Discussion Points for Decision Analysis

- Mazur:
  - A history of medical decision making, discussing the role of Bayes.
  - Origins in gambling
  - Backward versus forward probability (frequentist definition versus Bayesian definition)
  - Are we Bayesians, Priceans, or Laplaceans?
- Harrell and Shih:
  - First discusses basics of Bayesian approach. Nice summary, but you should already be familiar with most of this material.
  - Then discusses advantages of the Bayesian approach for inferences and decision making. Assignment question asks you to pick two particular advantages and discuss them.
- Hornberger:
  - Summary of use of Bayes Rule and Bayesian inference as applied to medical decision making, through a series of examples.
  - First example uses Bayes Theorem, not inference, to update P(disease = hemophilia) after some data become available about relatives.
  - Second example is to a posterior probability of an effect following a clinical trial.
  - Third example is of a "full" Bayesian analysis, which includes a loss function, with the optimal decision minimizing the Bayes Risk (recall the basic elements of Bayesian analysis). Note that is is, once again, just

a "toy" example. Still hard to find real examples in the literature.

- Chikhaoui et al:
  - A full example of using a decision tree for cost minimization. Which of two treatment paths (include a genetic test for FAP or not) minimizes total costs?
  - Figure 1 outlines the two possible treatment paths.
  - Figure 2 outlines the decision tree.
  - In addition to "one-way" sensitivity analyses of the optimal decision (minimum cost), uses a Bayesian sensitivity analysis that averages over prior densities for each uncertain input in the tree. Results in a confidence interval for the difference in cost between the two arms.
- Brophy et al:
  - In making a medical decision about drug choice, do we consider only direct (head-to-head comparative clinical trials) or other evidence (indirect comparisons) as well?
  - Three analyses are done here:
    * Objective Bayesian analysis of direct evidence only.
    * Uses information from other direct studies in different populations to form a prior for the current study, and uses different weights of this prior.
    * Adds in evidence from placebo controlled trials in a meta-analysis of indirect comparisons.
    * Assignment discusses advantages and disadvantages of using indirect comparisons.
- McCarron et al:
  - Combines patient level data with prior information to make decisions accounting for all available evidence.

- Used three different priors, objective (also compared to a frequentist analysis with similar results), skeptical, and what they call "face value," similar to what Spiegelhalter calls a clinical prior.
- Found a few differences when using informative priors.