

# **HOW TO TALK TO A STATISTICIAN**

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# Why do I need a statistician?

- **Keep current with the literature**
- **Planning a study**
- **Proposal writing**
- **Data analysis and interpretation**
- **Presentation development**

# When should I seek a statistician's help?

- Literature interpretation
- Defining the questions
- Deciding data collection instruments
- Determining the sample size

# What does the statistician need to know?

- **General idea of project**
- **What has been done before**
- **Rationale for the study**
- **Budget constraints**

# Statistical Vocabulary

- **Hypothesis - Statement of research question that sets forth the appropriate statistical evaluation. Must be specified before the study begins.**

# Statistical Vocabulary

- **Null Hypothesis - Statement of no differences or association between variables. Rejected, usually, when  $P < 0.05$ . Rejection results in acceptance of....**

# Statistical Vocabulary

- **Alternative Hypothesis - Statement of differences or association between variables. Cannot be tested. Only accepted when null hypothesis is rejected.**

# Statistical Vocabulary

- **One-tailed vs., two-tailed hypotheses:** One-tailed states that an outcome is expected in only one direction. Two-tailed specifies that the direction of the effect is unknown.



# Statistical Vocabulary

- **Type I Error: Rejecting the null hypothesis and accepting the alternative when the null is true.**
- **Type II Error: Failing to reject the null hypothesis when differences due exist between groups of interest.**

# Statistical Power

- **Primary factors -**
  - **effect size**
  - **variability**
  - **sample size**

# Statistical Power

- **Secondary factors -**
  - **sampling unit**
  - **dropouts**
  - **confounding variables**
  - **multiple hypotheses**
  - **post-hoc hypotheses**

# Statistics

- **Types of Statistical Information**
  - **descriptive**
  - **parametric**
  - **non-parametric**
  - **analytic**
  - **association**

# Statistics - Descriptive

- **Types of Descriptive Data**
  - **central tendency**
  - **variance**
  - **standard deviation**
  - **standard error of the mean**
  - **confidence intervals**

# Statistics - Non-parametric

- **Types of Nonparametric Tests**
  - **Chi-square**
  - **Mann-Whitney-U**
  - **Kruskal-Wallis**
  - **Spearman Rank-Order Correlation**

# Statistics - Parametric

- **Types of Parametric Tests**
  - t-test
  - ANOVA, ANCOVA, MANOVA
  - correlation
  - regression

# Statistics - Post-hoc Testing

- **Types of Post-hoc Testing**
  - **uncorrected**
  - **Bonferroni**
  - **Tukey**
  - **Scheffe**



# Statistics - A Final Word

- **STATISTICS NEVER PROVE ANYTHING!**