DATA, DATA, DATA: What to Make of It And How To Use It

*Florida Consortium for HIV/AIDS Research*

*The AIDS Institute*
Numbers, Rates, Proportions, Ratios….

• Interpreting public health data is a lot like those hated word problems from middle school math.

• A big part of doing this well is being precise in the words we use when working with numbers.
Precise Words

Here is a mathematical expression:

$$100 / 20 = 5$$

How do you say this in words?

“20 goes into 100 5 times”

“20 divided into 100 is 5”

“100 divided into 20 is 5”

“100 divided by 20 is 5”
## A Typical Public Health Table

<table>
<thead>
<tr>
<th></th>
<th>Tall</th>
<th>Short</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>100</td>
<td>40</td>
<td>140</td>
</tr>
<tr>
<td>Old</td>
<td>200</td>
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<td>230</td>
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<tr>
<td>Total</td>
<td>300</td>
<td>70</td>
<td>370</td>
</tr>
</tbody>
</table>
What can we say about these data?

- What percentage of subjects in this table are old?
- What percentage of subjects are short?
- What percentage of short subjects are old?
- What percentage of old subjects are short?
- What percentage of young subjects are short?
Let’s Examine One of These

• What percentage of old subjects are short?
• \(\frac{30}{230} \times 100 = 13.04\%\)
## A Typical Public Health Table

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Another One

- What percentage of short subjects are old?
- $\frac{30}{70} \times 100 = 42.86\%$
# A Typical Public Health Table

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Relevance....

- This is just like asking “what percentage of people with AIDS are black?” and “what percentage of black people have AIDS”? 
Are young people more likely to be short than old people?

- Percentage of young people who are short:
  - 40 / 140 * 100 = 28.6 %

- Percentage of old people who are short:
  - 30 / 230 * 100 = 13.0 %

- So it looks like the answer is yes
What Else Can We Measure?

• Difference in rates:
  • 28.6 % - 13.0 % = 15.6%
  • In words, the percentage of young people who are short is bigger than the percentage of old people who are short, by 15.6 percentage points

• Ratio of rates:
  • 28.6 / 13.0 = 2.2
  • In words, young people are about two times as likely to be short as old people
Percentages and Rates

- Percentages are a special case of rates.
- Percentages have base 100; rates can have any base (like 1,000 or 100,000).
- So if we say, 28.6% of young people are short, we are saying about 29 out of every 100 young people are short.
- We could express this same quantity as a rate per 100,000:
- 28,400 of every 100,000 young people are short.
When to Use Percentages or Rates?

- Percentages are widely understood when in the range of 1 to 99.
- When a percentage gets really low, it gets hard to understand.
- We can express \( \frac{1}{100,000} \) as 0.001 per 100 or as 0.001%, but most people find these harder to grasp intuitively.
Numerator and Denominator

- The numerator is the number on top of the division sign.
- The denominator is the number on the bottom of the division sign.
- Rate = Numerator / Denominator * Base
- The denominator is the number of people at risk.
- The numerator is the number of cases or events among the people at risk.
- The base results in a proportion (if it’s 1), a percentage (if it’s 100), or a rate (if it’s some other number).
What is a Proportion?

- Any fraction can be understood as a proportion – say, 7 out of 37 or 7/37.
- The fraction can then be written as a decimal: 7/37 = .189
- This is like a rate with base 1 (percentages have base 100)
- You could say, “.189 out of every 1 people”
- Most people find proportions easier to understand if expressed as a percentage or rate
- .189 is equivalent to 18.9%
One Out of --

• If 50 % of old people are short, we can also say that 1 out of 2 old people are short
• We can see right away that 50 out of 100 is the same as 1 out of 2; we can also use arithmetic: $100 / 50 = 2$
• If 12.5 % of old people are short, what can we say?
• $100 / 12.5 = 8$
• “1 out of 8 old people are short”
• This conveys exactly the same information as 12.5%, but many people find it easier to relate to.
• Usually statements of this kind are rounded off to the nearest integer.
Graphs with Numbers of Cases
Number of Adult AIDS Cases by Race/Ethnicity And Year of Report, Florida, 1988-2004

*The AIDS case definition was expanded in 1993.
HIV Cases Among Men Who Have Sex with Men (MSM) By Race/Ethnicity and Year of Diagnosis, Florida, 1999-2004

Note: MSM include MSM/IDUs.
Graphs with Percentages of Cases
Percentage of Adult AIDS Cases by Race/Ethnicity And Year of Report, Florida, 1988-2004

*Other includes American Indian/Alaska Natives, Asian/Pacific Islanders, and multi-racial persons.
Infectious (Primary & Secondary) Syphilis
Miami-Dade County, 1999-2004

Source: STD MIS.
Pie-charts with Percentages of cases
AIDS Cases and Population, Florida

Adult* AIDS Cases by Race/Ethnicity 2004 (N=5,797)

- Black: 53%
- Hispanic: 17%
- White: 29%
- Other: 1%

2004 Adult* Population By Race/Ethnicity (N=14,804,070)

- White: 67%
- Black: 17%
- Hispanic: 14%
- Other: 2%

*13+ yrs.
HIV Cases and Population, Florida

Adult* HIV Cases By Race/Ethnicity 2004 (N=6,304)
- 49% Hispanic
- 19% White
- 2% Black
- 2% Other

2004 Adult* Population By Race/Ethnicity (N=14,804,070)
- 67% White
- 17% Hispanic
- 14% Black
- 2% Other

*13+ yrs.
Reported AIDS Case Rates per 100,000 Population By Sex and Race/Ethnicity, Florida, 2004

- **Male**
  - White: 29.4
  - Black: 184.7
  - Hispanic: 62.4

- **Female**
  - White: 5.5
  - Black: 112.9
  - Hispanic: 16.6
How Much Bigger?

- We notice that the incidence rate for Black males is much bigger than the incidence rate for White males – 184.7 per 100,000 versus 29.4 per 100,000.
- Rate difference is 184.7 – 29.4 = 155.3
- Rate ratio is 184.7 / 29.4 = 6.3
- The rate for Black males is 6.3 times that of the rate for White males.
Reported AIDS Case Rates per 100,000 Population
By Sex and Race/Ethnicity, Florida, 2004

MALES
Rate ratios
Blacks:Whites, 6.3:1
Hispanics:Whites, 2.1:1

FEMALES
Rate ratios
Black:Whites, 21:1
Hispanics:Whites, 3.0:1
### STD Rates Per 100,000 Population*
By Race/Ethnicity, Florida, 2004

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>Gonorrhea</th>
<th>Chlamydia</th>
<th>Syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>White, non-Hispanic</td>
<td>35.7</td>
<td>105.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>447.4</td>
<td>789.9</td>
<td>9.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>37.5</td>
<td>150.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>20.9</td>
<td>97.6</td>
<td>1.5</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>68.5</td>
<td>198.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Based on 2004 mid-year population estimates.
Source: Bureau of STD, Management Information System

Year
Rate per 1,000 Births

Black

White

89 90 91 92 93 94 95 96

0 2 4 6 8 10 12 14 16 18 20

Rate per 1,000 Births

Year
Incidence and Prevalence

- Incidence: how many new cases of the disease of interest appeared in the population of interest in the period of interest.

- Incidence rate is number of cases per unit population per unit time.

- So if 432 new cases occur in 100,000 people during 2004, the annual incidence rate in 2004 is 432 per 100,000.

- If 216 new cases occur in 43,567 people during January through June of 2004, the annualized incidence rate is

- $216/43,567 \times 100,000 \times 2 = 991.6$ per 100,000
Incidence and Prevalence

- Prevalence is the number of cases currently living in a population, at a particular moment in time.
- Prevalence can also be expressed as a rate, number of cases per unit population.
- Prevalence rate is also measured at a particular moment in time.
Contact Us

Visit www.FCHAR.org

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