Chapter 4: Overview

Statistical Literacy 2009
Chapter Summaries
by
Milo Schield

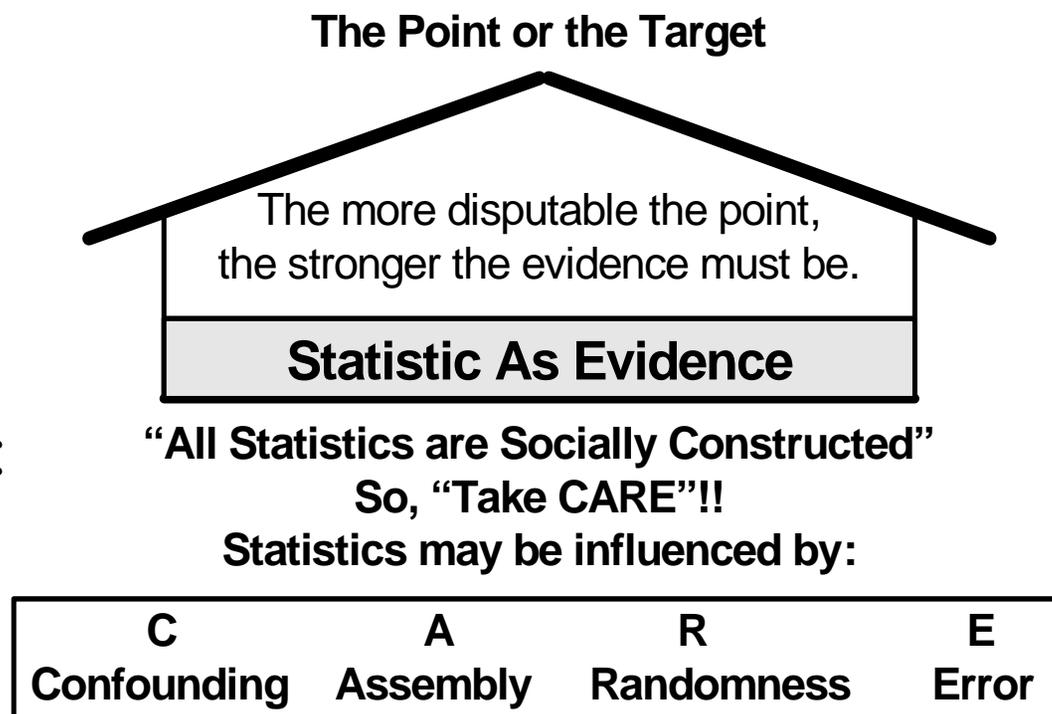*www.StatLit.org/pdf/...*

2009StatLitTextHandoutCh4.ppt

2009StatLitTextHandoutCh4.pdf

Ch 1. Review

Statistics are generally used as evidence to support an argument.

The influences on a statistic are of four kinds: Context, Assembly, Randomness or Error.

The Point or the Target

The more disputable the point, the stronger the evidence must be.

Statistic As Evidence

"All Statistics are Socially Constructed"
So, "Take CARE"!!
Statistics may be influenced by:

C	A	R	E
Confounding	Assembly	Randomness	Error

Context and Ratios

Context: Related factors taken into account; the confounders not taken into account.

An easy way to take into account a related factor is to form a ratio.

One of the most basic ratios is the part-whole ratio.

This ratio is typically expressed as a percentage.

The English grammar involved gets complex.
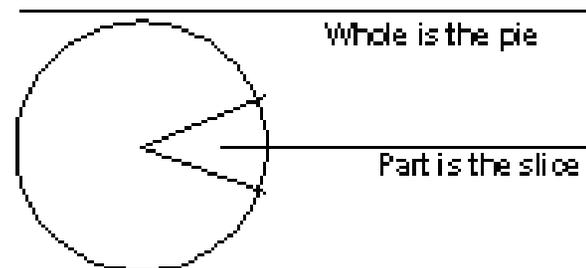
Percents: Two Kinds

Percent change:

- Can be bigger than 100%.
- Can be negative.
- Can NEVER be illustrated by a pie chart

Part-whole Percent:

- Can NOT be bigger than 100%.
- Can NOT be negative.
- Can ALWAYS be illustrated be a pie chart

A **part-whole percentage** gives the size of the part measured as a percentage of the whole

Part-whole Grammars: Two Kinds

Percent grammar is clause based:
- Simple; should be used whenever possible
- *Percent of* always introduces the whole
- Main verb separates part from whole.
- Cannot be used in making comparisons.

Percentage grammar is phrase based:
- *Percentage of* can introduce whole or part.
- Can be used in making comparisons.
- Often used in titles of tables and graphs.

(1) Percent Grammar: Statements

Four components:

- Leading prepositional phrase. Whole or whole delimiter.
- "Among" prepositional phrase: always whole.
- % of _____: always whole
- Verb or opposite side of verb from % of: always part.

Examples: Part is underlined

- 20% of men are <u>smokers</u>.
- **Among** men, 20% are <u>smokers</u>.
- <u>Smokers</u> are 20% of men
- 20% are <u>smokers</u> **among** men.

Determiners

Determiners are conditions that determine or delimit the size of the whole or part. Determiners might include date, place, race or sex. Here are two rules:

1. Leading prepositions such as *in* and *for* modify the entire statement and are components of the *whole*.

2. Modifiers take on the part-whole status of whatever they modify. Modifiers may be leading (adjectives) or trailing (relative clauses using *who* or *what*).

Percent Grammar: Examples

1. In the U.S. in 1997, 23% of 8th graders <u>have tried marijuana</u>.

2. Among US 8th graders, 17% <u>have used smokeless tobacco</u>.

3. In 1991, 17% of guys (10% of gals) <u>were involved in an affair</u>.

4. Of those 18-24 in 1991, 61% <u>lost their virginity by age 16</u>.

5. In 1950s, 58% of women <u>were virgins when married</u> (35% in 90s).

6. <u>Women</u> were 35% of the labor force in 1950s, (45% in 1990s).

7. <u>LSD has been used</u> by 5% of U.S. 8th graders.

8. <u>Parents should stay in bad marriage</u>. Agree: guys 46%, gals 25%

Forming Percents from Table of Counts

1. Decode the question; identify the whole and part.
2. In the table, identify the appropriate whole (draw a circle).
3. Identify the part of interest from within that whole.
4. Calculate the percent: (part/whole) times 100%.

Students	Men	Women	ALL
Humanities	28	72	100
Arts	4	36	40
Science	48	12	60
ALL	80	120	200

Describing a Percent in a 100% Table

1. Find the whole by finding the closest margin cell with a 100%. The relevant whole can be a column, a row, or the entire table.

2. Describe the associated part within that whole.

3. Describe the percentage using this whole and part.

Students W	-----------SEX -W------------		
Ⓟ MAJOR	W MALE	W FEMALE	W ALL
Ⓟ Business	↓ 60%	↓ 20%	↓ 40%
Ⓟ Economics	↓ 10%	↓ 50%	↓ 30%
Ⓟ MIS	↓ 30%	↓ 30%	↓ 30%
ALL	100%	100%	100%

Percents & Percentages

Percents and percentages are often confused.

Percent should only be used when it follows a number, as in 38%. Otherwise use percentage.

Percent is a unit of measure (20%); percentage is what is being measured.

Percents are units like inches or volts; percentages are properties like height or voltage.

(2) Percentage Grammar Introduction

Percentage grammar involves keywords: *percentage*, *fraction* or *proportion*. The rules are the same.

Percentage grammar is commonly used in the titles for tables and graphs, and in comparisons of percentages.

Percentage grammar is different from *percent grammar*.

- The word "percentage" never follows a number. E.g., "The percentage" or "The highest percentage".

- The rules and clues for identifying part and whole in percentage grammar are more complex.

Percentage Grammar Rules

In sentences with *percentage*, the word *of* can introduce either a whole or a part.

If *percentage* is followed by a relative clause (who are, that are), the phrase is part and *of* introduces a whole.

E.g., The percentage of men who <u>smoke</u> is 20%.

If *percentage* is not followed by a relative clause, then *percentage of* introduces a part.

E.g., the percentage of <u>smokers</u> is 20% among men.

Percentage Grammar: Statements

1. Among U.S. college freshman in 2006, the percentage who <u>thought abortion should be legalized</u> was 57%.

2. In 2005, the percentage of U.S. male college students who were <u>employed part time</u> was 23%.

3. In 2005 among U.S. college students who are black, the percentage <u>who were employed full time</u> was 19%.

4. In 2005 among U.S. college students who attended a two-year college, the percentage of <u>blacks</u> was 16 %.

5. In 2006, the percentage of U.S. college students who are <u>whites</u> who <u>attended four year colleges</u> was 44%.

Percentage Questions

There are two kinds of *percentage* questions:

Percentage grammar:

- **What is the percentage** of <whole> who are <part>?

Percent grammar: What percentage …

- of <whole> are <part>?
- of <whole> who are <whole> are <part>?

Bad form: What percent of <whole> are <part>?

Percent to Percentage Grammar

Converting from percent to percentage grammar is hard if there is a relative clause following "% of."

Compare "10% of students who are blacks <u>play sports</u>" with "The percentage of students who are <u>blacks</u> who <u>play sports</u> is 10%." This conversion is wrong. It makes *blacks* part when *blacks* was originally whole.

One way to avoid this problem is to convert the trailing relative clause to a leading adjective (black students) which gives "the percentage of black students who <u>play sports</u> is 10%."

Sports Grammar

Sports grammar is common:

- percentage of <u>completed</u> passes, passes <u>completed</u>, subscriber <u>renewals</u>, loans <u>denied</u>, <u>defective</u> cans; tire <u>failures</u>, student <u>dropouts</u>, or <u>overturned</u> verdicts.

In each of these cases, there is a natural whole.

Without a natural whole, sports grammar is ambiguous.

- percentage of female smokers; working males, infant deaths, or single mothers.

Moral: Avoid sports grammar in your writing.

Half Tables

Half tables are common:

- Plus: save space, focus on essentials.
- Minus: harder to read.

Class Last Year	Percentage who are Retained	Percentage who are Not Retained	All
Freshman	60%	40%	100%
Sophomore	75%	25%	100%
Junior	90%	10%	100%
Senior	10%	90%	100%
ALL	70%	30%	100%

Margin Value Rules

Margin values are Total values at the edge of a table.

Margin values are always sums or averages.
- Sums if bigger than biggest value.
- Averages if smaller than the biggest value.

Margin Value Rules: If margin value of a group, …
- is average then group is part and members are wholes.
- is a sum, then group is whole and members are parts.

Half Tables

Left table: Margin value is a sum.

   Group is whole, components are parts.

Right table: Margin value is average.

   Group is part, components are wholes.

Percentage Distribution Of Uninsured	U.S. 2002		Percentage who are Uninsured	U.S. 2002
ALL AGES	100%		ALL AGES	15%
Teens	12%		Teens	12%
Twenties	30%		Twenties	30%
Thirties	25%		Thirties	25%
Forties	18%		Forties	18%
Fifties	14%		Fifties	14%
Seniors	1%		Seniors	1%

Summary

Context involves what is (not) taken into account.

What is taken into account can influence
- Counts or totals (by forming ratios)
- Averages (by selection or standardizing)

Part-whole ratios are one of the most common ways of taking into account a related factor. In this case, the size of the group. Part-whole ratios standardize groups of different sizes.