# Does quantitative research eliminate bias?

Richard C. Douglas, Ph.D.
The University of Leicester
Centre for Labour Market Studies
Doctorate in Social Sciences

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The author recently conducted a seminar on workplace motivation with 33 financial managers with varying degrees of experience supervising others. An exercise was conducted, requiring the course participants to rank a variety of workplace motivators (praise, good working conditions, etc.) as employees taking the survey ranked them, then again as managers who took the survey ranked them. The purpose was to demonstrate that, as managers (which they were), it is easy to lose touch with what motivates workers, and to assume that the factors that motivate one as a manager are the same as those that motivate workers. (They are not!) Typically, course participants were much more accurate with the rankings provided by other managers. The reaction? Besides quite a bit of acceptance and contemplation, a few course participants asked questions like, “Who conducted this survey? How long ago? Who were the participants? What methods did they use?” When used as inquiry, the answers to such questions can provide insight into the methodologies used. But instead, they were used to dismiss the unexpected outcomes as being inaccurate; as being a result of bias.

This paper sets out to explore the selected topic: “Discuss the assertion that quantitative research eliminates bias.” It defines bias as it relates to research, briefly examines its potential impact on research, presents a case for eliminating bias by using quantitative methods, and concludes with an exploration of the ways bias still enters into quantitative methods.

## Bias in Research

The term “bias” means something similar to a prejudice: a willingness to believe something before determining whether or not it is true. (Really, biases can live on despite contradictory findings!) In research, bias can also cause the researcher to act in an unfair way.

This can take place anywhere in the research process, from formulating the research question(s), designing the research methods, collecting data, evaluating data, and reporting results. Bias can cause a researcher to slant questions, omit data, ignore outcomes, even "shade" results towards a more desirable outcome. As one professor at the University of Chicago puts it, research bias "is unknown or unacknowledged error created during the design, measurement, sampling, procedure, or choice of problem studied." (Bennett, n.d., p. 1) Finally, the term itself is ambiguous, open to many interpretations. (Hammersley & Gomm, 1997) But it is presumed here to mean the introduction of improper intentional or unintentional influence on a research project's purpose, design, methods, data, and/or analysis. It is the goal of the researcher, using either qualitative or quantitative methods, to remain as objective (bias-free) as possible, identify and control for biases, and report the results of research honestly and without favoring one outcome over another.

## The Case in Favor of the Ability of Quantitative Research Methods to Eliminate Bias

There are several aspects of using quantitative methods that help eliminate bias in the research process. These can be found in random sampling, data collection, and data reporting.

*Random Sampling*. While also available to qualitative researchers, random sampling is a common feature of quantitative studies. When the researcher desires to determine some aspect of the subject population, it is often difficult to take a census of the entire population. Instead, a sample (manageable subset) of the population is measured, and whose results are used to make inferences about the larger population (within certain levels of certainty, or confidence). Simply put, in order for the sample to best represent the population, each member of the population (or strata, in the case of stratified random sampling) must have an equal chance of being selected for the sample. (Czaja & Blair, 1996) Strict adherence to randomness principles—like using random number generators or tables to determine which members of the population will be selected—help ensure against bias by removing the researcher's influence on who is and is not selected. For example, if the researcher is conducting a survey to get the "man on the street" opinion on a topic, he/she might wish to stand on a busy sidewalk and ask passersby to participate. While this may sound random—after all, the researcher does not control who walks down the sidewalk—it is not. The survey taker may, knowingly or not, favor a particular type of person and thus include more of them in the sample. A way around this error would be to choose people at a certain interval, after a certain time period elapses, or every fifth person for example. Again, while random sampling is not limited to quantitative research, quantitative methods often require the generation and/or manipulation of large amounts of data—hundreds of samples in a quantitative survey as opposed to a handful of samples in a case study, for example. (CLMS (b), 2004) This lends them towards unbiased sampling, if effective procedures are identified and maintained.

*Data Collection.* Quantitative methods applied to social sciences problems often involve the quantification of observations, opinions, judgments, etc. as reported by each participant in the study. (CLMS (a), 2004) Once this is done, often by designing a questionnaire to be filled out by the participants, the participants can be provided "forced choice" questions—those found on a Likert scale, yes/no, or multiple-choice, for example. (Czaja & Blair, 1996) Participants' responses are limited to rating the question (Likert) or selecting one of the provided responses (yes/no, multiple-choice). The researcher collects the participants' responses and evaluates them quantitatively—there is no opportunity for the researcher to interject his/her point of view or interpretation of the responses. Thus, they are free from potential bias during the data collection phase. But as the reader will see later, the use of these processes may not ensure bias is eliminated.

*Data Reporting and Analysis.* Once the quantitative data are received by the researcher, he/she may apply one or more statistical processes to turn the data into information, to give it meaning. Descriptive statistics may be used to summarize demographic data or to describe the sample collected. Inferential statistics may be applied to draw meaning from the sample, such as how well it represents the population, how two or more samples compare, etc. (Roberts & Russo, 1999) Assuming the statistical procedures and rules are followed correctly, there should be no opportunity for the introduction of intentional or unintentional bias into the reporting of the results. However, reporting the results is not the same as analyzing them, describing what they mean. Because the analysis of the data is subject to the knowledge and opinions of the researcher, it is very susceptible to any biases the researcher may hold.

Described above are just three aspects of quantitative research design that *help guard against* bias. However, the question remains: Can quantitative research eliminate bias? In a word, no. Several examples supporting this contention follow.

## The Case Against the Ability of Quantitative Research Methods to Eliminate Bias

The use of quantitative methods can help the researcher reduce or even eliminate bias in his/her work. However, their use does not ensure the elimination of bias in the research. In fact, every aspect of the research process is subject to potential bias. This section will explore several possibilities.

*Sampling.* Just as effective random sampling can help to eliminate bias in the research process, ineffective methods almost ensure bias will affect it. As noted earlier, the researcher might fail to carry out a truly random selection of a sample. In this case, he/she runs the risk that the sample does not accurately represent the population and, thus, threatens to weaken or invalidate inferences drawn. Even when bias is recognized and controlled for—in convenience sampling, for example, where non-random samples are drawn where they are available—the researcher runs a risk that uncontrolled bias may enter into the process through either poor sampling or by not controlling for the non-random nature of it. (Bryman, 2004) Also, the researcher may purposely use a “sampling frame bias,” where access to a truly random sample is skewed by some limiting factor (like using a telephone to reach participants, which excludes those who do not own a phone or do not answer it). (Czaja & Blair, 1996)

*Instrument Development.* A commonly held misconception is the notion that a “forced choice” survey instrument—where each question is answered by selecting one of the options provided—is somehow “objective.” While it is true that the questions answered can be observed and analyzed objectively, there is no assurance the researcher was objective in preparing—or selecting—the questions on the instrument. (Czaja & Blair, 1996) For example, the researcher may “load” questions to influence the respondent towards a desired answer. Or, perhaps, the researcher may choose to emphasize some areas of the research via the questionnaire, while giving others a lighter going over. And, of course, the researcher may choose to avoid answering troublesome questions completely.

*Secondary Sources.* Using secondary sources (data collected by someone else for some other purpose) can introduce unintentional bias, since the researcher has no control over the original data collection. “The secondary analyst has not been involved in the collection of data and as such may not be fully aware of the strengths and weaknesses of the particular data set." (CLMS, 2004, p. 31) While not unique to quantitative studies, it is important to note that the use of quantitative methods does not control against bias in this commonly used approach to social research.

*Instrument Application.* As with the use of secondary data, introducing bias into using the survey instrument is not prevented by the use of quantitative methods. This is especially true in questionnaires administered person-to-person (or telephonically), where the data collector may bias the collection process by his/her explanations of questions/answers to the respondents. (Bryman, 2004) Even "innocent" clarifications can turn into unintentional "nudges" away from some responses and towards others.

*Data Collection.* The most obvious example of introducing bias into the data collection process is to eliminate pieces of the data entirely in order to create a more desirable outcome. Or, the researcher may choose to alter the data. Since most (or all) reviewers of the research will not have access to the raw data itself, the researcher may do these things with relative assurance that he/she will not be discovered. (This is why careful documentation of the research process is an essential element—the research itself, not just the methods, should be understood. Also, where possible, it should be able to be replicated by others.

*Interpretation of Results.* Despite the need to remain neutral or "objective" in the research process, researchers are often passionately committed to both the research question and the outcomes of the research. Whether the researcher is tackling an organizational challenge, or is finally at the point where he/she is writing the doctoral dissertation that will make his/her mark in his/her discipline, the researcher is hardly a casual observer to the process. Bias can be introduced into quantitative methods in many ways. Two examples both relate to changing the stringency of the statistical tests used on the data after the data has been collected and analyzed, and are discussed below:

1. A researcher collects samples from two populations to compare differences. He/she decides to test the significance of the sample differences at $p > .001$. (The null hypothesis is that the two samples are equal will not be rejected unless the difference observed in the samples have less than a 1-in1,000 chance of occurring due to sampling error—a very high standard. After collecting the samples, the researcher runs the statistical tests and finds that, while there is a difference between the two samples, it is significant at $p > .04$. This result fails to support rejecting the null hypotheses (that there is no difference between the populations) in favor of the alternate hypothesis (that the observed difference between the samples indicates a difference between the two populations). *But if the researcher has a vested interest in demonstrating a difference, he/she can* <u>*change the significance*</u> *level to* $p >.05$ *and suddenly the difference is statistically significant*, allowing the rejection of the null hypothesis in favor of the alternate. Now the data has come out "right."
2. *Another way to manipulate the statistics and introduce bias to the process after the data are collected is to change from a two-tailed test to a one-tailed test.* Without getting too deep into the statistics, changing the test from a two-tailed test to a one-tailed test allows for a smaller observed difference between the samples in order to declare a difference between the populations they represent. (Simply put, a two-tailed test looks for significant differences in

either direction; a one-tailed test looks for differences in one direction only.) As in the previous example, if the data comes out in the "right" (desired) direction, but the difference is not large enough to be considered statistically significant, a switch to a one-tailed test will permit the researcher to declare significant difference where one would not have existed!

*Reporting of Results.* Sternberg (1981) cautions the researcher to report the results of the research dispassionately, even if the data emerging from it contradicts one's cherished theory or desired outcome. "My own data's coming out wrong." (Sternberg, 1981, p. 121) (The researcher is further cautioned that even disconfirming evidence can constitute a significant contribution to the body of knowledge in one's field.)

## Conclusion

Despite some advantages with introducing "objective" data collection procedures and analytical processes, the use of quantitative methods does not ensure bias is eliminated from the research process. Effective use of random sampling, forced-choice questionnaires, and quantitative analyses help take the researcher's personal biases out of the research process. However, there are opportunities all along the way for bias, intentional or unintentional, to creep into the process, even a quantitative one. These include non-random sampling, question development, influencing respondent's answers on questionnaires, *post hoc* manipulation of statistical analyses, and reporting and interpreting the results. As long as humans conduct research, bias is a very real issue. It is the researcher's responsibility to control it wherever possible, and to acknowledge it wherever it is unavoidable. To the maximum extent possible, researchers must remain objective, dispassionately, honestly, and transparently reporting research results as they occur.

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