

5 April 2005 IASE 1

## Statistical Prevarication

---

### MILO SCHIELD

Augsburg College Department of Business Administration  
 Director, W. M. Keck Statistical Literacy Project  
[www.StatLit.org](http://www.StatLit.org) schield@augsborg.edu

*Communicating Statistics*  
 IASE Satellite Conference  
 5 April 2005

5 April 2005 IASE 2

## 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.

5 April 2005 IASE 3

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

**From \$33 Motel 6 Chicago - Elk Grove**

1601 Oakton Street, Elk Grove Village, IL 60007 | [Map](#)  
 5.4 Miles Northwest of Chicago O'Hare International

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

5 April 2005 IASE 4

## 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...** ☺

5 April 2005 IASE 5

## 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™ Technology

**FDA APPROVED**

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

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

5 April 2005 IASE 6

## 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

**HIV-1 TEST**

5 April 2005 IASE 7

### Prevaricating with Nonsense

---

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

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

5 April 2005 IASE 8

### Borderline Prevarication

---

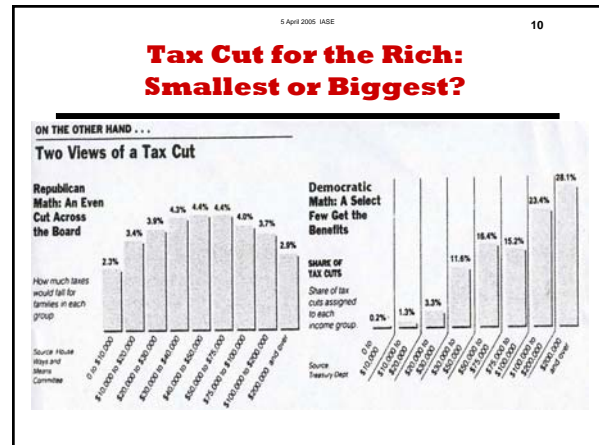
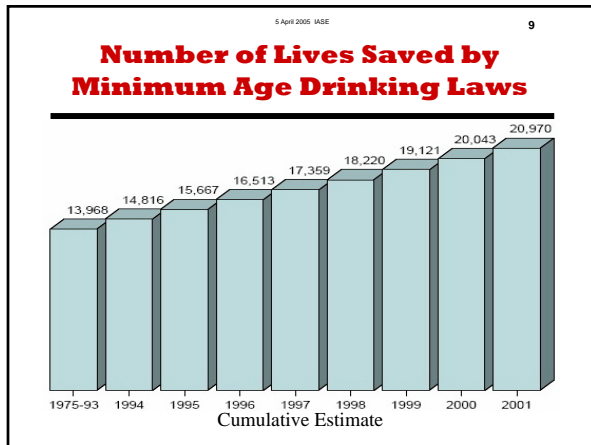
**Prevarication:** a half-truth involving a material ambiguity or equivocation.

**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.



5 April 2005 IASE 11

### 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

5 April 2005 IASE 12

### 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%.

5 April 2005 IASE 13

**Borderline Prevarication:  
Twice as Many Marriages**

---



**1** site for love

match.com

“twice as many marriages as any other site in the world.”

 WeddingChannel.com

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

5 April 2005 IASE 14

**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.

5 April 2005 IASE 15

**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]

5 April 2005 IASE 16

**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.

5 April 2005 IASE 17

**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.

5 April 2005 IASE 18

**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.

5 April 2005 IASE 19

**Statistical Prevarication**  
**“Hypothesis test”**

---

Test of Hypothesis

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

---

Test

- that  $H_0$  is true given a statistic
- of the statistic given  $H_0$  is true

5 April 2005 IASE 20

**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

5 April 2005 IASE 21

**Statistical Prevarication**  
**“Probability of Error”**

---

Alpha is the “probability of *Type 1 Error*”

---

Type 1 Error:

- Rejecting  $H_0$  when/given/if  $H_0$  is true
- $H_0$  is true when rejecting  $H_0$  [No]
- Rejecting a true  $H_0$  [No]

---

Very sophisticated prevarication:  
putting conditionality inside the ‘part’.

5 April 2005 IASE 22

**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

5 April 2005 IASE 23

**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

5 April 2005 IASE 24

 **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.