

Lecture 2: Sampling and Bias

Chapter 1.3

Goals for Today

- ▶ Understand important considerations about data collection in particular **sampling**.
- ▶ Two real-world examples.
- ▶ Food for thought about the next lecture: explanatory/response variables and causality.

Recall: What is statistics?

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1. Identify the scientific question or problem
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Point 2 is just as, if not, more important than point 3.

Populations and Samples

We want to make statements about some aspect of a **study/target population**.

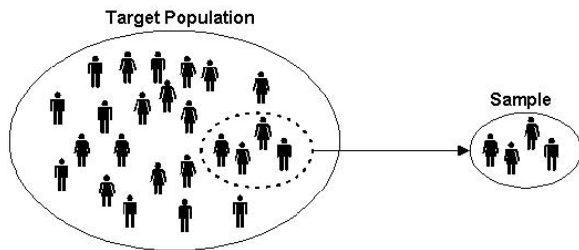
1. What proportion of Vermonters smoke?
2. What are the sexual behaviors of males and female Americans in 1948?

Populations and Samples

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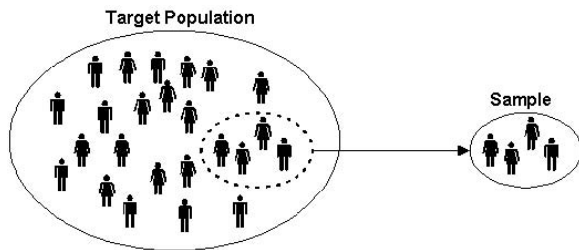
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Important:

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- ▶ We stand outside a tobacco store and randomly select 100 people walking nearby. This is a non-representative sample AKA a **biased sample**.
- ▶ We have a list of all citizens of the state and randomly select 100 people from this list. This sample is representative and hence the poll's results can generalize to all of VT.

Comment on the Representativeness of These Samples:

1. The Royal Air Force wants to study how resistant their airplanes are to bullets. They study the bullet holes on all the airplanes on the tarmac after an air battle against the Luftwaffe (German Air Force).
2. I want to know the average income of Middlebury graduates in the last 10 years. So I get the records of 10 randomly chosen Midd Kids. They all answer and I take the average.
3. Imagine it's 1993 i.e. almost all households have landlines. You want to know the average number of people in each household in Middlebury. You randomly pick out 500 phone numbers from the phone book and conduct a phone survey.
4. You want to know the prevalence of illegal downloading of TV shows among Middlebury students. You get the emails of 100 randomly chosen Midd Kids and ask them "How many times did you download a pirated TV show last week?"

Statistics in Society: Alfred Kinsey

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At the time sexuality was an extremely taboo subject, very little research had been conducted at that point and Kinsey was astonished at the public's general ignorance.

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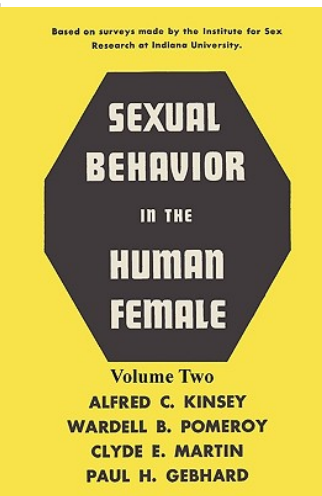
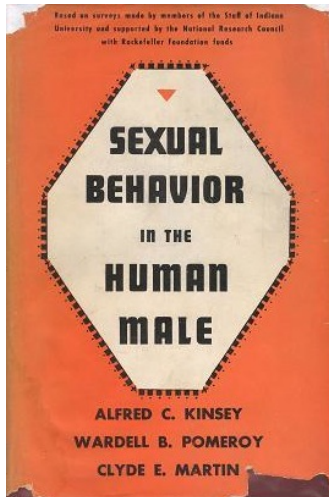
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What type of questions was Kinsey interested in? Using his 300 question survey, he hoped to address...

1. What percentage of Americans engaged in premarital and extramarital sex?
2. What were the homosexual tendencies of American males?
3. How common were oral sex and masturbation?
4. ...

Statistics in Society: Kinsey Reports

The results were published two books on human sexual behavior known as the “Kinsey Reports”: *Sexual Behavior in the Human Male* (1948) and *Female* (1953).



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2. Kinsey wrote in 1948 that **one in ten** white men were more or less, exclusively homosexual for at least three years between the ages of 16 and 55.

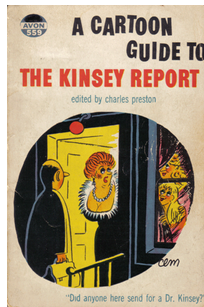
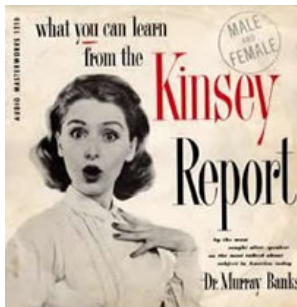
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2. Kinsey wrote in 1948 that **one in ten** white men were more or less, exclusively homosexual for at least three years between the ages of 16 and 55.
3. Kinsey reported that oral sex was very common (70% of couples did it), masturbation was very common (almost 63%/92% of women/men did it)

Statistics in Society: Reaction to Kinsey Reports

Needless to say, people were taken quite aback.



There was also a huge conservative backlash against the reports.

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What could be some issues?

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Even though the Kinsey Report was groundbreaking and contributed much to the field of sexology by bringing many topics to the forefront, Kinsey's statements were not generalizable to the general public.

Examples of Different Types of Bias:

Moral of the Story

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1. **the consumer of statistics:** Ask yourself what was the study design?
 - ▶ Who is the study population?
 - ▶ Who are the respondents and how were they selected?

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For you:

1. **the consumer of statistics:** Ask yourself what was the study design?
 - ▶ Who is the study population?
 - ▶ Who are the respondents and how were they selected?
2. **the producer of statistics:** If you want your results to generalize **beyond** just your sample to your study population, your sampling scheme has to as representative as feasible.

Another Example: Facebook

In the news

- ▶ NPR's story on younger users ([link](#))
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Let's consider a hypothetical scenario where we compare 15 life occurrences between you and your friend rated between 0 (lowest) and 5 (highest).

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	avg
you																
friend																

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	avg
you	3	1	2	3	3	3	3	1	1	3	4	2	1	4	3	2.5
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you	3	1	2	3	3	3	3	1	1	3	4	2	1	4	3	2.5
friend	1	5	2	0	4	2	4	1	0	1	4	4	1	5	3	2.5

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	avg
you	3	1	2	3	3	3	3	1	1	3	4	2	1	4	3	2.5
friend's FB		5			4		4				4	4		5		4.3
friend	1	5	2	0	4	2	4	1	0	1	4	4	1	5	3	2.5

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you	3	1	2	3	3	3	3	1	1	3	4	2	1	4	3	2.5
friend's FB		5			4		4				4	4		5		4.3
friend	1	5	2	0	4	2	4	1	0	1	4	4	1	5	3	2.5

The selective “Facebook image curation” your friend performed is a form of selection bias!

Explanatory and Response Variables

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What's wrong with hypotheses?