Midterm

Yuki Joyama

Question 1

(1) We know all the potential outcomes, so the causal effect of the treatment for an individual can be calculated by $Y_1 - Y_0$ (Y_1: the potential outcome of a disease if an individual is assigned new treatment, Y_0: the potential outcome of a disease if an individual is assigned standard treatment). The average causal effect is $E[Y_1 - Y_0] = 0.3$. On average, the new treatment prevents disease in 30% more individuals compared to the standard treatment.

(2) Under consistency, SUTVA, randomizeation and positivity assumption, $ACE = E[Y_1 - Y_0] = E[Y_1 \mid A = 1] - E[Y_0 \mid A = 0] = E[Y \mid A = 1] - E[Y \mid A = 0]$
Given the table, $E[Y \mid A = 1] = \frac{1+0+1+0+0+0+0+1+1+0}{10} = 0.4$ and $E[Y \mid A = 0] = \frac{0+0+1+0+0+0+0+1+0+0}{10} = 0.2$. So $ACE = 0.4 - 0.2 = 0.2$.
This suggest that the new treatment has 20% higher likelihood of disease prevention compared to standard treatment.

(3)