Critical Thinking

Tutorial 7: Inference from a sample

Exercise 1: Identify the population, sample, and target property for each of the following inference from a sample arguments. Then comment on whether the argument provides a good reason to accept the conclusion. If it is not what are its main weaknesses?

1. About 45% of 1,000 doctors randomly selected from Melbourne hospitals are female. Therefore, between 40% and 50% of all doctors in Melbourne are female.

Population:	All doctors in Melbourne
Sample:	1000 randomly selected doctors from Melbourne hospitals
Target Property:	Being female

The problem is that the sample is from *hospitals* but the conclusion is about *all doctors in Melbourne* (which would include GP's and other doctors at clinics that are not at hospitals).

2. About 45% of 1,000 randomly selected doctors in Melbourne are female. Therefore, between 40% and 50% of all doctors in Melbourne are female.

Population:	All doctors in Melbourne
Sample:	1000 randomly selected doctors from Melbourne
Target Property:	Being female

This argument is reasonably unproblematic, assuming the doctors are truly randomly selected. The sample size of 1000 should be sufficient (remember that large populations don't require larger sample sizes if the sample is truly random)

3. Based on a survey of 3460 homeowners in Melbourne, 95% also owned an automobile. Therefore, almost all Melbournians own a car.

Population:	All Melbournians
Sample:	3460 homeowners in Melbourne
Target Property:	Own a car

The sample is likely unrepresentative of the population. What's the percentage of *homeowners* in Melbourne? *All* Melbournians would include people who rent, who are homeless etc… Also, what about "automobile" – does this exclusively refer to cars or other kinds of vehicles?

4. Trust me, I'm a tour guide in New York and I meet Canadians all of the time. Canadians just dress less formally than Americans do.

Population:	All Canadians
Sample:	Canadians this person has met
Target Property:	Dress less formally than Americans

Sample size – too small? How many Canadians has this person met? Main issue: **availability bias (selection not random)**. Cannot generalise from this sample onto *all* Canadians.

5. None of the 15 social workers we investigated has behaved unethically. Therefore, if we investigate another social worker, he or she will not have behaved unethically.

Population:	All social workers
Sample:	15 social workers
Target Property:	Behave unethically

Sample size is too small. Availability bias could be a problem, as well as we don't know if this is random or not.

Exercise 2: Assuming that the given statement is true, indicate which conclusion(s) would be strongly supported.

72% of the three hundred university students who responded to a questionnaire published in the campus newspaper are opposed to the president's economic policies.

a) Some readers of the campus newspaper are opposed to the president's economic policies.
~~b) 72% of the students attending this school are opposed to the president's economic policies.~~
c) Some students attending this school are opposed to the president's economic policies.
~~d) Most readers of the campus newspaper are opposed to the president's economic policies.~~
~~e) 72% of the readers of the campus newspaper are opposed to the US president's economic policies.~~

Exercise 3: After reading the following procedures for sampling a population and measuring the target property determine what risks, if any, there are of sampling bias and measurement bias. If you identify any risks of bias, explain what they are, and how they might affect the results.

a) Nina recently started her own podcast and she wants to figure out which segments she should prioritize to grow her audience. She directs her listeners to an online poll to evaluate the

different segments she regularly holds during her podcast episodes.

[her current audience is not necessarily representative of the group of people who don't currently listen to the podcast, but might be interested. She may end up with evaluations that are higher than they would be among those that are not current listeners and she end up playing to her current audience rather than growing if the preferences of the two groups systematically differ].

b) Nadir wants to do research about energy-use habits among undergraduates at Monash University. He constructs a survey to ask respondents about a variety of energy saving and spending habits. He plans to call a representative sample of 100 undergraduates and ask them the questions on the survey over the phone, while recording their answers.

[This experimental design will be subject to response bias. Respondents may not be truthful about their habits because it will make them look bad].

c) Noah is working on a project for his marketing class on consumer opinions of major brands. He decides to survey 500 people from within Metropolitan Melbourne in hopes of reaching some conclusions about consumer attitudes in Melbourne. He pays for a representative sample of phone numbers of Melbournian residents and calls people for a few hours when he wakes up every morning at 9 AM until he is able to complete 500 surveys with people who answer the phone.

[This sample will be biased toward people who have phones, who are willing to answer, and who are free at that time of day. This might be an older, wealthier sample than usual, so the brands they rate positively may reflect their age and class status]

Exercise 4: More complex inferences from a sample. Identify the sample, population, and target property for each of the following passages and comment on whether the poll provides a good reason to accept the conclusion drawn.

a) To determine the overall workplace satisfaction of their younger employees (aged 20-30 years old) the HR department at a multi-national corporation asked each of their 2000 employees (aged 20-30 years old) from their branches in Melbourne and Sydney to complete and return a survey asking the key question about job satisfaction. They received 468 completed surveys back and found that 75% say that they are at least satisfied with their current employment. Of those, 23% reported being very satisfied. Given that this is higher than the Australian national average (75.4%), the HR department concludes that no changes need to be made to improve the workplace satisfaction of young employees.

What is the main conclusion of this article?

No changes need to be made to improve the workplace satisfaction of young employees.

What is statistical generalization is made?

75% of young employees at the company are satisfied.

Population:	Employees at this multi-national corporation aged 20-30
Sample:	468 employees from branches in Melbourne and Sydney
Target Property:	Satisfied with job.

Is it supported by the study?

No! There are a suite of problems here.
First there are problems with the generalization they make.

Problems with the sample.

- Multi-national corporation but sample only selected from Australian branches (Sydney and Melbourne). It may be that job satisfaction is high in Australian branches but not in overseas branches.
- The sample is **self-selected** and the **response rate** was quite low.

Problems with how the target property was measured

- We don't know much about what questions were asked, but it is plausible that dissatisfied employees who wish to keep their job will not honestly report their dissatisfaction. Especially if the surveys are not anonymous.
- It's not clear why the Australian national average is the appropriate benchmark for "no changes to be made". Why not strive to be better than average? Moreover, the Australian National average includes older employees also. It may be that the Australian National average for job satisfaction among young people is higher!
- And even if it is true that 75% of young employees at this company are satisfied, the percentage of 'very satisfied' employees may be considerably lower than the national average.

b) People from 171 countries responded to the web survey, which was available in ten languages. It was live for seven weeks, spanning May and June 2020.

This report, based on 55,811 responses, includes data from 11 countries where we had the most respondents: Austria, Australia, Brazil, France, Germany, Ireland, Netherlands, New Zealand, Switzerland, United Kingdom, and the United States.

People reflected on how their alcohol and other drug use had changed in the past month (April to May) compared to February 2020, before the COVID-19 pandemic was declared and lockdown restrictions implemented in most countries.

The Australian sample of 1,889 people consisted mainly of younger adults (73% were younger than 35). The sample spanned Australian jurisdictions, including 40% from Victoria.

We asked people about how often they drank alcohol, how much they drank in a typical session, and how often they binge-drink, defined as drinking five or more drinks in a session.

Some 39% reported drinking more compared to before COVID-19, whereas a similar number (37%) were drinking less. A total of 17% reported drinking at the same frequency and quantity, while 7% reported a mix of effects.

This challenges the existing narratives that people are mainly drinking more alcohol during lockdown. While we acknowledge many people did drink more, our results showed a varied response.

(https://theconversation.com/forget-the-stereotypes-our-survey-shows-many-young-people-are-drinking-less-alcohol-in-lockdown-145832)

What is the main conclusion of this article?

'It's not true that people are drinking more during Covid Lockdown'

What is statistical generalization is made?

The supporting claim for this is that as many Australians are drinking less as are drinking more.

Population:	1889 Australians
Sample:	All People
Target Property:	drinking more than before lockdown

Is it supported by the study?

No!

Sample not representative:

- Mostly young Australians
- Self-selected
- Cherry picked Australian data from a bigger study!

Measurement problems:

- Folks might be reluctant to report their binge drinking habits as binge drinking is generally viewed as a bad thing.