



# Quantitative Research Designs 101

What public health questions are best answered by quantitative research designs?

## The Importance of Understanding Research Designs

- Identifying the strengths and limitations of various study designs allows you to find and use the strongest research evidence.
- Understanding the different types of research designs can help you search for the most appropriate type of evidence to address your question and assess the quality of the research evidence you find. (See [Searching for Research Evidence in Public Health](#) and [Critical Appraisal Modules](#))

## Objectives of Quantitative Research

- Quantitative research designs:
  - Identify, define and measure factors that contribute to a disorder or disease
  - Examine relationships among factors
  - Determine whether something is caused by something else
  - Evaluate the effectiveness of an intervention
  - Evaluate the cost-effectiveness of an intervention
  - Determine the accuracy and precision of an assessment or test

If your question is about:	You are looking for:	Research design(s) you are most likely to see:
the effectiveness of prevention or treatment/therapy interventions, you have an <b>effectiveness</b> question	evidence for interventions that can prevent or treat a problem/condition/disease	randomized controlled trial
		cohort-analytic study
		single group pre/post-test design
		case-control study
		two group, post-test only design
the association between a risk factor and a health outcome, you have a <b>causation</b> question	evidence for risk factors that are associated with or cause a problem/condition/disease	cohort study
		case-control study
		cross-sectional study

## Quantitative Research Designs

- The best research design is the one that is the most rigorous, feasible and ethical. If the strongest design is not feasible or ethical, you should use the next strongest design.
- Note: The following tables list and describe quantitative research designs for intervention effectiveness and causation in the order of most to least rigorous.



## Intervention Effectiveness Research Designs

### Randomized Controlled Trial (RCT)

An RCT randomly (random allocation) assigns people who have agreed to participate in the study (participants) into one or more groups. Random allocation should ensure both the experimental (intervention) and control groups are similar, so any differences in outcomes observed between the groups can be attributed to the intervention.

Note: Although an RCT provides the strongest evidence to answer a causation question, it is not ethical or feasible for researchers to conduct this type of study for many public health questions.

### Cohort-Analytic Study

Cohort-analytic studies compare an experimental (intervention) group and control group when random allocation is not feasible or ethical. Since the groups are not allocated randomly, it is more difficult to attribute differences in outcomes between the groups to the intervention.

### Single Group Pre/Post-Test Design

The single group pre/post-test design is useful when it is not possible to have a comparison or control group. Instead, this design has participants act as their own control, measuring outcomes prior to and after an intervention. Without a true control group, it is more difficult to attribute changes in outcomes to the intervention.

### Case-Control Study

Case-control studies identify participants with and without the outcome of interest and look back in time (retrospectively) to collect data about the participants' exposure to an intervention. This design can determine if the exposure is associated or correlated with the outcome but cannot confirm that the intervention causes the outcome.

### Two Group, Post-Test Only Design

Two group, post-test only designs only measure outcome data following exposure to the intervention. There is no way to assess the similarities or differences between the experimental and control groups prior to the intervention. As a result, it is not possible to determine if any differences between the groups are attributable to the intervention only.

## Causation Research Designs

### Cohort Study

Cohort studies select a sample of the population and follow this group forward in time (prospectively) or review their history (retrospectively) to see if they are exposed to the exposure of interest and if they develop the outcome of the interest. Since the groups are not allocated randomly, it is more difficult to attribute differences in outcomes between the groups to the exposure.

### Case-Control Study

Case-control studies identify participants with and without the outcome of interest and look back in time (retrospectively) to collect data about the participants' exposure to a risk factor. This design can determine if the exposure is associated or correlated with the outcome, but cannot confirm that the exposure causes the outcome.

### Cross-Sectional Study

Cross-sectional studies measure exposure and outcome data at the same point in time for each participant. This design can determine if the exposure is associated or correlated with the outcome, but cannot confirm that the exposure causes the outcome.