

Freund, John and Frank Williams (1966). *Dictionary/Outline of Basic Statistics*. P. 20.

- **Confounding:** In factorial experiments, a process by which one foregoes some information (usually about higher order interactions) in order to reduce an experiment to manageable size. Specifically, two effects are confounded and referred to as *aliases*, if it is impossible to differentiate between them on the basis of a given experiment; that is, the contrasts which measure one effect are the very same contrasts which measure the other effect. An effect is confounded with blocks if it is impossible to differentiate between the effect and variations caused by differences among the blocks.

Vogt, W. Paul (1993). *Dictionary of Statistics and Methodology*. Sage Publications p 42

- **Confound:** (a) *verb*: to study combined treatments in such a way that their separate effects cannot be determined, (b) *noun*: A variable that obscures, or makes it impossible to interpret, the relations among other variables. For example, to study the effects of fertilizer on your lawn when the fertilizer must be applied with water is to confound the effects of the watering and of the fertilizing. Water is the confound.
- **Confounded:** Said of two or more variables whose separate effects cannot be isolated. For example, if one professor used Textbook A and another used Textbook B and students in the two classes were given achievement tests ..., the independent variables (textbooks and professors teaching) would be confounded. There would be no way to tell whether any differences in achievements (the dependent variable) between the two classes were caused by either or both of the independent variables.
- **Confounding variable:** A variable that obscures the effects of another.

Last, John (1994). *A Dictionary of Epidemiology*, 3rd edition. IEA. P. 35.

- **Confounding variable, confounder:** A variable that can cause or prevent the outcome of interest, is not an intermediate variable, and is associated with the factor under investigation. Unless it is possible to adjust for confounding variables, their effects cannot be distinguished from those of factor(s) being studied. Bias can occur which is also correlated with outcome. For discussion, see Weinberg CR: Towards a clearer definition of confounding. *Am J Epidemiol* 1993; 137:1-8.

Everitt, B.S. (1998). *The Cambridge Dictionary of Statistics*. P. 74.

- **Confounding:** A process observed in some factorial designs in which it is impossible to differentiate between some main effects or interactions, on the basis of the particular design used. In essence, the contrast that measures one of the effects is exactly the same as the contrast that measures the other. The two effects are usually referred to as *aliases*.

Everitt, Brian and Til Wykes (1999). *A Dictionary of Statistics for Psychologists*. P. 40

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Greenland, Sander (1999). Confounding in *The Encyclopedia of Epidemiological Methods*. Editors: Gail and Benichou. p. 254

- **Confounding:** The word *confounding* has been used to refer to at least three distinct concepts. (1) In the oldest usage, confound is a **bias** in estimating causal effects (see Causation). This bias is sometimes informally described as a mixing of effects of extraneous factors (called confounders) with the effect of interest. This usage predominates in non-

experimental research, especially in epidemiology and sociology. (2) In a second and more recent usage, confounding is a synonym for non-collapsibility (see Collapsibility), although this usage is often limited to situations in which the parameter of interest is a causal effect. (3) In a third usage, originating in the experimental-design literature, confounding refers to inseparability of main effects and interactions under a particular design. The term *aliasing* is sometimes used to refer to the latter concept: this usage is common in the analysis of variance literature.

Sahai, Hadwi and Answer Khurshid (2002), *Pocket Dictionary of Statistics*. p. 58.

- Confounding variable: A variable more likely to be present in one group of subjects than another that is related to the outcome of interest and thus potentially confuses or “confounds” the results.
- A confounding variable is associated with both treatment and outcome and can affect both.

Porta, Miquel (2008). *A Dictionary of Epidemiology*, 5th edition. IEA. P. 49-50.

- **Confounding:** (From the Latin *confundere*, to mix together) Loosely, the distortion of a measure of the effect of an exposure on an outcome due to the association of the exposure with other factors that influence the occurrence of the outcome. Confounding occurs when all or part of the apparent association between the exposure and outcome is in fact accounted for by other variables that affect the outcome and are not themselves affected by exposure.
- **Confounding bias** (Syn: confounding)
 1. Bias of the estimated effect of an exposure on an outcome due to the presence of a common cause of the exposure and the outcome. Example. The effect of aspirin use on the risk of stroke will be confounded if aspirin is more likely to be prescribed to individuals with heart disease, which is hence both an indication for treatment and a risk factor for the disease. Heart disease may be a risk factor for stroke if it has a direct causal effect on stroke (heart disease is then the common cause of aspirin use and stroke) or if atherosclerosis causes both heart disease and stroke (atherosclerosis is then the common cause).
 2. Bias of the estimated effect of an exposure on an outcome due to baseline difference among exposure groups in the risk factors for the outcome, or differences in POTENTIAL OUTCOMES. Unlike the first definition, this definition includes biases produced by selection when the selection occurred prior to the exposure of interest (e.g., M-BIAS and CONFOUNDING BY INDICATION). Confounding bias is often equated with lack of COLLAPSIBILITY, but the latter concept is purely numerical, not causal.
- **Confounding by indication:** A type of CONFOUNDING BIAS that occurs when a symptom or sign of a disease is judged as an indication (or a contraindication) for a given therapy and is therefore associated both with the intake of a drug or medical procedure (or its avoidance) and with a higher probability of an outcome. <SNIP> Confounding by indication stems from an initial lack of similarity in the prognostic expectations of treated and nontreated subjects. It shares some features with “susceptibility bias,” “procedure selection bias,” PROTOPATHIC BIAS and SELECTION BIAS.
- **Confounding variable:** A variable that can be used to decrease confounding bias when properly adjusted for. The identification of confounding requires expert or substantive knowledge about the causal network of which exposure and outcome are part (e.g., pathophysiological and clinical knowledge). Attempts to select confounders solely based on observed statistical associations may lead to bias.