HW3: Introduction to Causal Inference

Problem 1: Verify the bounds for the mean of potential outcome under control in never takers and compliers (NN and NY), that is θ^0_{NN} and θ^0_{NY}, shown in the SSC Example (Note the results shown in the lecture slides might be (in)correct)

Problem 2: We have

- Z: Receipt of letter from physician to encourage flu shot (Z=1) or not (Z=0)
- A: Patient decides to receive the flu shot (A=1) or not (A=0)
- Y: Hospitalization (Y=1) or not (Y=0)

We observed that the probability of A=*a* given Z=z are $\boldsymbol{p_{za}} = (p_{00}, p_{01}, p_{10}, p_{11}) = (30\%, 70\%, 10\%, 90\%)$ and the probability of hospitalization (Y=1) for patients of A=*a* and Z=z are $\theta_{za} = (\theta_{00}, \theta_{01}, \theta_{10}, \theta_{11}) = (.1,\ .08, .2,\ .15)$.

Research question: what are the impacts of the physician's encouragement letter on hospitalization for those who are induced by the letter to take the flu shot (compliers)?

1) Define the principal strata
2) You observe a group of people who received the physician's encouragement letter and received flu shot. What are their principal strata memberships?
3) For patients in the principal stratum AT, what are possible observed values of (Z, A)?
4) State the assumption of monotonicity and exclusion restrictions. Are they plausible? Why or why not?
5) Use both principal stratification and instrumental variable estimation methods to answer the research question under assumptions of *monotonicity and exclusion restriction*.