

Statistical Errors Even YOU Can Find (No, Really)

Tom Lang, MA
Tom Lang Communications and Training International

1

Statistical Problems in the Literature

- *EVERY STUDY* on statistical and methodological quality in the literature has found errors in large proportions (even more 50%) of articles
- Many of these errors are serious enough to call the authors' conclusions into question
- Many studies included the world's leading peer-reviewed general medical and specialty journals.

2

Statistical Problems in the Literature

- Widespread
- Long-standing
- Potentially serious
- Largely unknown
- Concern mostly basic statistics (which is why medical writers can and should learn how to report statistics)

3

Mistakes in Basic Math

- Found in 66% (21) of 32 manuscripts submitted for editing at the Cleveland Clinic by author's editors with calculators
- Found in 66% (104) of 157 articles from 20 radiology journals

The most common errors are in rounding, totals, percentages, and missing or incorrect numbers

4

Numbers reported with unnecessary precision

Imply a false or unnecessary precision in measurements or calculations

Measurement	Weight, mean (95% CI), pounds	P
Baseline	125.32 (112.06 to 138.63)	0.0002
9 months	-8.73 (4.25 to 12.47)	0.0071
Baseline	125 (112 to 139)	<0.001
9 months	-9 (4 to 12)	0.007

5

Reporting Percentages for Samples ~<100

Numerators and denominators should *always* be readily apparent for *all* percentages

“30% of the rats lived;
30% died; and . . .
the last one got away.”

6

Percentages with missing denominators

Be especially careful to look for low baseline rates

Increasing mean RN hours from 6 to 9 per day reduced the rate of urinary tract infections by 12%.

(But the initial rate was 7.5%, so a 12%-drop reduced the rate by less than 1%, to 6.6%.)

7



8

The 10-year Risk of Death in 400 Men with Prostate Cancer

Absolute risk with watchful waiting	14%	Natural frequency, watchful waiting	14 of 100 men
Absolute risk with resection	7%	Natural frequency, resection	7 of 100 men
Absolute risk reduction (ARR) with resection	7%	NNT with resection to prevent 1 death	16
Relative risk reduction (RRR) with resection	50%	Odds with resection (14/186)	7.5
Risk ratio, resection to watchful waiting	0.5	Odds with watchful waiting (30/170)	17.7
10-year hazard rate with resection	7%	Odds ratio with watchful waiting	2.3

14 of 200 treated with resection died, and 30 of 200 treated with watchful waiting died. NNT, number needed to treat (1/ARR)

9

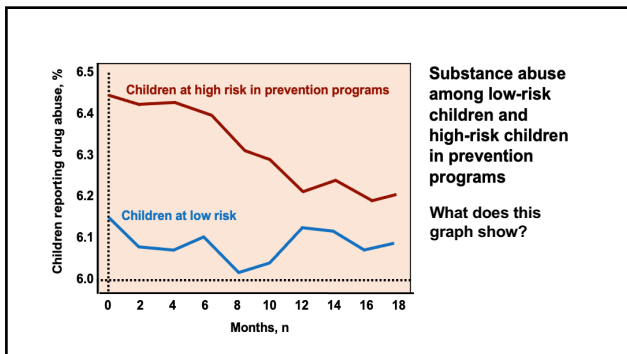
In patients with multiple risk factors for heart disease,

Lipitor reduces risk of heart attack by **36%***

Dr. Robert Jarvik
-Inventor of the Jarvik Artificial Heart and Lipitor Peer

* That means in a large clinical study, 3% of patients taking a sugar pill or placebo had a heart attack compared to 2% of patients taking Lipitor.

10



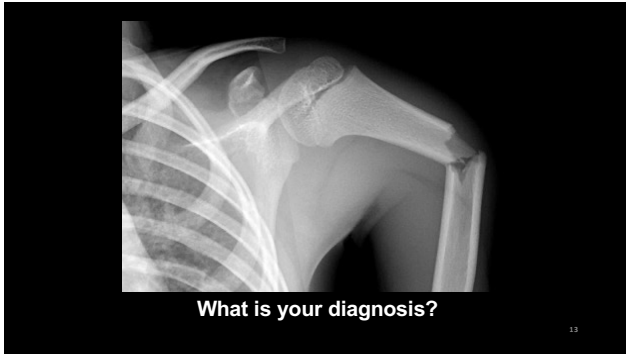
11

Interpreting Agreement: The Kappa Statistic

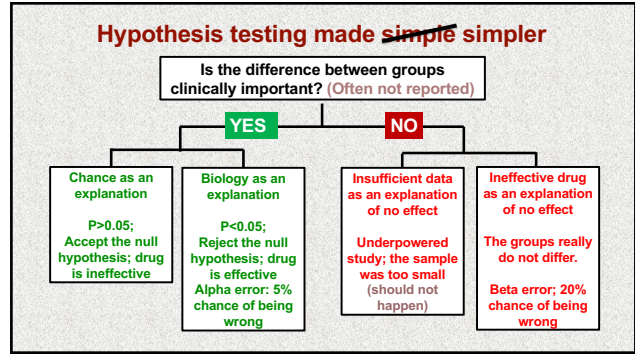
Kappa coefficient	Strength of agreement
> 0.8 to 1	Very high
0.6 to 0.8	High
0.4 to 0.6	Moderate
0.2 to 0.4	Low
0.2 to -0.2	None
-0.2 to -0.4	Low
-0.4 to -0.6	Moderate
-0.6 to -0.8	High
-0.8 ≤ -1	Very high

Warning!! The interpretation depends on the *medicine!*

12



13



14

Mistakes in Reporting P-Values

Baseline Comparisons in a Randomized Trial

Variable	Control (n = 43)	Treatment (n = 51)	Difference	P
Men, n (%)	21 (49)	21 (51)	3	1.0
Age, mean, y	75	74	1	NS
BMI, median,	27	35	1	<0.05
Diabetes, n (%)	11 (26)	8 (20)	6	0.723
Albumin, mean, g/L	30.0	33.0	3.0	0.03

15

"Spin"

Presenting non-statistically significant results as proof of efficacy (eg, lying) or minimizing or distracting readers (eg, misleading) from non-statistically significant results

- Reporting only significant results
- Focusing on significant secondary endpoints
- Presenting statistically significant findings as clinically important when they are not
- Claiming equivalence (no difference) from samples too small to make the claim

16

"Spin"

Of 2900 papers in a British pharmacology and a physiology journal, 56% to 63% of P-values between 0.05 and 0.1 were misleadingly reported as "trending toward significance" or as statistically significant.

(Let me know if you ever read about a P-value "running away" from significance.)

17


**"No matter how cynical you get,
it's impossible to keep up."**

Lily Tomlin

18

Search for reporting guidelines

Use your browser's Back button to return to your search results

 **Basic Statistical Reporting for Articles Published in Biomedical Journals: The "Statistical Analyses and Methods in the Published Literature" or The SAMPL Guidelines"**

The SAMPL Guidelines for reporting statistics
www.equator-network.org

19

19

How To Report Statistics in Medicine: Annotated Guidelines for Authors, Editors, and Reviewers

Thomas A. Lang, MA
Michelle Secic, MS
Foreword by Ed Huth, MD, MACP

(American College of Physicians, first edition, 1997; second edition, 2006)

20

20

Questions?



I'll put in a request for an answer

21

21

Tom Lang, MA

Tom Lang Communications and Training International

tomlangcom@aol.com
www.TomLangCommunications.com

22

22