

A
DICTIONARY
of
Epidemiology

Fifth Edition

Edited by
Miquel Porta

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Edited for the
International Epidemiological Association
by

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aims and design. Examples of potential reasons for selection bias include surveys limited to volunteers or to persons present in a particular place at a particular time; studies based on disease survivors; hospital-based studies that cannot include patients who die before hospital admission due to acute illness or that do not include persons with mild conditions, which seldom require hospital care; case-control studies in which selection of cases and controls is differentially influenced by cost, distance, concomitant illnesses, access to diagnostic procedures, or other factors.^{10,12,14} Selection biases may be related to **CONFOUNDING** and **INFORMATION BIASES**.³¹ In **CLINICAL TRIALS**, two kinds of selection bias are especially relevant: sample selection bias or **SAMPLING BIAS** (systematic differences among participants and nonparticipants in trials) and **ATTRITION BIAS** (systematic differences due to selective loss of subjects, also known as follow-up bias).

Selection bias can virtually never be corrected by statistical analysis. It is a common and commonly overlooked problem, not just in epidemiological studies but also in clinical and basic biological studies. See also **BERKSON'S BIAS**; **CONSENT BIAS**; **CONTROLS, HOSPITAL**; **INCEPTION COHORT**.

SEMI-INDIVIDUAL DESIGN Individual-level studies (e.g., **COHORT STUDIES**, **CROSS-SECTIONAL STUDIES**, **CASE-CONTROL STUDIES**) in which outcome and covariates are measured at the individual level while exposure is characterized on the aggregate (or ecological) level. Used either because groups share the same exposure or because individual-level exposure measures are not available. Frequently used in environmental epidemiology to describe exposure to air, water, or soil pollutants. Not to be confused with **ECOLOGICAL STUDIES**.^{107,358}

SEMIOLGY (Syn: symptomatology)

1. In medicine, the study of signs and symptoms of disease. Their relevance to the practice of clinical medicine has long been recognized. They are important also to epidemiology-related activities like **HEALTH SERVICES RESEARCH** (e.g., when quality assurance programs monitor intervals from first symptom of disease to first consultation, diagnosis, and treatment). Symptoms and signs are also relevant to etiological research because they often reflect underlying pathophysiological processes that may alter levels of the exposures under study (e.g., when disease progression entails metabolic changes that alter exposure biomarkers). The analysis of the attribution of meaning to signs and symptoms is essential to understand the **SICKNESS "CAREER"**^{124,128} and hence to **PREVENTIVE MEDICINE**, **EARLY CLINICAL DETECTION**, and clinical care. See also **SYNDROME**.
2. The study of signs, signals, and symbols, especially the relationship between written and spoken language.³⁵⁹

SENSITIVE PERIOD (Syn: critical period) A time during the development of a tissue, organ, or system when it can be permanently changed by harmful influences (e.g., undernutrition, hypoxia, stress). It often coincides with a period of rapid cell division and, for many tissues and systems, occurs before birth. The brain and liver are the main organs that remain plastic after birth.⁴⁵ The adverse (or protective) effects on health of exposures during a sensitive period may be apparent many years later. See also **DEVELOPMENTAL ORIGINS HYPOTHESIS**; **PLASTICITY**; **PROGRAMMING**; **VULNERABILITY**.

SENSITIVITY ANALYSIS A method to determine the **ROBUSTNESS** of an assessment by examining the extent to which results are affected by changes in methods, models, values of unmeasured variables, or assumptions.³⁶⁰ The aim is to identify results that

are most dependent on questionable or unsupported assumptions. See also INFLUENCE ANALYSIS; OUTLIERS.

SENSITIVITY AND SPECIFICITY (of a screening test, of a diagnostic test):

1. *Sensitivity* is the probability that a diseased person (case) in the population tested will be identified as diseased by the test (syn: true positive probability). Sensitivity is thus the probability of correctly diagnosing a case or the probability that any given case will be identified by the test (syn: true-positive rate).
2. *Specificity* is the probability that a person without the disease (noncase) will be correctly identified as nondiseased by the test. It is thus the probability of correctly identifying a nondiseased person with a test (syn: true-negative probability).

The relationships are shown in the following fourfold table, in which the letters *a*, *b*, *c*, and *d* represent the numbers in the table below.

Screening test results	True status		Total
	Diseased	Not diseased	
Positive	<i>a</i>	<i>b</i>	<i>a + b</i>
Negative	<i>c</i>	<i>d</i>	<i>c + d</i>
Total	<i>a + c</i>	<i>b + d</i>	<i>a + b + c + d</i>

- a*. Diseased individuals detected by the test (true positives)
- b*. Nondiseased individuals positive by the test (false positives)
- c*. Diseased individuals not detectable by the test (false negatives)
- d*. Nondiseased individuals negative by the test (true negatives)

$$\text{Sensitivity} = \frac{a}{a + c} \quad \text{Specificity} = \frac{d}{b + d}$$

$$\text{Predictive value of a positive test result} = \frac{a}{a + b}$$

$$\text{Predictive value of a negative test result} = \frac{d}{c + d}$$

$$\text{Accuracy} = \frac{a + d}{a + b + c + d}$$

The predictive value of a positive test result may be called the *yield*. See also LIKELIHOOD RATIO; PREDICTIVE VALUE.

SENSITIVITY TESTING A study of how the final outcome of an analysis changes as a function of varying one or more of the input parameters in a prescribed manner. See also SENSITIVITY ANALYSIS.

SENTINEL HEALTH EVENT A condition that can be used to assess the stability or change in health levels of a population, usually by monitoring mortality statistics. Thus, death due to acute head injury is a sentinel event for a class of severe traffic injury that may be reduced by such preventive measures as use of seat belts and crash helmets.

SENTINEL PHYSICIAN, SENTINEL PRACTICE In family medicine, a physician or practice that undertakes to maintain surveillance for and to report certain specific

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