## Statistical Prevarication

# MILO SCHIELD

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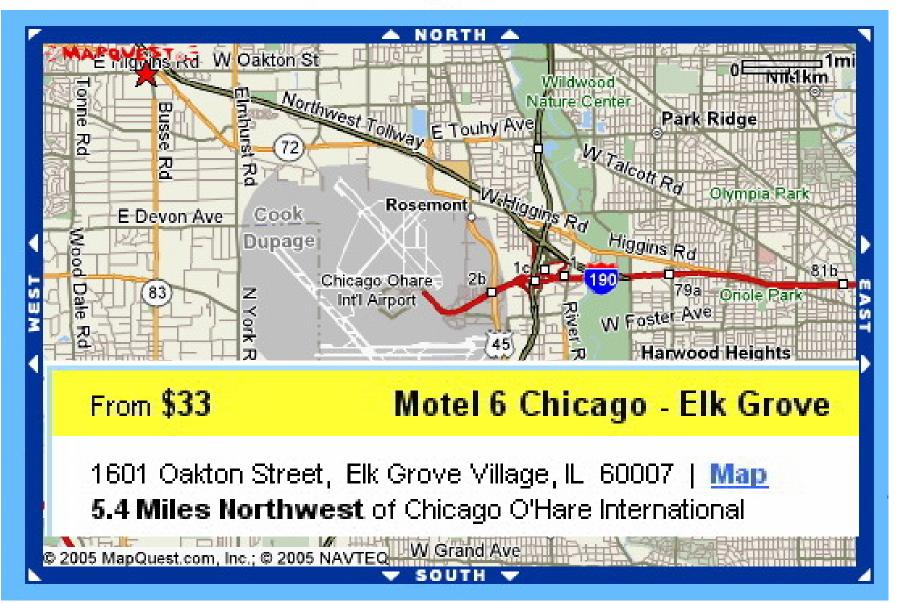
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## Prevarication

To straddle, to equivocate, to tell a half-truth. Prevarication uses omission and ambiguity Prevarication is not lying.

Prevarication can be

- \* deliberate and even malicious.
- \* accidental or overly-enthusiastic.



#### Hotel address: 1601 Oakton Street, Elk Grove Village, IL 60007

#### Area airports

O'hare International Airport 8.6 miles, Palwaukee Municipal Airport 10.4 miles, and Midway Airport 23.9 miles.

#### PREVARICATION

1999 US Households	Mean Income	Median Income
Before tax	\$55K	\$41K
After tax	\$41K	\$34K
Tax Paid	\$14K	\$7K

Q. How much tax is paid by the average family?Q. How much tax is paid by a typical family?

\$55K: Before-tax US household mean income
\$34K: After-tax US household median income
Look at that \$21K difference due to taxes... ☺

#### Everyday Prevarication: "99.9% Accurate"

- Greater Than 99.9% Accurate Reliable as Tests Used by Doctors and Hospitals
- Confidential and Anonymous
- Results 24 Hours a Day
- One Spot<sup>™</sup> Technology

FDA APPROVED

U.S. FOOD & DRUG ADMINISTRATION Premarket approval # BP950002

HIV-1 TEST SYSTEM for the Detection of Antibodies to HIV-1

### Prevaricating with "Accuracy"

#### **Accuracy in Confirmation:**

99.9% of those who have HIV test positive.

# Accuracy in Prediction: If 0.1% have HIV 50% of those who test positive have HIV.

# Greater Than 99.9% Accurate Reliable as Tests Used by Doctors and Hospitals



#### **Prevaricating** with Nonsense

#### Software: 6 times [600%] cheaper than retail.



**True: Three is 2 times [200%] more than One.** 

#### **Borderline Prevarication**

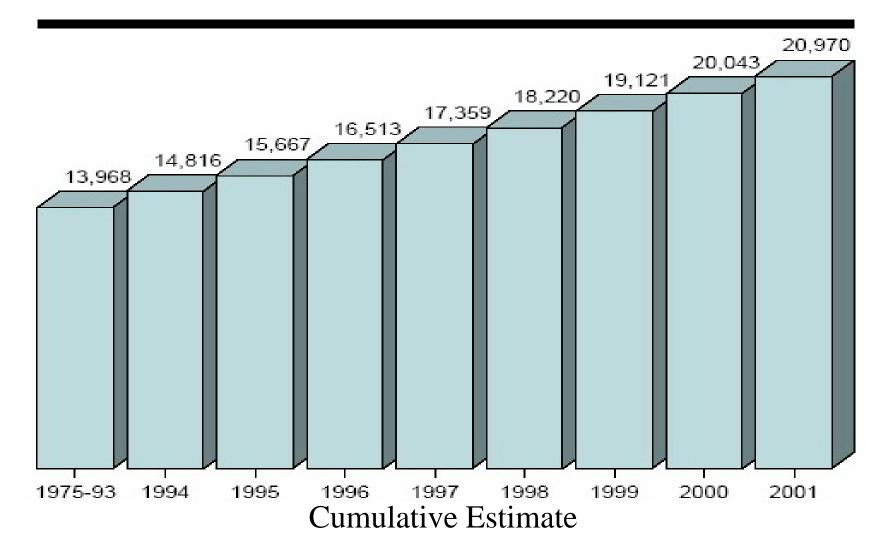
**Prevarication:** a half-truth involving a material ambiguity or equivocation.

**Borderline Prevarication:** placing a material element where it is unlikely to be noticed.

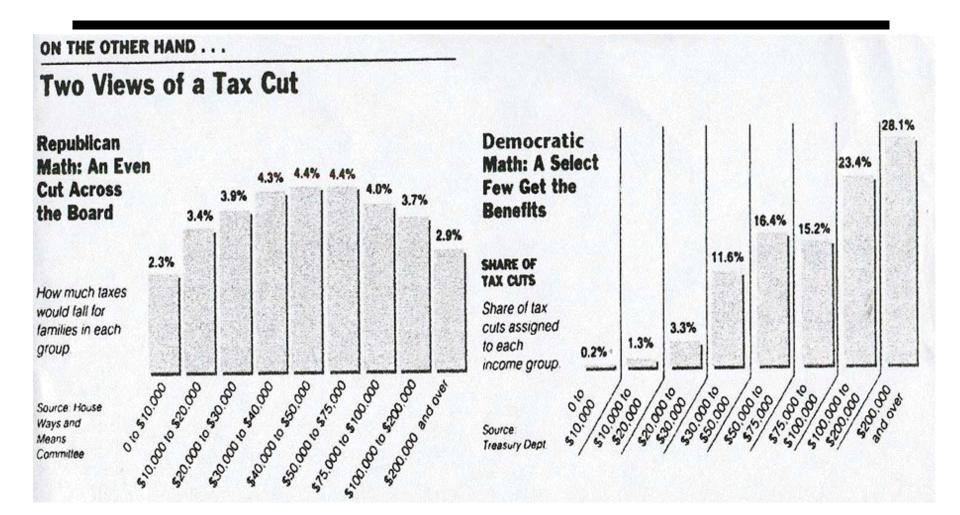
Both lead to reader misunderstanding.

Borderline prevarication is writer mistake.Prevarication is writer negligence.

#### Number of Lives Saved by Minimum Age Drinking Laws



#### Tax Cut for the Rich: Smallest or Biggest?



#### Borderline Prevarication: Misleading Comparisons

- Men (widows) are more able to withstand loss of spouse than are women (widowers).
- Widows (women) are more likely among suicides than are widowers (men).

#### Mexico has better medical care than the US.

- Death rate in Mexico: 5 per 1,000 population
- Death rate in US: 8.7 per 1,000 population

#### Borderline Prevarication: Choice of Groups

#### Heart attack risk is X times greater for those with HIGH blood pressure than for those with LOW blood pressure.

#### X can be anywhere between 1.5 and 20.

- X = 1.5 using top and bottom 50%.
- X = 2.0 using top and bottom 10%
- X = 10 using top and bottom 2%
- X = 20 using top and bottom 1%.

#### **Borderline Prevarication: Twice as Many Marriages**



#### How could this reflect poorly on match.com?

#### Full Prevarication: Incomplete Comparisons #1

#### Judy likes dolls more than Joan.

- Judy likes dolls more than Judy like Joan.
- Judy like dolls more than Joan likes dolls.

#### More doctors recommend Crest ...

- ... than any other toothpaste
- ... than not.
- ... than nurses recommend Crest.

#### Full Prevarication: Incomplete Comparisons #2

# Q. Are you more likely to worry about your health than most people?

A. Yes, most people don't worry about my health.

#### Of all cars, a Maxima is most likely to be stolen.

- most likely to be [found among all those] stolen.
- more likely to be stolen [than any other car]

#### **Full Prevarication**

#### Auto death rate in Hawaii vs. Arkansas

- higher per mile of road
- lower per vehicle

#### **Divorced men 35-44 are most likely to marry...**

- than any other age-group of divorced men.
- than divorced women 35-44.
- than non-divorced men 35-44.

#### **Statistical Prevarication**

No matter how much statistical prevarication there is in the everyday news, statistical prevarication is more common in statistical education teaching and textbooks.

#### Statistical Prevarication 95% Confident

### What does this mean operationally?

What choice should one make?

- Bet on randomly drawing a red ball from an urn with 19 red balls and 1 black ball.
- Bet that a specific randomly-selected 95% confidence interval contains the fixed unknown population parameter.

#### Statistical Prevarication "Hypothesis test"

#### Test of Hypothesis

- Test of the hypothesis
- Test of the statistic using the hypothesis

#### Test

- that Ho is true given a statistic
- of the statistic given Ho is true

#### Statistical Prevarication "Due to Chance"

"First convince us that a finding is *not due to chance*" Sir Ronald Fisher

A finding is unlikely

- if due to chance
- to be due to chance
- .... due to chance

#### Statistical Prevarication "Probability of Error"

Alpha is the "probability of Type 1 Error"

Type 1 Error:

- Rejecting Ho when/given/if Ho is true
- Ho is true when rejecting Ho [No]
- Rejecting a true Ho [No]

Very sophisticated prevarication: putting conditionality inside the 'part'.

#### Statistical Prevarication Smaller p-value is better

What does p-value mean operationally?

What choice should one make?

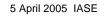
- P-value of less than 0.02% for ESP
- P-value of 2% for new drug

#### Statistical Prevarication Statistical significance

### What is most important about p-value

- Model assumptions (pooling)
- Sample size
- Population size/correction
- Type of study: random assignment

Omitting the last is professional negligence





#### Conclusions

Prevarication is telling a half truth – not lying.

Journalists and communicators must be educated so they aren't guilty of statistical prevarication.

Information consumers must be educated to spot statistical prevarication to avoid bad decisions.

Statistical educators must reduce or eliminate statistical prevarication in their classes & texts.