

Encyclopedia of Social Science Research Methods

Quantitative Research

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Research can be grouped into two different types: quantitative and qualitative. The difference has to do with the ways in which the data are collected and how many observations there are. Sample surveys are examples of quantitative research, whereas small ethnographic case studies are examples of qualitative research.

A quantitative research project is characterized by having a population for which the researcher wants to draw conclusions, but it is not possible to collect data on the entire population. For an observational study, it is necessary to select a proper, statistical random sample and to use methods of statistical inference to draw conclusions about the population. For an experimental study, it is necessary to have a random assignment of subjects to experimental and control groups in order to use methods of statistical inference.

Statistical methods are used in all three stages of a quantitative research project. For observational studies, the data are collected using statistical sampling theory. Then, the sample data are analyzed using descriptive statistical analysis. Finally, generalizations are made from the sample data to the entire population using statistical inference. For experimental studies, the subjects are allocated to experimental and control group using randomizing methods. Then, the experimental data are analyzed using descriptive statistical analysis. Finally, just as for observational data, generalizations are made to a larger population.

Historical Account

The previous century saw large growth in the area of theory and methods for the drawing of statistically random samples. The British statistician Sir Ronald A. Fisher was an early proponent for the use of randomness in the collection of data, particularly in experiments. In experimental research, there has also been large growth in the area of designs for the running of experiments. Each design carries with it its own computational methods, and they are more accessible in both statistics text and statistical software.

The second half of the previous century saw the arrival of large, national sample studies. The studies done by George Gallup and his associates are the wellknown examples of such studies, but there are also other early studies of this kind. The Roper studies are an example. The best-known academic studies have been done by the National Opinion Research Center (NORC), first located at the University of Chicago, and by the Survey Research Center at the Institute for Social Research at the University of Michigan. NORC has collected data for many years in their General Social Survey, and the Michigan group has a long history of the study of economic behavior and voting in elections.

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Applications

Drawing a national sample of respondents is a difficult task because there is no accessible list of the residents of this country. Various sophisticated methods of telephone sampling are now commonly used, but because of their complexity, special statistical formulas have been developed for the analysis of such data. The formulas in all introductory statistics texts and most statistical computer packages are based on simple random sampling of respondents. But the standard errors computed from simple random sampling are not correct when the sample has been collected using more complicated methods, as they often are for large, national studies.

Examples

After the data have been collected, either through sampling or experiments, statistics is used to analyze the data. This is typically done by arranging the data in tables, making graphs of the data, or computing summary statistics for the data. Often, two or all three methods are used. These are methods used by quantitative research as well as qualitative research. In quantitative research, the data often have to be weighed in various ways to compensate for the ways in which the data were collected.

Herein lies the largest difference between quantitative research and qualitative research. Because the data are collected randomly, only quantitative research can make use of methods of statistical inference. It is not as clear how generalizations are made on the basis of qualitative research. Results can be used to obtain anecdotal evidence, but neither point estimates nor confidence intervals and P values can be used. However, insights gathered through qualitative research often go deeper than what is possible with quantitative research. They can also act as the foundation for future quantitative research.

In the computation of both p values and confidence intervals, it is important to use formulas that reflect the way in which the data were collected. In experimental research, it is common to compute a variety of sums of squares from the data and use these sums of squares for the computation of F values and thereby p values. Similar formulas are not as easily available for more complicated sample surveys.

As implied by its name, quantitative research results in the computation of a variety of quantities, most often of a numerical nature. With proper random data, it is possible to compute summaries such as means and medians. They, in turn, help us understand the data on the corresponding variables. The same holds for p values and conclusions from statistical inference.

Critics point out that such summary quantities can be too restrictive and may not tell the story the way it should be told. The many examples of statistical fallacies and statistical jokes are reflections of this. Even in quantitative research, it becomes necessary to consider special cases, such as outliers, to gain a better understanding of the data. As soon as we move from statistical summaries to individual observations, we really move from quantitative research to the richness of qualitative research. Such studies of individual data points blur the line between the two approaches. One particular area where the shortcomings of quantitative research can show up is in regression studies of the relationships between variables. A single data point that is away from the cluster of the remaining observations can have a large influence on both the regression line and the correlation coefficient. On the other hand, a quantity such as the median is not as sensitive to outliers.

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