Class 16 in-class problems, 18.05, Spring 2022

Concept questions

Concept question 1. Increasing probability
To convert an 80% probability interval to a 90% interval should you shrink it or stretch it?

1. Shrink   **2.** Stretch.

Board questions

Problem 1. Treating severe respiratory failure*
Two treatments for newborns with severe respiratory failure.

1. CVT: conventional therapy (hyperventilation and drugs)

2. ECMO: extracorporeal membrane oxygenation (invasive procedure)

In 1983 in Michigan:

19/19 ECMO babies survived and 0/3 CVT babies survived.

Later Harvard ran a randomized study:

28/29 ECMO babies survived and 6/10 CVT babies survived.

*Adapted from *Statistics: a Bayesian Perspective* by Donald Berry

Name the probabilites of survival:

θ_E = probability that an ECMO baby survives
θ_C = probability that a CVT baby survives.

Consider the values 0.125, 0.375, 0.625, 0.875 for θ_E and θ_C.

(a) Make the 4×4 prior table for a flat prior.

(b) Based on the Michigan results, create a reasonable informed prior table for analyzing the Harvard results (unnormalized is fine).

(c) Make the likelihood table for the Harvard results. (You might use R to compute some of the values.)

(d) Find the posterior table for the informed prior.

(e) Using the informed posterior, compute the probability that ECMO is better than CVT.

(f) Also compute the posterior probability that $\theta_E - \theta_C \geq 0.6$.

(The posted solutions will also show 4-6 for the flat prior.)