IB = Intuitive Biostatistics
7P = Seven Pillars of Statistical Wisdom

Before Week 1: Review: heuristics and biases

- IB Ch1 & Ch2 (pages 3 - 23) - Intro
- IB Ch8 (pages 75 - 79) - types of variables

Wk1: Part 1: Sources of variability

- Noticing variability
    - IB Ch7 (pages 63 - 74) - tools to notice variability
    - IB Ch25 (pages 232- 238) - outliers
        - Outliers aren't what you think they are. And they're okay as long as they're not errors.
- Measurement variability
    - 7P Ch1 - Aggregation
- Individual differences (and sampling variability),
    - Ch3 (pages 24 - 28) - intro sampling variability
- Group differences (to be discussed later)

Wk1: Part 2: designing studies

- The act of sampling
    - Sampling variability
        - From Dr Chris Wild:
            - https://youtu.be/0F2wHGcELYA
            - https://youtu.be/1eKeVMf0yf8
    - 7P Ch2 - Information
    - IB Ch26 (pages 239 - 259) - choosing a sample size
- Randomization
    - 7P Ch6 - Design
    - average treatment effect
        - From Dr. Matt Masten: https://youtu.be/ln5LBKiF8hE

Wk2: Part 1: describing variability across measures

- Part A
    - IB Ch9 (pages 80 - 88) - SD as a summary statistic
    - IB Ch13 (pages 110 - 117) - theory of CIs
    - IB Ch14 (pages 118 - 126) - the SEM
- Part B
    - IB Ch4 (pages 31 - 45) - CI for a prop
        - only excerpts on concepts are good
    - IB Ch5 (pages 46 - 54) - good intro to survival data
    - IB Ch6 (pages 55 - 60) - intro to count data (and poisson distribution)
    - IB Ch12 (pages 101 - 109) - CI for a mean

Wk2: Part 2: statistical hypotheses

- Part A
    - Start with a problem, comparison of groups. We see a difference. What might explain it? Introducing the null model:
        - *Lecture by Prof Rao*
    - Introducing p-values
        - From Cassie Kozyrkov: https://youtu.be/9jW9G8MO4PQ
    - IB Ch34 (pages 350 - 356) - introduction to models
- Part B
    - IB Ch18 (pages 165 - 178). interpreting $p<0.05$. good run down of possible explanations. Includes bayes - skip that part.
    - IB Ch19 (pages 179 - 185). interpreting $p>0.05$. Again, good possible explanations.
    - IB page 152 - section on statistical v scientific significance
    - Fisher on *p*-values (1925)
        - *Lecture by Prof Rao*
    - IB Ch20 (pages 186 - 192) - test power
    - IB Ch42 (pages 442 - 451) - sensitivity and specificity

Wk3: Part 1: comparing two groups

- IB Ch27 (pages 263 - 272) - prospective groups
- IB Ch28 (pages 273 - 283) - Retrospective groups (prevalence, incidence)
- IB Ch29 (pages 283 - 293) - group survival (mortality)
- IB Ch30 (pages 294 - 305) - group means
- IB Ch31 (pages 306 - 317) - within-subject groups
- 7P Ch4 - Intercomparison

Wk3: Part 2: simple statistical models

- IB Ch33 (pages 331 - 349) - SLR
- IB Ch32 (pages 318 - 328) - correlation
- IB Ch39 (pages 407 - 417) - ANOVA
- IB Ch40 (pages 418 - 430) - multiple comparisons
- IB Ch35 (pages 357 - 365) - comparing models

Wk4: Part 1: statistical tests

- Distribution-based tests *Lecture by Prof Rao*
    - 2 vars
        - Chi-sq test / fisher exact
        - T-test / z-test
        - Pearson rho
    - An entire model

        - Chi-sq / LRtest
        - F
- Simulation-based tests
    - *Lecture by Prof Rao*
- IB Ch41 (pages 431 - 441) - nonparametric tests
    - Signed rank
    - Rank sum
    - KW
    - Spearman rho

Wk4: Part 2: Review

Wk5: multiple linear regression
- IB Ch37 (pages 378 - 394) - MLR
    - ANCOVA: *Lecture by Prof Rao*
- Modelling to predict, control, and explain variability: *Lecture by Prof Rao*
    - Response variables, explanatory variables, and covariates
- 7P Ch5 - Regression
- 7P Ch7 - Residual

Wk6: Part 1: logistic and log-binomial regression
- Ch38 (pages 395 - 399) - logistic (odds ratio)
- Log binomial (relative risk)
    - *Lecture by Prof Rao*

Wk6: Part 2: proportional hazards regression
- Ch38 (pages 399 - 403) - ph reg (hazard ratio)

Wk6: Part 3: poisson regression
- Chapter 4 from *Broadening Your Statistical Horizons* by Julie Legler and Paul Roback
    - https://bookdown.org/roback/bookdown-bysh/ch-poissonreg.html
- Intro from PSU STAT 504: https://online.stat.psu.edu/stat504/node/168/

Wk7: other regression
- IB Ch36 (pages 366 - 377) - non-linear models
- Advanced methods: *Lecture by Prof Rao*
    - Multivariate regression
    - GLMM
    - Machine Learning

Wk8: Part 1: review
- IB Ch43 (pages 452 - 459) - meta-analysis
- IB Ch47 (pages 502 - 510) - reproducibility

- IB Ch44 (pages 463 - 467) - key concepts
- 7P Conclusion

Wk8: Part 2: writing

- IB Ch45 (pages 468 - 486) - traps to avoid
- IB Ch48 (pages 511 - 515) - checklist for reporting methods and results
- IB Ch46 (pages 487 - 501) - capstone example