

# Statistical Tests and Linear Regression

Yishih Chung

National Chiao Tung University

# Types of tests

- Correlational tests
  - Look for association between variables
- Comparison of means
  - Look for the difference between the means of variables
- Regression
  - Assess if changes in one variable predict changes in another variable
- Non-parametric
  - Used when the data does not meet assumptions required for parametric tests

# Correlational

- Pearson correlation
  - Tests for the linear strength of the association between two continuous variables
- Spearman correlation 有順序性
  - Between two ordinal variables
- Chi-square 類別：性別、種族
  - Between two categorical variables

# Comparison of means

- Independent T-test 檢定不同獨立母體的檢定
  - Tests for the difference between two independent variables
- Paired T-test 有前後關係的母體檢定
  - Between two related variables
- ANOVA 檢定平均數差異
  - Between group means after any other variance in the outcome variable is accounted for

# Non-parametric

無母數  
正負號相等？

- Wilcoxon rank-sum test
  - Tests for the difference between two independent variables—takes into account magnitude and direction of difference
- Wilcoxon sign-rank test
  - Between two related variables
- Sign test
  - Tests if two related variables are different—ignores the magnitude of change, only takes into account direction

# You can Google the R commands needed to perform the aforementioned tests and *more*!

- One sample t-test
  - `x <- rnorm(50, mean = 10, sd = 0.5)`
  - `t.test(x, mu=10)`
- Wilcoxon rank-sum test
  - `x <- c(0.80, 0.83, 1.89, 1.04, 1.45, 1.38, 1.91, 1.64, 0.73, 1.46)`
  - `y <- c(1.15, 0.88, 0.90, 0.74, 1.21)`
  - `wilcox.test(x, y, alternative = "g")`

# Regression

- Linear
- Generalized linear
- Mixed linear
- Generalized mixed linear

# Linear regression

- Developing regression models is both arts and science. There is no standard way to develop a “correct” regression model.
- We will demonstrate the following tricks:
  - Center or transform variables
  - Display regression models
  - Compare regression models
  - Examine regression models
  - Plot regression models



# In-class practice

- Use the provided NHTS data
  - Do one statistical test that is meaningful to you. Explain your results.
  - Develop a regression model and report it.
    - “Report” means explaining why you chose the variables, their interpretations, and examination of the residuals.