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Reading tables of ratios

Statistical Literacy

Reading Tables of Rates and Percentages

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Part-Whole Grammar of Percentage and Rates

%1   X% of [whole] are \part/.
%2   Among [whole], X% are \part/.

P1   X% is the *percentage* of [whole] who are \part/.
P2   Among [whole], X% is the *percentage* who are \part/
P3   Among [whole], X% is the *percentage* of \part/.

R1   The *rate of \part/* among [whole] is X per N.
R2   The \part/ *rate* among [whole] is X per N.
R3   The \part/ *rate* of [whole] is X per N.

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Ambiguous Grammar Rates

1.   The <u>accidental death</u> rate among *teenagers*
2.   The *teenagers'* <u>accidental death</u> rate is …
3.   The <u>accidental death</u> rate of *teenagers* is …

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4.   The *teenager* <u>accidental death</u> rate is ...
5.   The rate of *teenager* <u>deaths</u> is …

4 and 5 are ambiguous; possessive is unstated.

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Ambiguous Grammar Percentages

A.   25% of males are smokers
1.   The percentage <u>*of males*</u> among smokers …
2.   The percentage <u>*of males*</u> who smoke …

B.   Among smokers, the percentage of males is 45%.
1.   45% <u>*of males*</u> are smokers.
2.   45% <u>*of smokers*</u> are <u>males</u>

C.   Among teens, the percentage of females who smoke
1.   Among teens, the percentage <u>*of female*</u> smokers …
2.   Among <u>female</u> teens, the percentage <u>*of smokers*</u> ...

Semantics: #1 never matches; #2 always matches

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Grammar Differences: Percentage and Rates

1.   Adjectives:
      a. Accident rate   b. Accident percentage

2.   'Of':
      a. Rate of inflation   b. Percentage of inflation

3.   'Of' and relative clause:
      a. Rate of workers who are unemployed
      b. Percentage of workers who are unemployed

4.   'Of' and 'among:
      a. Rate of unemployment among workers
      b. Percentage of unemployment among workers

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Difficulties Reading Rates in Tables

Percentage of Smoking *Prevalence* Among U.S. Adults, 18 and Older: 1955 - 1990

Year	All	Males	Females	Whites	Blacks
1955	--	56.9	28.4	--	--
1965	42.4	51.9	33.9	42.1	45.8
1970	37.4	44.1	31.5	37.0	41.4
1980	33.2	37.6	29.3	32.9	36.9
1990	25.5	28.4	22.8	25.6	26.2

Among U.S. adults 18 and over in 1965, 45.8% is
a. the percentage of smokers who are black
b. the percentage who are black smokers
c. the percentage of blacks who are smokers

Slide 7 — Difficulties Reading Rates in Tables

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Percentage of Smoking *Prevalence* Among U.S. Adults, 18 and Older: 1955 - 1990

Year	All	Males	Females	Whites	Blacks
1955	--	56.9	28.4	--	--
1965	42.4	51.9	33.9	42.1	45.8
1970	37.4	44.1	31.5	37.0	41.4
1980	33.2	37.6	29.3	32.9	36.9
1990	25.5	28.4	22.8	25.6	26.2

Among U.S. adults 18 and over in 1965,
a. 45.8% of smokers are black
b. 45.8% are black smokers
c. 45.8% of blacks are smokers

Slide 8 — Difficulties Reading Percentages in Tables

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Percent of Women, 15 to 44, Who Received Selected Medical Services

CHARACTERISTIC	HIV Test	Pregnancy test	Pap smear
Total	17.3	16.0	61.9
AGE AT INTERVIEW			
15-19 years old	14.6	16.1	33.5
20-24 years old	23.7	27.4	68.7
25-29 years old	23.6	25.3	70.9
30-34 years old	18.5	17.4	69.5
35-39 years old	14.2	8.1	62.9
40-44 years old	10.0	4.3	62.7

Source: For 1995. Taken from Table 198 in 1998 U.S. Statistical Abstract.

CHOICES: Among these women ages 15-44,
a. 10% of those receiving an HIV test are ages 40-44.
b. 10% of those ages 40-44 received an HIV test.

Slide 9 — Ratio Table Margin Value Rules

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- **Margins** summarize data from table cells.
- **Margin values** are either *sums* or *averages*
- *Total* means 'all subjects'– not '*sum*'

If a margin value for rates or percentages:
1. is a *sum*, then the pieces are parts
2. is a *100% sum*, then the pieces are parts and their group is whole
3. is an *average*, then the pieces are wholes

A corner margin value can be a sum one way and an average the other

Slide 10 — Missing-margin tables with poor part-whole grammar

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Low Birth-Weight Births by State: 1990, 1995 and 1996.

STATE	PERCENT OF BIRTHS WITH LOW BIRTH WEIGHT		
	1990	1995	1996
U.S.	7.0	7.3	7.4
AL	8.4	9.0	9.3
AK	4.8	5.3	5.5
AZ	6.4	6.8	6.6
AR	8.2	8.2	8.5
CA	5.8	6.1	6.0

Source: Adopted from 1998 US Statistical Abstract (Some data omitted)

In the US in 1996,
a. 6% of low-weight births are in California.
b. 6% of California births are low-weight.

Slide 11 — Presentation Rules for Ratio-Tables

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1. Never use *percent* if *percentage* is needed.
   "The *percent* of women who received services…"
2. Never omit relative clause indicators.
   "The percentage of men *with* disabilities..."
3. Never use an adjective-noun for part-whole.
   "The percentage of *unemployed men*…"
4. Never use just "*by*" for a part.
   Use '*distributed by*' or appropriate grammar.
   "Death Rates [classified] by specific causes"

Slide 12 — Statistical Literacy

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Reading tables of ratios · Statistical Literacy

Is based on three kinds of reasoning*:*
1. *Proportional: describing rates and percents*
2. *Conditional: selecting groups (c.f. tables)*
3. *Contextual: making relevant comparisons*

To be statistically literate, one must be able to describe and compare rates and percentages as found in tables and graphs.

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Reading tables of ratios

Actions

Statistical Literacy

1. Test students' ability to describe and compare rates and percentages.
2. Test students' ability to read and decode tables of rates and percentages.
3. Create materials to teach students how to read tables of rates and percentages.
4. Teach college students these materials, test their ability and present the results.