

# AP Statistics: Designing Experiments

From Simple Studies, <https://simplestudies.edublogs.org> & @simplestudiesinc on Instagram

## Definitions

- **Population**: Includes all people or items with the characteristics one wishes to understand.
- **Sample**: A subset of the population.
- **Census**: An official count or survey of a population, typically recording various details of individuals.
- **Voluntary Response Sample**: Consists of people who choose themselves by responding to a general appeal.
- **Explanatory Variable**: The variable that affects the response variable
- **Response Variable**: The variable that is expected to change with the explanatory variable
- **Confounded**: Two variables whose effects on a response variable cannot be distinguished from each other.
- **Convenience Sampling**: When individuals who are easiest to reach are chosen.
- **Simple Random Sample (SRS)**: Of size “ $n$ ” consists of “ $n$ ” individuals from the population chosen in such a way that every set of “ $n$ ” individuals has an equal chance to be the sample actually selected.
- **Stratified Random Sample**: Take a population, then divide the population into groups of similar individuals (strata). Afterwards, choose a separate SRS in each stratum.
- **Systematic Sample**: Every “ $n$ th” person is chosen for the sample.
- **Cluster Sample**: A sample consisting of a whole group.
- **Biased**: Systematically favors certain outcomes.
- **Undercoverage Bias**: When some group of the population are out of the process of choosing the sample.
- **Response Bias**: Occurs when an individual responds in a false way.
- **Non-Response Bias**: Occurs when an individual chosen for the sample cannot be contacted or refuses to cooperate.
- **Wording Bias**: In a survey, when a question is worded in such a way that influences what a subject might respond.

- **Observational Study:** Observes individuals and measures variables of interest but does not attempt to influence the response.
- **Experiment:** Deliberately imposes some treatment on individuals in order to observe their response.
- **Replication:** Repeating the experiment many times, under the same conditions, but with different subjects.
- **Control Group:** A group of patients who receive a sham treatment called the placebo (e.g. sugar pill).
- **Randomization:** All the experimental units are allocated at random among all of the treatments
- **Treatment:** A specific experimental condition applied to the units.
- **Double-Blind Procedure:** Neither the subjects nor the people who are in contact with them know which treatment a subject received (only a third party knows).
- **Block:** A group of experimental units or subjects that are similar in ways that are expected to affect the response to the treatments.
- **Match Pairs Design:** Assigning subjects with similar characteristics and giving one group the treatment and the other the placebo. Another design is giving the same subject a treatment and determining before and after if it had an effect on the subject.

## Choosing a SRS

- “I will number [the n subjects] 000 (put as many zeros as digits in  $n - 1$ ) to  $[n - 1]$ . I will read [the number of digits in  $n - 1$ ] digits at a time, ignoring repeats and numbers above  $[n - 1]$  (only applies if  $n - 1$  is not 9, 99, 999, etc.). The first [number of subjects you want] [subjects] will [receive treatment 1]. The next [number of subjects you want] [subjects] will [receive treatment 2] (repeat until you have all the subjects assigned to treatments).”