothesis-testing to actually be such testing, the study must have a virtue beyond freedom from bias: it must have at least a modicum of propensity to produce evidence against the substantive ‘null hypothesis’ insofar as this indeed is incorrect. This means, in the context of whatever may be the efficiency and size of the study, that the etiogenetic histories need to address the etiogenetically relevant span of time (on the scale of etiogenetic time). This is particularly important to appreciate in studies to test hypotheses about the etiogenesis of a cancer (as the

initiation of a cancer readily is decades in the past when viewed from the vantage of the time of its first overt manifestation). *Pseudo-testing* of these hypotheses is, unfortunately, not uncommon at present, still.

*Independence\** – Lack of association (theoretical) between an outcome and a potential determinant of (the rate of) its occurrence; also: among causal determinants, absence of synergism, antagonism, and interaction.

*Independent parameter* – In a regression model, any particular one of the regression coefficients (incl. the intercept).

Note 1: This term is a here-suggested neologism, patterned after ‘independent variate’ (sect. I – 3. 2). Those coefficients are treated as constants of Nature (for the domain of the model, conditionally on the other independent variates involved in the model).

Note 2: Correspondingly, the mean of the dependent variate, or a transform of this, is the *dependent parameter* in the framework of a regression model; its value depends on the independent variates and parameters.

*Indicator variate\** – A variate with 0 and 1 as its (only) realizations, with realization 1 indicating something particular. (Examples:  $Y = 1$  indicating membership in the case series of person-moments and  $X_1 = 1$  indicating index category of the etiogenetic determinant in an etiogenetic study – in the logistic model for the object of study.)

*Induction period\** – See [section I – 1. 2.](#)

*Latency period\** – See [section I – 1. 2.](#)

*Null hypothesis\** – The denial of a hypothesis (in epidemiology, typically, about etiogenesis). The denial inherently pertains to all subdomains of the referent domain of the hypothesis.

Note: In science (epidemiological or whatever), all effects – and descriptive differences also – are supposed to be regarded as being nil until there is good reason to think otherwise. This is the backdrop for adducing a hypothesis – an inspired idea (conducive to insomnia in the one who experiences the inspiration. The genesis of a hypothesis is, to one extent or another, a ‘flash of genius’). Thus, the denial of a hypothesis is *not a hypothesis*; it is merely the expected stance until there is adequate reason to regard the hypothesis as being true, as having become a piece of scientific knowledge. (Cf. ‘Hypothesis’ in [sect. I – 2. 2.](#))

*Prevention/preventive\** – See [section II – 1](#) and ‘Intervention’ in [section I – 1. 2.](#)

Note: The I.E.A. dictionary defines five types/levels of prevention – from “primordial” to “quaternary” – as though curative medicine were subsumed under preventive medicine. (Cf. ‘Curative’ in [sect. I – 1. 2.](#))

*Quantitative research* – Statistical research.

Note: This term originates from statistics and is applied, in statistical science, to hypothesis-testing as well as to quantification (of the magnitudes of parameters in the objects of studies). Substantively, however, only research for quantification/estimation is quantitative.

*Research design\** – See ‘Study design’ (Note 3).

*Screening\** – See [section I – 1. 2.](#)

*Study design\** – The structure of an epidemiological study in its ad-hoc particulars (substantive, given its a-priori generic structure) together with the way in which this structure and substantive content were/are to be produced in the process of the study. (See Note 2 under ‘Analysis and synthesis’ in [sect. I – 2. 2.](#))

Note 1: The a-priori generic structure of an epidemiological study, so long as it is logically admissible, is dictated by the generic nature of the *object* of study. The ad-hoc particulars – substantive – in the framework of this structure also are dictated by the object design for the study, but only in conceptual terms. (Cf. ‘Etiologic study’ in [sect. II – 4](#) and ‘Intervention study’ in [sect. III – 4.](#)) The study’s *methods design* specifies only the operationalizations of the (conceptual) elements in the structure, as well as the way in which this structure and substantive content were/are to come about (cf. ‘Design’ in [sect. II – 4](#)).

Note 2: As is thus evident, the principal components of epidemiological study design could be taken to be the study’s object design and its methods design, with the latter subordinate to the former; but perhaps a preferable view is that deliberate object design is a necessary precursor – a prerequisite – for study design in the merely epistemic meaning of rational methods design.

Note 3: The *term* ‘study design’ in epidemiological contexts has recently, quite commonly (incl. in the I.E.A. dictionary), been discarded in preference to ‘research design.’ Yet, at issue is design of only a piece of research, rather than the entirety of studies on the object of study at issue.

Note 4: For further conceptual orientation to study design, see ‘Design and analysis.’

*Survey\** – In community medicine, acquisition of information about the cared-for population by means of drawing a sample of the population (of person-moments in it), ascertaining the information/facts on the instances in the sample, and generalizing from this to the population (the ‘target population’).

Note: Such particularistic inquiry is *not research* (see [sect. I – 2. 2.](#)).

*Theory* – Concerning epidemiological (or meta-epidemiological clinical) research at large, the general concepts, principles, and terminology of this (distinct from ones specific to particular topics of subject-matter).

Note 1: This book obviously is about the theory of epidemiological and meta-epidemiological clinical research in respect to *concepts* of these, and also about

their associated English-language *terms* (this is the sequence of these two in their development, in contrast to their sequence in a dictionary); and just as obviously, this book, like the I.E.A. dictionary, is preparatory to expositions of *principles* of these lines of research.

Note 2: Once well-grounded on the concepts (and terms) – tenable concepts (and terms) – of these lines of research, one’s ‘natural logic’ (distinct from ‘acquired, scientific logic’) becomes quite a good guide to the principles of the research. Acquisition of the requisite, logically tenable concepts goes a long way in preparing a student for adopting the proper principles for the research. In fact, principles are critically involved in the genesis of many of the concepts, including absolutely central ones such as that of *the* etiologic study (as the outgrowth of the ‘cohort’ and ‘case-control’ studies).

Note 3: The I.E.A. dictionary [4] asserts that the theory of epidemiological research addresses (specifically and solely) “how to study” – methods of epidemiologic research, that is. But the theory of *methods* design for epidemiological research – epistemic – is subordinate to the ontic theory of the design of *objects* of epidemiological research (both of which rest on critically adopted concepts of epidemiological research).

Note 4: Theory of epidemiological research is first – orientationally – *general theory*, addressing the concepts and principles of the research, without reference to any particular area of subject-matter. This book is about general theory of epidemiological – and meta-epidemiological clinical – research in respect to the concepts the research. Concepts of the practice of epidemiology are addressed only insofar as they bear on understanding those of the research.

*Theory of epidemiology\** – Concepts, principles, and terminology of epidemiology (of the practice of community medicine); in particular, general concepts and principles, and corresponding terms across particular topics of subject-matter.

Note 1: Theory of community medicine is one of the two principal components of *theory of medicine* (the other one being theory of clinical medicine).

Note 2: If the concept of epidemiology is taken to subsume epidemiological research (while no-one takes clinical research to be clinical medicine), then theory of epidemiological research is subsumed by that of epidemiology. (Cf. ‘Epidemiologist’ and ‘Epidemiology.’)