# Ordinal Deep Dive

# Ordinal Logit

- Use when data represents a rating scale that satisfies the proportional odds assumption

- For a rating scale of 1 to 5, the log of the odds of answering in a certain way are

  - 1 = log{p1/[p1+p2+p3+p4+p5]}
  - 2 = log{[p1+p2]/[p1+p2+p3+p4+p5]}
  - 3 = log{[p1+p2+p3]/[p1+p2+p3+p4+p5]}

  And so forth . . .

# Does This Occur Much?

*"Ordinal data are the most frequently encountered type of data in the social sciences." (Johnson and Albert, 1999, 126)*

**Examples**

- Yes, maybe, no
- Likert scale (strongly agree – strongly disagree)
- Always, frequently, sometimes, rarely, never
- No hs diploma, hs diploma, some college, bachelor's degree, master's degree, doctoral degree
- Free school lunch, reduced school lunch, full price lunch
- 0–10K per year, 10–20K per year, 20–30K per year, 30–60K per year, > 60K per year
- Low, medium, high
- Basic math, regular math, pre-AP math, AP math

# Ordinal Logistic Regression: Results

| Source | Value |
|---|---|
| Intercept 5 | -1.738 |
| Intercept 4 | -0.166 |
| Intercept 3 | 1.213 |
| Intercept 2 | 2.435 |
| Age | 0.004 |
| Action | -0.141 |
| Adventure | 0.129 |
| Animation | 0.601 |
| Childern's | -0.221 |
| Comedy | -0.101 |
| Crime | 0.1 |
| Documentary | 0.12 |
| Drama | 0.383 |

*Cutoffs for each level of rating scale*

*Xb = .004*Age-.141*Action + .129*Adventure + .601*Animation -.221*Children's-.101*Comedy +.1*Crime +.12*Documentary + .383*Drama*

# Rating Predictions

- Probability of rating equals 5 = logit (intercept 5 – Xb)
- Probability of rating equals 4 =
  - Logit (intercept 4 – Xb) – logit (intercept 5 – Xb)
- Probability of rating equals 3 =
  - Logit (intercept 3 – Xb) – logit (intercept 4 – Xb)
- Probability of rating equals 2 =
  - Logit (intercept 3 – Xb) – logit (intercept 2 – Xb)
- Probability of rating equals 1 =
  - 1 – logit(intercept 2 – Xb)

$$\text{Logit}(x) = \exp(x)/(1+\exp(x))$$