

APDU '99 **Statistical Literacy** ¹⁰⁹⁹
Reading Rates and Percents 1

Association of Public Data Users
 October 26, 1999
 Milo Schield
 Augsburg College Minneapolis Minnesota USA
 www.augsburg.edu/ppages/schield
 schield@augsburg.edu

APDU '99 **Student Experiences** ¹⁰⁹⁹ 2

In Statistical Literacy, college students have described and compared rates and percentages.

Most student problems reflect ignorance:

- of comparisons (test and base),
- of English grammar used to state comparisons
- of rates and percentages (part and whole)
- of English grammar used to describe and compare rates and percentages

APDU '99 **Ignorance of Comparisons** ¹⁰⁹⁹ 3

Students have trouble with basic comparisons:

- simple difference (test - base) , "more than"
- simple ratio, (test/base), "times as much as"
- relative difference, (test-base)/base, "more than"

See "*Common Errors in Forming Comparisons*", by Schield, 1999 in *Of Significance, Vol1, Num. 1*.

APDU '99 **Ignorance of Percentages** ¹⁰⁹⁹ 4

Students have trouble with part-whole relations.

Arithmetic: Percentage = (Part/Whole) * 100%

Grammar:

"X% of {whole} is {part}"

"The percentage

- * of {whole} which/who are {part}."
- * among {whole} which/who are {part}."
- * of {part} among {whole}."

APDU '99 **Ignorance of Rates** ¹⁰⁹⁹ 5

Students have trouble with part-whole relations when the part and whole are different (c.f., rate of accidents per million miles).

Grammar:

"rate of {part} per/among {whole}"

"{part} rate per/among {whole}"

"rate which/who are {part} per/among {whole}"

"{part} rate who are {part} per/among {whole}"

APDU '99 **Differences between Rates and Percentages** ¹⁰⁹⁹ 6

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

Some students problems are due to Titles of Tables

In describing rates and percentages, the titles of tables, columns and rows may precipitate student problems in identifying part and whole:

- Titles are too brief
- Titles only list the topic
- Same indicator words are used for part and whole
- Part and whole are combined:
 - used as adjacent adjectives
 - used as adjective noun.

Percent: In or Below Poverty

www.census.gov/hhes/poverty/pov95/povest1.html

Table A. Persons and Families in Poverty by Selected Characteristics (Numbers in thousands)

Characteristic	1995		1994		difference Number of poor	Poverty rate
	Number	Per cent	Number	Per cent		
PERSONS						
Total.....	36,425	13.8	38,059	14.5	-1635*	-0.7*
White.....	24,423	11.2	25,379	11.7	-955*	-0.5*
Non Hispanic..	16,267	8.5	18,110	9.4	-1843*	-0.9*
Black.....	9,872	9.3	10,196	30.6	-324	-1.3*
Asian.....	1,411	14.6	974	14.6	437	-0.0
Hispanic origin..	8,574	10.3	8,416	30.7	159	-0.4

Poverty Rate for families...

www.census.gov/hhes/poverty/histpov/hstpov13.html

Historical Poverty Tables - Families

Table 13. Number of Families Below the Poverty Level and Poverty Rate (Numbers in thousands. Families as of March of the following year)

Year	Number of poor families	Poverty rate for families	Number of poor families with female (NSP) householder	Poverty rate for families with female householder
1998	7,186	10.0	3,831	20.0
1997	7,324	10.3	3,995	31.6

'98 US Statistical Abstract #141 Title Mixes Part and Whole

Death and Death Rates for Injury by Firearms, Race and Sex

- Death by [means of] firearms is the part.
- Race and sex are wholes [broken down by].

Solutions:

- (1) Death Rates due to/for/from Firearm Injuries by Race and Sex.
- (2) Firearm-related Death Rates by Race & Sex.

US Government Statistics US Statistical Abstract

DIVISION AND STATE	% OF BIRTHS WITH LOW BIRTH WEIGHT
United States	7.0
Dist.of Columbia	15.1
New England	5.9
Middle Atlantic	7.3
East North Central	7.1

Conclusion

Those responsible for writing the titles of tables have a special responsibility to the readers.

They must not only inform the readers, but they must educate readers on

- how to detect the whole and the part, and
- how to describe rates and percentages.