

# **Comparing Ratios**

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*Statistical Literacy 2009*

**Chapter 5 Summary**

by

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*[www.StatLit.org/pdf/...](http://www.StatLit.org/pdf/...)*

*2009StatLitTextOverviewCh5.ppt*

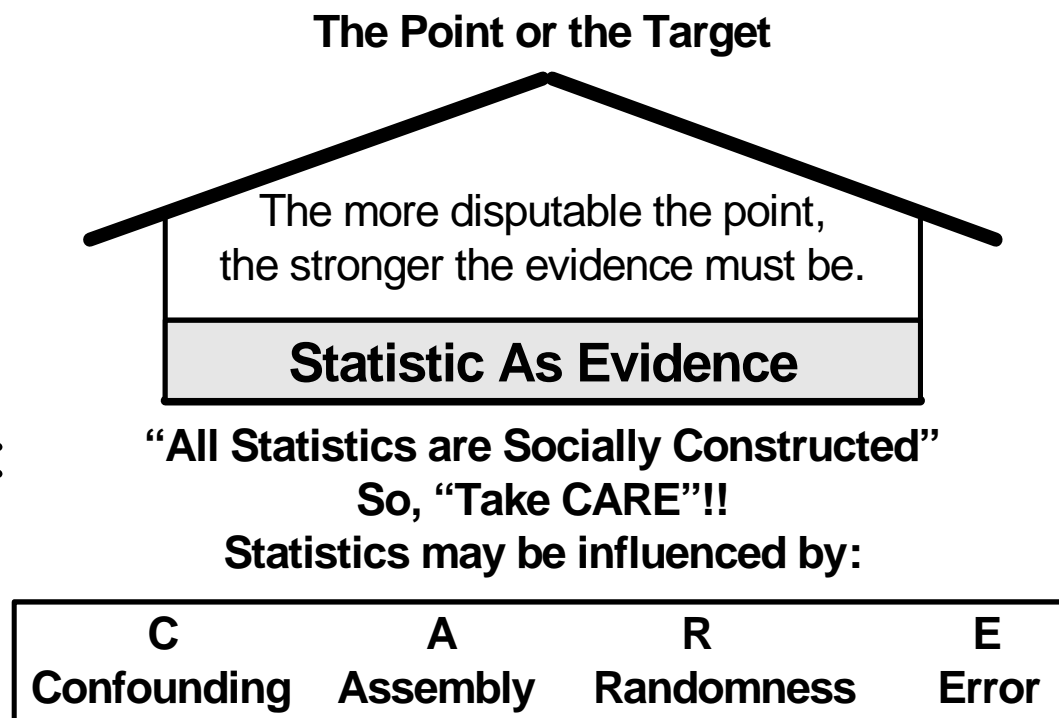
*2009StatLitTextOverviewCh5.pdf*

# Ch 1. Review

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Statistics are generally used as evidence to support an argument.

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



# Context and Ratios

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

The easiest way to take into account a related factor are to make a comparison or to form a ratio.

Making a comparison of ratios takes into account two factors: size of a relevant basis for comparison and the sizes of the groups.

The English grammar involved gets very complex.

# Three Topics

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**Percent Attributable:** A common almost undetectable, form of comparison. Examples: deaths from second-hand smoke, obesity and radon.

**Ratio Comparisons: Distinct Part vs. Common Part**

DP: Widows are more likely among suicides than widowers.

CP: Widows are more likely to suicide than widowers.

**Comparing ratios using *Likely* grammar**

# Percent Attributable:<sup>5</sup> The Idea

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Speculative statistics: statistics based on a model.

Common statistical model is epidemiological model.

“Attributed” or “attributable” are common signs.

“Attributed to” simply means “associated with”

“Attributed to” is often restated as:

- due to, because of (misleading restatement)
- caused by (incorrect restatement)

# Percent Attributable:<sup>6</sup> Examples

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38% of the low birth-weight babies born to mothers who smoke are *attributable to* smoking.

33% of all private medical insurance costs, and 20% of Medicare medical costs are *attributed to* smoking.

9% of annual medical spending is *attributable to* being overweight or obese.

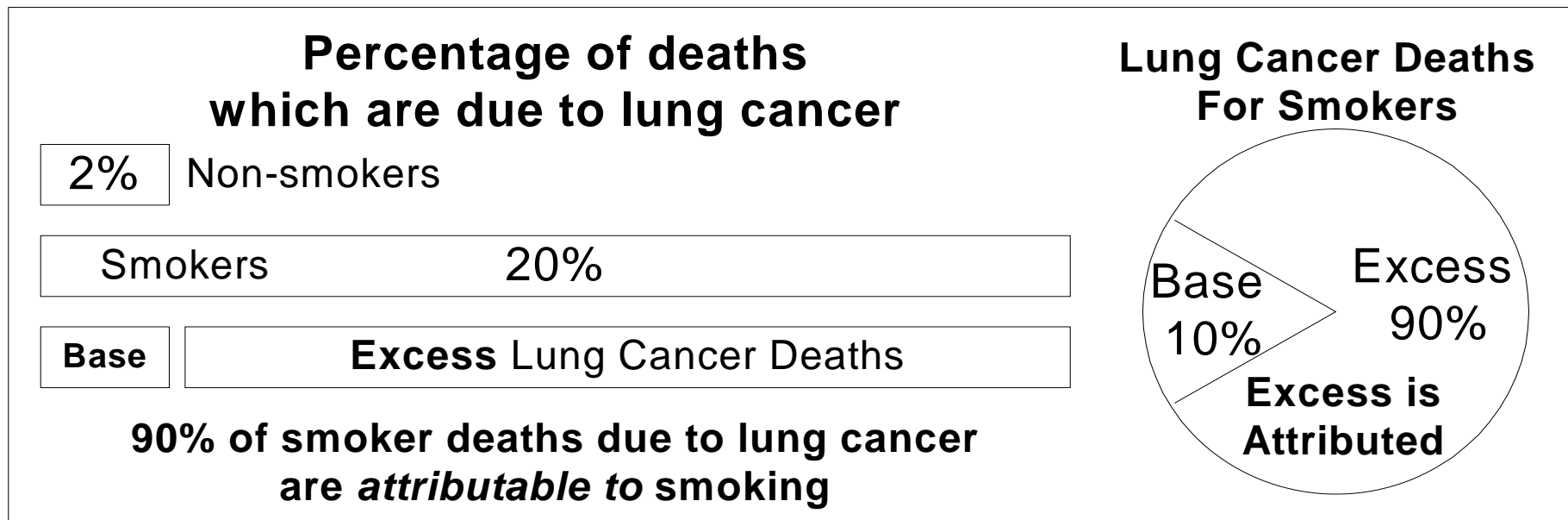
Background: *Confound Those Speculative Statistics*

> [www.statlit.org/pdf/2009SchieldASA.pdf](http://www.statlit.org/pdf/2009SchieldASA.pdf)

# Percent Attributable:<sup>7</sup> Calculation

Percentage of the exposure rate that is attributable to the exposure is the excess between the exposure and control group rates as a percentage of the exposure rate

Excess rate: 18%. Percentage attributed:  $18\% / 20\%$ .



# Comparisons of Ratios

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Two kinds of comparisons of part-whole ratios:

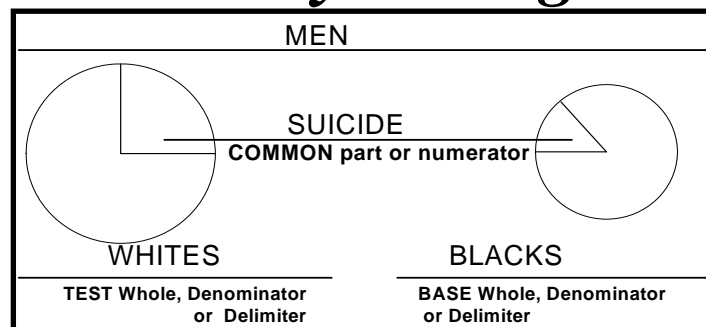
- A **common-part comparison** compares ratios having a common part but different wholes, as in *whites are more likely than blacks to commit suicide*. The wholes are blacks and whites; the common part is suicide
- A **distinct-parts comparison** compares ratios having different parts but a common whole, as in *thieves are more likely to steal a Nissan than [to steal] a Ford*. The common whole is all cars stolen; the parts are Nissans and Fords.



# Comparisons of Ratios

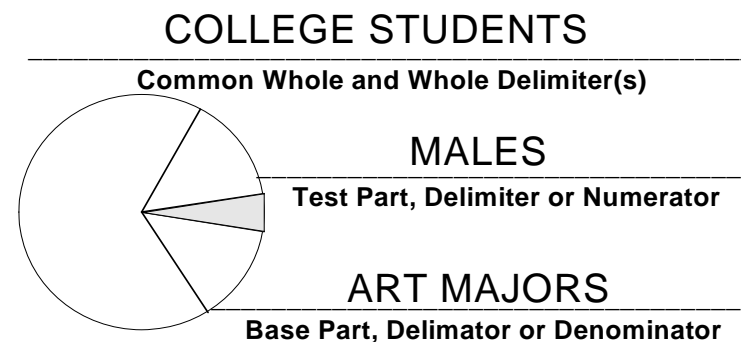
**Common-part comparison: controls for size of groups**

*Among men, suicide is more likely among whites than among blacks*



**Distinct-parts comparison: single group; no control.**

*Among college students, males are more likely [to be found] than [are] art majors.*



# Comparison of Ratios

**Common-part comparison: compare 60% with 20%.**

**Common part is business majors.**

**Distinct-parts comparison: Compare 60% with 30%**

**Common whole is males.**

Students $\boxed{W}$	-----SEX - $\boxed{W}$ -----		
$\textcircled{P}$ MAJOR	$\boxed{W}$ MALE	$\boxed{W}$ FEMALE	$\boxed{W}$ ALL
$\textcircled{P}$ Business	↓ $\textcircled{60\%}$	↓ $\textcircled{20\%}$	↓ 40%
$\textcircled{P}$ Economics	↓ 10%	↓ 50%	↓ 30%
$\textcircled{P}$ MIS	↓ $\textcircled{30\%}$	↓ 30%	↓ 30%
ALL	100%	100%	100%

# Likely Grammar: Examples

Common-part comparison: Business majors are more likely among males than among females. Males are more likely to be business majors than [are] females.

Distinct-parts comparison: Business majors are more likely among males than [are] MIS majors.

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%

# Likely Grammar: Rules

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- 1 "among" always indicates a whole
- 2 "to" indicates a part. (Also, to be, to do, to have, etc.)
- 3 A part-whole compare must have at least 3 part-whole terms with at least one part and one whole.
- 4 "as X is" or "than X is" means X is *linked* to the subject. Two linked terms have the same part-whole status.
- 5 "is likely to " without an object (e.g., *is likely to occur* or *is likely to happen*) indicates the subject is the part.

# Likely Grammar:

## Common-part compare

**Likely Among: Part as subject.** *Among* indicates distinct wholes.

\_\_\_ is \_\_\_ <compare> **likely**\*among\*\* \_\_\_\_ |than/as\*\*\*|among \_\_\_\_.  
 {part} # {test-whole} {base-whole}

\* *prevalent* can be used in place of *likely*.

\*\* *Other prepositions can be used in place of “among”.*

**Likely To: Test whole as subject:**

\_\_\_\_\_ is \_\_\_ <compare> **likely** to \_\_\_\_\_ | than/as\*\*\*| is \_\_\_\_\_.  
 {Test whole} # {part} {base-whole}

\*\*\* The choice of “than” or “as” depends on whether the compare is a difference (simple or relative) or a ratio. Never use both.

Note: the main verb can be either singular (is) or plural (are) and can be replaced by an active verb.

## Likely Grammar: More Examples

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*People who put away six cloves of garlic a week are about half as likely to get stomach cancer as those who rarely touched the pungent bulb.*

*Married women using an IUD as their primary form of birth control are 50% more likely to get pregnant for those ages 15-19 than for those 20-24.*

*In 1991, Catholics were 6 times as likely to own a gun as were Jews*

*In 1992, voting for President was 83% more prevalent among blacks (64%) than [among] Hispanics (35%).*

# Summary

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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.

Comparisons of part-whole percentages are very powerful. They compare test with base and standardize groups of different sizes.