

Section 1.2

Observational Studies Versus Designed Experiments

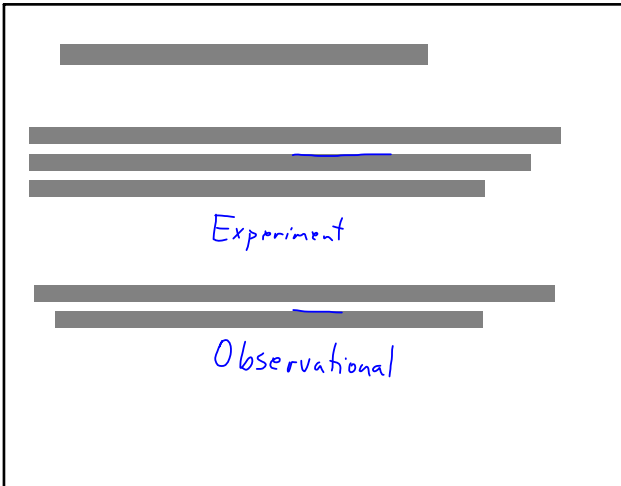
Objectives

1. Distinguish between an observational study and an experiment
2. Explain the various types of observational studies

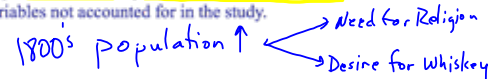
An **observational study** measures the value of the response variable without attempting to influence the value of either the response or explanatory variables.

Observational studies do not allow a researcher to claim causation, only association.

The researcher is conducting a **designed experiment** if a researcher assigns the individuals in a study to a certain group, intentionally changes the value of the explanatory variable, and then records the value of the response variable for each group.



Confounding in a study occurs when the effects of two or more explanatory variables are not separated. Therefore, any relation that may exist between an explanatory variable and the response variable may be due to some other variable or variables not accounted for in the study.



A **lurking variable** is an explanatory variable that was not considered in a study, but that affect the value of the response variable in the study. In addition, lurking variables are typically related to any explanatory variables considered in the study.

Types of Observational Studies:

Cross-sectional Studies Observational studies that collect information about individuals at a specific point in time, or over a very short period of time.

Case-control Studies These studies are retrospective, meaning that they require individuals to look back in time or require the researcher to look at existing records. In case-control studies, individuals that have certain characteristics are matched with those that do not.

Cohort Studies A cohort study first identifies a group of individuals to participate in the study (cohort). The cohort is then observed over a period of time. Over this time period, characteristics about the individuals are recorded. Because the data is collected over time, cohort studies are prospective.

Researchers wanted to assess the long-term psychological effects on children evacuated during World War II. They obtained a sample of 169 former evacuees and a control group of 43 people who were children during the war but were not evacuated. The subjects' mental states were evaluated using questionnaires. It was determined that the psychological well being of the individuals was adversely affected by evacuation. *Cross-Sectional*

Observational study;

Case-control

Xylitol has proven effective in preventing dental caries (cavities) when included in food or gum. A total of 75 Peruvian children were given milk with and without xylitol and were asked to evaluate the taste of each. Overall, the children preferred the milk flavored with xylitol.

Cross-sectional

Designed experiment

A total of 974 homeless women in the Los Angeles area were surveyed to determine their level of satisfaction with the healthcare provided by shelter clinics versus the healthcare provided by government clinics. The women reported greater quality satisfaction with the shelter and outreach clinics compared to the government clinics.

Case Control

Observational study; Cross-sectional

The Cancer Prevention Study II (CPS-II) is funded and conducted by the American Cancer Society. Its goal is to examine the relationship among environmental and lifestyle factors on cancer cases by tracking approximately 1.2 million men and women. Study participants completed an initial study questionnaire in 1982 providing information on a range of lifestyle factors such as diet, alcohol and tobacco use, occupation, medical history, and family cancer history. These data have been examined extensively in relation to cancer mortality. Vital status of study participants is updated biennially. Cause of death has been documented for over 98% of all deaths that have occurred. Mortality Follow-up of the CPS-II participants is complete through 2002 and is expected to continue for many years.

Cohort

Observational study; cohort

A census is a list of all individuals in a population along with certain characteristics of each individual.

1.3 Sampling Methods

Objectives


1. Random Sampling
2. Simple Random Sample
3. Obtain a Simple Random Sample

Random sampling is the process of using chance to select individuals from a population to be included in the sample.

* If every possible sample of size n has an equally likely chance of occurring. The sample is then called a simple random sample

A simple random sample is similar to a random sample. The difference between the two is that with a simple random sample, each object in the population has an equal chance of being chosen. With random sampling, each object does not necessarily have an equal chance of being chosen.

Place the 12 game pieces in a bowl and (without looking) choose 3.



Handwritten notes: $\frac{1}{12}$, $\frac{1}{11}$, Not Equally Likely, Random Sample

Steps for Obtaining a Simple Random Sample

- 1) Obtain a frame that lists all the individuals in the population of interest.
- 2) Number the individuals in the frame 1 - N.
- 3) Use a random number table, graphing calculator, or statistical software to randomly generate n numbers where n is the desired sample size.

The 110th Congress of the United States had 435 members in the House of Representatives. Explain how to conduct a simple random sample of 5 members to attend a Presidential luncheon. Then obtain the sample. Frame - Names #001-435

Handwritten notes: 313, 080, 224, 101, 191

Row Number	01-05	06-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
01	89392	23212	74483	36590	25956	36544	68518	40805	09980	09467
02	61458	17639	96252	95649	73727	33912	72896	66218	52341	97141
03	11452	74197	81962	48443	90360	26480	73231	37740	26628	44690
04	27575	04429	31308	02241	01698	19191	18948	78871	36030	23980
05	36829	59109	88976	46845	28329	47460	88944	08264	00843	84592
06	81902	93458	42161	26099	09419	89073	82849	09160	61845	40906
07	59761	55212	33360	68751	86737	79743	85262	31887	37879	17525
08	46827	25906	64708	20307	78423	15910	86548	08763	47050	18513
09	24040	66449	32353	83668	13874	86741	81312	54185	78824	00718
10	98144	96372	50277	15571	82261	66628	31457	00377	63423	55141
11	14228	17930	30118	00438	49666	65189	62869	31304	17117	71489
12	55366	51057	90065	14791	62426	02957	85518	28822	30588	32798
13	96101	30646	35526	90389	73634	79304	96635	06626	94663	16696
14	38152	55474	30153	26525	83647	31988	82182	98377	33802	80471
15	85007	18416	24661	95581	45868	15662	28906	36392	07617	50248
16	85544	15890	80011	18160	33468	84106	40663	68115	74664	20553
17	10446	20699	98370	17684	16932	80449	92654	02084	19985	59321
18	67237	45309	17638	65115	29757	80705	82686	48565	72612	61760
19	23026	89817	05403	82209	30573	47501	60115	33655	50250	72592
20	67411	58542	18678	46491	13219	84084	27783	34508	55158	78742

A small community college employs 58 full-time faculty members. To gain the faculty's opinions about upcoming contract negotiations, the president of the faculty union wishes to obtain a simple random sample that will consist of 5 faculty members. She numbers the faculty 1 to 58.

Using Table 1 from Appendix A, the president of the faculty union closes her eyes and drops her ink pen on the table. It points to the digits in row 18, column 7. Using this position as the starting point and proceeding downward, determine the numbers for the 5 faculty members included in the sample.

Handwritten notes: Frame - Names - #01-58, 55, 12, 39, 29, 09

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