The key topics treated in this chapter are:

1. The nature of induction
2. The distinction between the sample and the population. In reports of studies, identify what the population is supposed to be; this is often not made clear.
3. The notion of a random sample; the fact that in actual practice, samples never are random in this technical sense.
4. The notion of a representative sample; the fact that a representative sample offers some approximation of what randomness would provide (but only an approximation); the fact that to determine what would constitute a representative sample one needs to rely on one's background knowledge.
5. The notion of a biased sample; students sometimes think the sample should be chosen with the conclusion in mind and may, for that reason, come to think that (e.g.) a sample to see how interested people are in literature should be taken from literature students. This might be one of the few topics in the chapter that would pose difficulties.
6. The qualifications that need to be introduced when a statistical generalization is applied to an individual case
7. The various fallacies; they should be quite easy to understand and identify.

Basic Information

An inductive generalization generalizes from a sample to an entire class. We use the sample to reach a conclusion about a target class.

- Sample: the part of a class referred to in the premises of an inductive generalization.
- Target population: in the conclusion of an inductive generalization, the members of an entire class of things.
- Property in question: in inductive generalizations, the members of the sample and target population share a property or feature in common.

The premises of an inductive argument are not offered as definitive evidence for the truth of their conclusion. The concept of validity does not apply to inductive generalizations.

There are two important characteristics to consider when assessing inductive generalizations:

1. **Representativeness.** In a strong inductive generalization, the sample must represent the target class.
   - A representative sample is a sample that possesses all relevant features of a target population and possesses them in proportion that are similar to those of the target population.
Chapter 9: Inductive Generalizations

- The less confidence we have that the sample of a class or population accurately represents the entire class or population, the less confidence we should have in the inductive generalization based on that sample.
- A biased sample is a sample that is not representative.
- If the population is heterogeneous, then the sample should be random or otherwise constituted so as to represent the target population. A random sample of a population is one in which every individual has an equal chance of being selected.

Consider the problems of representative sampling in the following cases:

- Psychological tests and experiments conducted in university psychology departments.
- Magazines that conduct reader polls where the readers send in their responses. If they send out questionnaires, their samples will be of those who return the questionnaire, which will give the sample a certain bias in favor of people who are relatively well-organized and well-disposed to social science--and rich enough to afford a postage stamp.
- Studies based on volunteers. People who volunteer for studies will have more time available, and be more favorably disposed to social science, than others who do not volunteer. If these traits turn out to be significantly related to the aspect being studied, the very fact of volunteers being used can work against the representativeness of the sample.
- Studies conducted at shopping malls. Where does the researcher stand in the mall: near the liquor store, the children's books, or the cheese shop? What sorts of people does he feel comfortable talking to? What sorts of people are likely to be willing to talk to him?
- Online Polls

**Biased Sample**

All of these issues have to do with simple nonrepresentativeness. Occasionally the problem will be even worse. The sample may be selected in such a way that it demonstrably misrepresents the population. This is the biased sample; the sample is selected in such a way that it is bound either to underemphasize or to overemphasize the characteristic being studied.

2. **Sample size.** Are the size and representativeness of the sample appropriate for how guarded the conclusion is?

- Generally, the more heterogeneous the population, the larger the sample should be.
- Except in populations known to be homogeneous, the smaller the sample in an inductive generalization, the more guarded the conclusion should be.
- When we generalize from the percentage of a random sample that has a certain feature to the percentage of the target class that has that feature, the larger the sample size, the higher the confidence level or the smaller the margin of error.
Criteria for Judging Inductive Generalizations

1. Representativeness of the Sample: The more representative the sample is of the population as a whole, the greater the reliability of the argument, other things being equal.
2. Sample Size Relative to Its Representativeness: The greater the sample size, the greater the reliability of the argument, provided that it is reasonable to believe that increasing the sample size will result in increasing the representativeness of the sample.
3. Relevance of the Observed Property (f) to the Definition of the Observed Individuals: The greater the relevance of the observed property to the definition of the observed individuals, the greater the reliability of the argument, other things being equal.
4. Scope, or Sweep, of the Conclusion: The more sweeping the conclusion, relative to the evidence presented, the less reliable the argument. The less sweeping the conclusion relative to the evidence presented, the more reliable the argument.

Procedure for Evaluating the Strength of Inductive Generalizations

1. First determine that indeed you have an argument and that it is an inductive generalization.
2. Be able to identify the conclusion, which usually contains the target population. If no explicit target population is mentioned, extrapolate to the most reasonable population. Note the degree of confidence with which the conclusion is stated.
3. Be able to identify the premises, which usually contains the sample on which the generalization is based.
4. Note any basic mathematical information (the size of the sample, percentages, etc.).
5. How variable is the population with regard to the trait or property that the argument is about.
6. Consider any information about how the sample was selected.
7. Try to evaluate the representativeness of the sample, drawing on common sense, background knowledge, etc.

Some Basic Types of Inductive Arguments

1. Enumerative Inductive Generalization (Universal)
In these arguments, the premises describe a number of observed objects or events as having some particular feature, and the conclusion asserts, on the basis of this generalization, that all objects or events of the same type will have that feature. This sort of inductive argument can be formally represented as follows:

1. All observed X's are f.
   Therefore, probably,
2. All X's are f.
2. Restricted Enumerative Inductive Generalization
This sort of argument is like the first type with the exception that the conclusion makes a claim about *most* items in the category rather than about *all*. The premise may be universal in form, or may be similarly qualified. Formally, this type of argument can be represented as:

1. All (or most) observed X's are f.
   Therefore, probably,
2. Most X's are f.

3. Inductive Argument to a Singular Conclusion
In this type of argument, the conclusion is about a single case. A generalization, about many or most cases, is applied to that single case. These sorts of inductive arguments can be formally represented as follows:

1. All, or most, observed X's are f.
2. Case A is an X.
   Therefore, probably,
3. Case A is f.

4. Statistical Inductive Argument (discussed further in the document on statistical arguments)
In a statistical inductive argument, there is a generalization from past experience, but the past experience need not be uniform or nearly uniform as it is in the inductive arguments just mentions. The premises describe a statistical relationship and the conclusion extrapolates that relationship from observed cases to unobserved cases. Formally, these arguments can be represented as follows:

1. N percent of observed X's are f.
   Therefore, probably,
2. Approximately N percent of unobserved and observed X's are f.

HOW TO READ THE REPORT OF A POLL

Polls are a key element of many inductive generalizations and statistical arguments and learning how to critically read and evaluate a poll is an important skill. We’ll cover this information in more detail in the document on surveys and polls. Here are some quick guidelines for reading the report of a poll.

A. Assess the Poll to the Extent that the Report Allows

1. *Orient Yourself*
   a. What is the "target property"--what's the poll asking about?
b. What is the population--to what group is the information gathered in the poll supposed to apply?
c. What is the sample--who were contained in it? how were they selected?

2. *Check the basic data.*
   Do the numbers add up?

3. *Check the sample.*
   Is the sample drawn from the target population? Is it too small? Is the sample representative of the target population with respect to those features known to affect the target property? Is it random? If not, how was it selected and why should we think that it is representative of the population with respect to the target property? Was the sample self-selected?

4. *Check the measuring instrument and method of contact.*
   a. What was the question? Is there reason to think it is loaded--that it invites a particular response?
   b. What was the method of contact? Is there reason to think the method of contact could have skewed the responses?

5. *Check the margin of error/confidence level.*
   What is the reported margin of error. When assessing the significance of the poll's findings, note whether the difference reported in the poll falls within the reported margin of error.

6. *Check the timing of the poll.*
   When was it done? Were there any events just prior to that time that might have caused responses untypical of long-term opinions or different from present or future opinions?

7. *Check the pollster and sponsor.*
   a. Who did the polling? Was it a reliable company or organization? Is there any reason to doubt the pollster's expertise?
   b. Who sponsored the poll and released the results? Is there any reason to suspect that their interests might have influenced the results in some way or have influenced which results have been disclosed.

**B. Assess the Reporting of the Poll**

8. *Is the information adequate?*
   Is the report of the poll deficient in that information you need to assess the poll was not provided?

9. *Are any inferences made by the reporter unwarranted?*
   Did the report contain statements that, in light of the information provided, are not justified? Did the report contain statements that depend for their credibility on evidence not provided? Did the headline express or imply a conclusion not warranted by the information provided?
C. Overall Assessment

10. Summarize your assessment of the information.
   a. Does the poll provide a reliable picture of the target population, so far as you can tell from what was reported? What specific limitations does the poll have, if any? In what ways should the pollster's statements be modified, if at all?
   b. Do the poll results really support the generalizations made and the conclusions drawn in the report?

Problems with Premises

Reliable Observations (A condition: personal testimony)
The observations that make up the premises of inductive generalizations and causal arguments have to be reliable. If there are circumstances that make those observations unreliable, we must reject the argument on the basis of the A condition.

Problems of Classification (A condition)
Inductive generalizations often include premises that classify particular things as having some property or other. Typically these arguments have the following standard form:

1. All (or most) observed X's are f.
   Therefore, probably,
2. Most X's are f.

The premise that all or most observed X’s are f presupposes that what has been observed is correctly and appropriately classified as X. You should pay attention to how items are classified and consider whether alternative classification schemes are applicable.

Questionable operational definitions (Chapter 4 on definitions)
- We should be careful when assessing inductive arguments (especially scientific and social scientific arguments) and not confuse the common lexical meaning of a term with more specialized meanings that have been stipulated as a basis for the research.
- We should also exercise caution and reflect on how key terms may have been operationally defined. Often key terms refer to abilities or mental operations that are not easily operationally defined by observable behavior.
- We also must recognize that values are often implied by the choice of terms we use (i.e., emotionally laden terms, etc.)

Pseudoprecision
- Information presented in numerical terms often has a ring of exactness that suggests it is the product of careful and rigorous study, and makes it seem particularly credible. It is as though the mere presence of numbers shows that the
facts presented are accurate and precise. We should be careful about such impressions, however.

- Pseudoprecision is defined as a situation where numbers suggest an exactness and accuracy that is just not there.
- When examining inductive generalizations, take a moment to reflect on the numbers used in the argument: where do they come from? How exact are they likely to be?

**Pseudoregularities**

- A pseudoregularity is an apparent regularity founded on a similarity between cases that is too superficial or of too little scientific significance to be appropriate as the basis for an inductive argument. For example: all these problems occurred on Tuesday, so Tuesday is my bad day.
- Relatedly, don’t confuse a correlation for a causal relationship.

**Plausible scenarios (A condition: begging the question)**

- A form of causal argument that begs the question because the narrative given in the premises assumes the correctness of the causal claim made in the conclusion.
- This happens when individuals rather than arguing in support of a causal claim don’t provide any real evidence for the claim, they simply cite a narrative in which the causal claim is presupposed. Such premises cannot provide real evidence for the causal conclusion because they are constructed on the assumption that the causal conclusion is true.

**Fallacies of inductive generalizations**

- **Hasty generalization**: a generalization based on a sample too small to be representative. For Example: “After only one year the alternator went out in Mr. O’Grady’s new Chevrolet. Mrs. Dodson’s Oldsmobile developed a transmission problem after six months. The conclusion is obvious that cars made by General Motors are just a pile of junk these days.”
- **Appeal to anecdotal evidence**: a form of hasty generalization presented in the form of an anecdote or story.
- **Refutation via hasty generalization**: when we ask someone to reject a claim on the basis of an example or two that run counter to the claim. For example: “Smoking doesn’t cause cancer. I have an uncle who smoked a pack of cigarettes a day every day of his adult life and he was 93 years old when he died following an auto collision.”
- **Biased generalization (biased sample)**: a generalization about an entire class based on a biased sample. For example: “Most Americans support displaying the Ten Commandments in County Court Houses. In a recent poll in Lancaster County, more than 70 percent of the respondents said they favored displaying the Ten Commandments in public office buildings”
Fallacies of composition and division

To think that what holds true of a group of things individually holds true of the same things as a group automatically and necessarily is to commit a mistake in reasoning known as the fallacy of composition.

To think that what holds true of a group of things as a group automatically holds true of the same things individually is to commit the error known as the fallacy of division.
Evaluate the following inductive generalizations. Identify sample and target population. Consider carefully the size and diversification of the sample and the extent to which the target differs or may differ from the sample. Remember, what's important is that the sample be representative.

1. SUSANVILLE--Less than 20% of college professors consider themselves shy, according to a new study by two psychologists. "We were surprised by this result because other studies have reported that almost 50% of adult Americans think of themselves as shy," said Elliot Smalley, professor at Colusa State University. "College professors are sometimes thought to be an introverted lot and so we expected perhaps a majority to think of themselves as shy," he said.

   Smalley and his associate, John Mahmoud, interviewed 150 college professors who were identified by administrators at 25 American universities as typical faculty. The universities were selected by a random procedure from a list of American colleges and universities, Smalley said.

2. A random survey of 1,000 callers to a drug hotline number produced the following results: 535 of the callers were heavy users of either cocaine freebase, amphetamines, or heroin; 220 were "recreational" users of cocaine or hashish; 92 were not drug users at all; and the remainder refused to answer the survey questions. This should put to rest the claim that most people who take drugs are of the occasional, "recreational" type.

3. ATLANTA (UPI)--A long-term federal study by the National Centers for Disease Control of 13 million U.S. births shows increases in the rate of eleven different types of birth defects, including a 17.5 percent yearly average increase in patent ductus arteriosus and a 10.8 percent ventricular septal defects, over a 14 year period. The study was conducted by the Birth Defects Monitoring Program of the CDC, which collected its data from hospitals across the country. From 1970 to 1983, over 13 million births were monitored.

4. A survey was made in 1948 in which a large number of names was randomly selected from the telephone book of a large city. The individuals called were asked whether they preferred Truman or Dewey in the presidential race. Over half of the respondents named Dewey, so the pollsters concluded that Dewey would carry the city and region.

5. Haslett wanted to know what percentage of students at his college votes in local elections. He asked each of his professors (he was a political science major) to ask for a show of hands in his classes so he could make a count. He found that 45 percent of the 120 classmates polled voted in local elections. He concludes that about 45 percent of the students at his college vote in those elections.

6. NEW YORK (AP)--Women who read "bodice-rippers," a sexy, violent genre of historical romance novel, have sex 74 percent more often than nonreaders, according to a survey by two psychologists from Emory Medical School in Atlanta, who interviewed 72
middle-class women in Atlanta, an equal number of them housewives, working women, and college students. Women who read the romances reported making love an average of 3.04 times a week, compared to 1.75 for nonreaders.

7. Most people who buy a Stick To It exercise machine continue to use it after five years. A survey of owners of Stick To It machines shows that more than 50% of those who still own their machines after five years use it at least a few times per week. The survey was conducted by mailing questionnaires to all registered owners of the machines. Twenty percent of the questionnaires were returned.

8. Surveys of several thousand Americans done in 1965, 1975, and 1985 show that men aged 18 to 65 have been doing a greater share of housework since 1965. This has happened in two phases. From 1965 to 1975, women dramatically cut the amount of time they spend on housework (from 27 to 22 hours a week) as more of them took paying jobs and they had fewer children. During that decade, the amount of time men spent on housework increased from 5 to 7 hours a week . . . [In 1985 men did] a total of almost 10 hours of housework a week. In contrast, women . . . [did] a total of 20 ours of housework a week by 1985.

9. In the most often cited 1985 study of 6,000 college students, University of Arizona Professor Mary Koss found that over 25 percent of college women had experienced a completed or attempted rape since their 14th birthday. Four out five of these encounters were with men they knew. But among college men, only 8 percent admitted to behavior that fit these definitions.

10. Suppose that you want to find out what percentage of the students in one of your classes got an A on a recent test. Since it is a large class, with over 200 students, you decide to survey some of the students. So, you go to class early one day and ask the first 25 students who arrive what grade they got on the test. Of these, 5 report getting an A. You conclude that about 20% of the students got an A.
Exercises on Polls

A. For each example assigned, do the following.
   (a) Identify (i) the target population, (ii) the target property, (iii) who constituted the sample, (iv) the method of contact, (v) the margin of error (sampling error) and degree of confidence, (vi) the timing of the poll relative to events that might influence its outcome, (vii) the sponsor of the poll, (viii) the polling organization, (ix) data reported from the poll, and (x) inferences based on the polling data.
   (b) Determine whether any differences reported were too close to call. Support your contention.
   (c) Decide whether there is any reason to challenge the representativeness of the sample used. Support your judgment.

B. For each example assigned, use the guidelines to prepare a succinct critique of the reported poll results. Distinguish between problems with the polling and problems with the reporting of the poll. Also discriminate between major or significant problems, and less important ones.

1. Background: Here is a fairly typical news report of the monthly Gallup poll of the fortunes of the three major political parties in Canada—the Liberals, the Conservatives (or Tories), and the New Democratic Party. (Gallup is a long-established commercial polling company.) It appeared in Canadian newspapers in February 1984.

   Liberals cut Tories’ lead in Gallup poll

   Montreal (CP) — A Gallup poll published today indicates the federal Liberals have cut into the Progressive Conservatives’ lead in voter support, but not as much as Liberal party polls made public last month had suggested.
   
   The Gallup poll, conducted in early January, indicates the Conservatives have a 20-percentage-point lead over the Liberals, down from 23 percentage points in December.
   
   Fifty-two per cent of decided respondents questioned in January supported the Tories, a drop of one percentage point from the previous month, while the Liberals gained two percentage points to 32 per cent.
   
   The new Democratic Party had the support of 15 per cent, unchanged from December.
   
   Gallup says its poll is accurate to within four percentage points either way 19 times out of 20, meaning the apparent changes may be illusory.
   
   The margin of error means, statistically, that voter support for the Conservatives could have been as high as 56 per cent or as low as 48 per cent, while the Liberals could have had the support of as many as 36 per cent of voters or as little as 28 per cent.
   
   Twenty-one per cent of the 1,046 respondents were undecided or refused to state a choice, down from 27 per cent in December.
2. **Background:** The following Reuters News Service report appeared in November 1987—at a time when the Soviet Union was involved in a war in Afghanistan and before it had announced or begun its withdrawal from that country.

**Poll in Moscow shows majority favor pullout from Afghanistan**

Reuter
PARIS—A Western-style opinion poll conducted in Moscow shows that the majority of Soviet citizens favor pulling troops out of Afghanistan and issuing visas to people who want to emigrate, the French magazine Le Point said yesterday.

The survey of 1,000 Moscow-area residents between 18 and 65 was conducted by the Soviet Institute of Sociological Studies and sponsored by Le Point, Radio France-Inter, the French television channel TFI and the French polling organization IPSOS.

It showed 53 per cent favored a “total withdrawal of Soviet troops from Afghanistan” against 27 per cent opposed.

The respondents also approved of “Issuing exit visas to Soviet citizens and their families who wish to leave the USSR for good” by 73 per cent to 18 per cent.

The poll turned up majorities of between 79 and 83 per cent in favor of multiple candidates in local elections, self-employment, workers’ selection of management and curbs on the sale of liquor.

Respondents were selected at random and interviewed by telephone Oct. 1-12, Le Point said.

The percentage of “won’t say” answers varied between six and 31—with the high score coming when respondents were asked whether they approved of the “anticipated liberation of so-called dissidents from incarceration.”

A resounding 85 per cent opposed abolition of the death penalty.

3. **Background:** Here is an Associated Press report of a poll that was published in June 1987.

**Date rapes acceptable, students tell U.S. survey**

Associated Press
PROVIDENCE—Nearly one-quarter of boys and one-sixth of girls who responded to a U.S. survey on rape said it is acceptable for a man to force a woman to have sexual relations if he has spent money on her.

The survey was taken of 1,700 students in grades 6 to 9 who participated in the Rhode Island Rape Crisis Centre’s assault awareness program at schools across the state. “I didn’t believe it,” said Jacqueline Jackson Kikuchi, the centre staff member who conducted the poll.

Ms. Kikuchi presented the findings last week at the National Symposium on Child Victimization in Anheim, California.

She said she was most surprised by the students’ answers about whether it would be acceptable for a man to rape a woman if he had dated her for a long time or spent money on her.
“Basically, the kids were very much into blaming the victim of the sexual assault.”

The survey also found that:

- 50 per cent of the students said a woman who walks alone at night and dresses seductively is asking to be raped;
- 51 per cent of the boys and 41 per cent of the girls said a man has the right to force a woman to kiss him if he has spent “a lot of money”—defined by 12-year-olds as $10 to $15—on her;
- 63 per cent of the boys and 57 per cent of the girls in grades 7 through 9 said it is acceptable for a man to force a woman to have sexual intercourse if they have been dating for more than six months;
- 87 per cent of the boys and 79 per cent of the girls said rape is acceptable if a couple is married.

“So many of our kids have attitudes that sexual abuse is okay,” Ms. Kikuchi said. She said the attitudes found in the survey could lead to date-rape and other forms of sexual assault.

Twenty per cent of the girls and 6 per cent of the boys in the survey said they had been sexually abused.

Ms. Kikuchi conducted the survey from February to December, 1987, when she conducted workshops for students at public and private schools.

She said the workshops were successful in changing some attitudes. After taking part in them, less than 25 per cent of the students thought rape or forced kissing was appropriate in any situation.