

Researchers often use the term “bias” in order to address concerns about reliability and validity of research studies. It does not necessarily carry the imputation of prejudice or other subjective factor, such as the researcher’s desire for a particular outcome. The aim of this article is to provide some insight into what “bias” is, and to discuss some types of bias encountered in research. Bias can be defined as any effect at any stage of a research process, or inference that tends to produce results that depart systematically from the true values. Hence, for one to appreciate the importance of bias in research, it must be differentiated from the conventional use of the term, which refers to a “partisan” point of view about an issue or “a one-sided inclination of the mind”. It should be noted that bias can be encountered at various stages of the research process such as during the:

- Literature review (restricting articles to those that support a particular view or finding)
- Selection of the sample (sampling bias)
- Data analysis or interpretation of data (bias of interpretation), or
- Publication of the result (reporting bias).

An error which arises from faulty logic or premises or mistaken beliefs on the part of the researcher usually manifests as false conclusions about the explanation for the associations between the variables and this is referred to as “**bias in assumption**”. Bias may also occur as a result of a faulty study design and this occurs from the difference between the true value and that actually obtained - referred to as “**design bias**”. Examples are seen in controlled studies where observations are based on a poorly defined population, or uncontrolled studies where the effects of two processes cannot be separated (confounding). An error that arises from a failure on the part of the researcher to discard an unusual value occurring in a small sample, or due to exclusion of unusual values that should be included in the study is referred to as “**bias in handling outliers**”.

Interestingly “**bias of interpretation**” of data occurs from error arising from inference and speculation. Some sources of this type of bias include failure of the researcher to consider every interpretation consistent with the facts and to assess the credentials of each, and mishandling of participants that constitute exceptions to some general conclusion. In some instances, bias can result during the research interview in which the interviewer subconsciously or even consciously gathers selective data and this is referred to as “**interviewer bias**”. A systematic error, which arises from inaccurate measurement or classification of participants on the study variable, is known to as “**measurement bias**”. The latter is different from a systematic difference between a true value and that actually observed due to observer variation, which is called “**observer bias**”. Observer bias may be due to differences among observers (inter-observer variation) or to variation in

readings of the data by the same observer on separate occasions (intra-observer variation).

With sampling in research, bias may occur especially when the study population does not have an equal chance of selection in the sample (**sampling bias**). The best way to ensure an equal chance of selection for all is to use a probability sampling method such as a table of random numbers. On the other hand, when bias is due to error from systematic differences in characteristics between those who are selected for a study and those who are not, this we refer to as “**selection bias**”. The latter is exemplified by selecting a group of hospital patients while excluding those who die before admission to hospital because the course of their illness is so acute, or those not sick enough to require hospital admission. Selection bias invalidates generalizable conclusions from studies that would include only participants from a healthy population. It is one of the major methodological problems encountered when hospital patients are used in case-control studies, but may be present in any situation or type of population where persons with illnesses or characteristics enter a study group at different rates or probabilities.

In a scientific article, bias may also occur with the presentation of the data and this error is due to irregularities produced by digit preference, incomplete data, poor techniques of measurement, or technically poor standards (**bias in the presentation of data**). An uncommon type of bias (**bias in publication**) occurs if there is editorial predilection for publishing particular findings such as positive results, which leads to failure of contributors or authors to submit negative findings for publication. Also, when there is selective suppression of information from data collected from a study, the researcher could be accused of “**reporting bias**”.

From this article, it is quite obvious that it is not enough to indicate that “**bias has been minimized or reduced**” in a research article without indicating the type of bias addressed during the research process. As family practitioners, it is essential that we familiarize ourselves with the various types of bias mentioned in this article and for those who want more information on bias, a review of Sackett’s article on bias will be a good starting point¹. When next you read a research article, ask yourself, what type of bias occurred during the process of preparing the article.

Reference:

1. Sackett DL. “Bias in analytic research” *Journal of Chronic Diseases* 1979; 32: 51 - 63.

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