



Statistics in Evidence Based Medicine

Lecture 1: Why learn statistics?

Rizwana Rehman, PhD

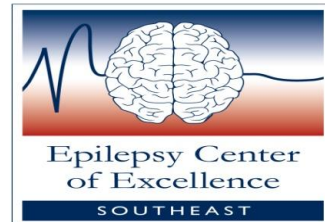
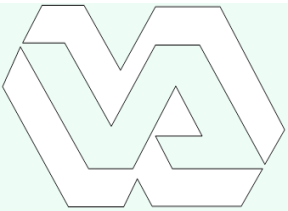
Regional Statistician

Southeast Epilepsy Center of Excellence

Durham VA Medical Center, Durham NC

Rizwana.Rehman@va.gov

(919)286-0411 ext: 5024





Overview

- Course objectives, textbooks/topics covered
- Definition of Evidence Based Medicine (EBM)
- Spotting statistical spin in research studies
- Some misunderstood statistical terms
- Types of data

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Course Objectives

- Learn some basic medical statistics
- Become a better reader/smart user of medical statistics
- Become an improved researcher
- Practice Evidence Based Medicine (EBM)

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Course Topics

- Data types
- Summarizing data/Descriptive statistics
- Data display methods
- Terminology for inferential statistics
- Hypothesis testing/Power
- Research questions about one group
- Research questions about two groups
- Study designs

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Course Textbooks

Main: Statistics at Square One (2010)

M J Campbell & T D V Swinscow

<http://www.phsource.us/PH/EPI/Biostats/>

Software: Openstat/Excel

<http://www.statprograms4u.com/>

Secondary (if interested):

- Basic and Clinical Biostatistics (2004)

Beth Dawson, Robert G. Trapp

<http://www.accessmedicine.com/resourceTOC.aspx?resourceID=62>

What is Evidence Based Medicine (EBM)?

“Evidence-based medicine is the integration of **best** research evidence with clinical expertise and patient values”

- *David Sackett*

Oxford Centre for Evidence-Based Medicine





Evidence Based Medicine (EBM)

“Evidence-based medicine (EBM) is the use of **mathematical estimates** of the risk of benefit and harm, derived from high quality research on population samples, to inform clinical decision-making in the diagnosis, investigation or management of individual patients.”

Trisha Greenhalgh

How to Read a Paper the basics of evidence –based
medicine; Wiley-Blackwell 2010



Why Use Statistics in EBM?

- **Variability in biological data**

In medical context detect/separate the actual effect from one by chance in a comparison

- **Generalization of results**

To ensure that the findings are comparable and generalizable

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Purpose for Reading Papers

- Satisfy intrinsic curiosity
- Answer questions that pertain to clinical practice
- Survey literature prior to starting a project

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Different Types of Papers

- Drug trials & interventions
- Diagnostics & screening tests
- Summary of other papers
- Guidelines for clinicians
- Economic analysis
- Qualitative research

Majority of the papers contain statistical analyses

**Audio Information: Dial 1-888-767-1050
Conference ID 59058061**



Questions Answered After Reading a Paper

- What was the research question and why was the study needed?
- What was the research design?
- Was the research design appropriate to the question?
- Did statistical analysis consider the research design?
- If results were statistically improved, were they clinically worthwhile?



Spotting Spin in Papers

- What point of view is the author trying to sell?
- Selection/Omission
- Confusion or misuse of statistical terms
- Do the conclusions logically follow from the statistical analysis?
- Are comparisons made like for like?
- Are there percentages without the absolute values?
- Overly simplistic view about cause and effect
- Ambiguous phrases such as 'could be', 'as high as', 'at least', 'includes', 'much more'



Spotting Spin in Papers

- Lack of details in the 'METHOD' section
sample size, source, actual questions asked, etc.
- Cut-down, uneven or missing chart axis
- Unlikely statistics, results too good to be true
- Unsourced statistics
- Unspecified averages (mean or median)
- Ignoring all factors in the analysis

How to spot spin and inappropriate use of statistics

Paul Bolton



Some Misunderstood/Misused Statistical Terms

- Bias \neq Inclination
- Parameter \neq Perimeter
- Correlation \neq Regression
- Normal distribution \neq 'Normal' in ordinary sense
- Statistically significant \neq Large or important
- Precision \neq Accuracy
- Standard deviation \neq Standard error
- Quarter \neq Quartile
- Random \neq Without pattern



Spin in RCTs

Specific reporting strategies to highlight

- Experimental treatment is beneficial despite a statistically nonsignificant difference in the primary outcome
- Distract the reader from nonsignificant results

Audio Information: Dial 1-888-767-1050
Conference ID 59058061



Some Interesting Papers

□ Isabelle Boutron; Susan Dutton; Philippe Ravaud
& Douglas G. Altman

**Reporting and Interpretation of Randomized Controlled
Trials (RCTs) With Statistically Non significant Results for
Primary Outcomes**

JAMA. May 2010

□ Christopher Weir & Gordon Murray

Fraud in Clinical Trials detecting it and preventing it

Significance Dec 2011

TYPES OF DATA



Audio Information: Dial 1-888-767-1050
Conference ID 59058061

Continuous Data



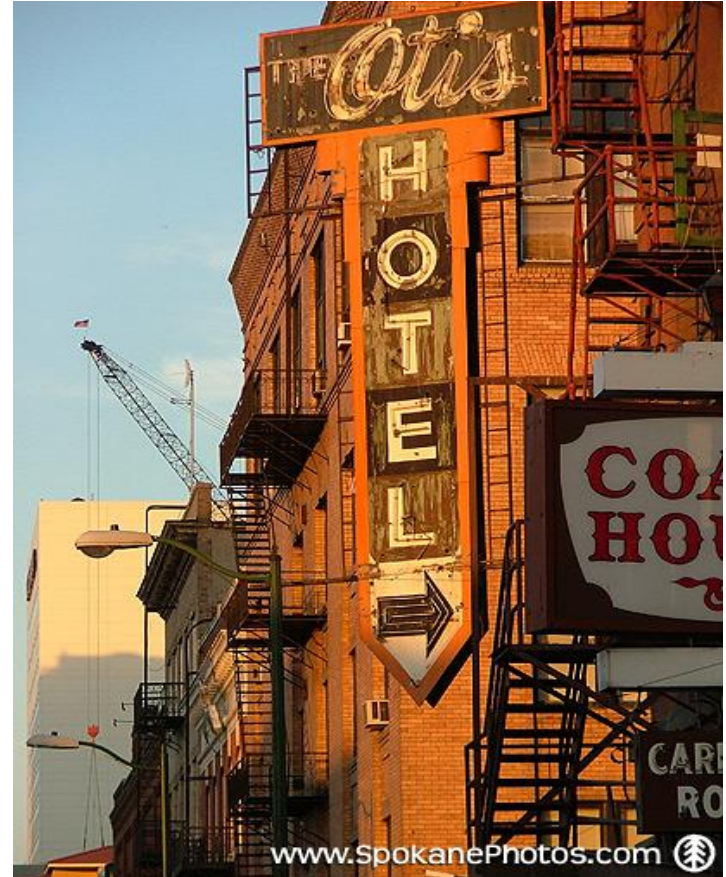
Discrete Data



Categorical Nominal Data



Categorical Ordinal Data





Two Types of Data

Quantitative

Continuous
blood pressure, height

Discrete
number of VA patients

Qualitative

Nominal
gender, race

Ordinal
get better, stay the same,
get worse



Thank you!

Questions/Comments

Rizwana.Rehman@va.gov

(919) 286-0411 ext: 5024

For more information, program materials,
and to complete evaluation for CME
credit visit

www.epilepsy.va.gov/Statistics