Statistical Literacy
Reading Rates and Percents

Association of Public Data Users
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Student Experiences

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

Ignorance of Comparisons

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"


Ignorance of Percentages

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}.

Differences between Rates and Percentages

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

Ignorance of Rates

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}"
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.

In or Below Poverty

Table 1. Persons and Families in Poverty by Selected Characteristics (Numbers in thousands)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>1995</th>
<th>1994</th>
<th>Number</th>
<th>Poverty Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>36,425</td>
<td>38,059</td>
<td>14.5</td>
<td>-1635*</td>
</tr>
<tr>
<td>White</td>
<td>24,423</td>
<td>25,379</td>
<td>11.7</td>
<td>-955*</td>
</tr>
<tr>
<td>Non Hispanic</td>
<td>16,267</td>
<td>18,110</td>
<td>14.4</td>
<td>-1843*</td>
</tr>
<tr>
<td>Black</td>
<td>9,872</td>
<td>10,196</td>
<td>14.6</td>
<td>-324*</td>
</tr>
<tr>
<td>Hispanic origin</td>
<td>8,574</td>
<td>8,416</td>
<td>14.6</td>
<td>437</td>
</tr>
</tbody>
</table>

Percent: In or Below Poverty

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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>Poverty Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>34,425</td>
<td>13.8</td>
</tr>
<tr>
<td>White</td>
<td>24,423</td>
<td>11.2</td>
</tr>
<tr>
<td>Non Hispanic</td>
<td>16,267</td>
<td>14.4</td>
</tr>
<tr>
<td>Black</td>
<td>9,872</td>
<td>9.3</td>
</tr>
<tr>
<td>Hispanic origin</td>
<td>8,574</td>
<td>14.6</td>
</tr>
</tbody>
</table>

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/from Firearm Injuries by Race and Sex.
2. Firearm-related Death Rates by Race & Sex.

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.