Problem Set on “Behaviour within a Clinical Trial and Implications for Mammography Guidelines,” developed by Amanda Kowalski, Meredith Rief, Katherine Kim, and Louis McKinnon

This problem set is based on Kowalski (2023) Behaviour within a Clinical Trial and Implications for Mammography Guidelines, found in The Review of Economic Studies, January 2023, Vol. 90, No. 1, pages 432 – 462 or at: https://doi.org/10.1093/restud/rdac022.

This problem set is created to test and deepen your understanding of the mechanics and key takeaways of this study. Please complete the questions as clearly and concisely as possible, drawing on what you have learned from the paper.

Part 1: Conceptual Questions [10 points]

1.1. Define never takers, compliers, and always takers in terms of the treatment (“treated” or “untreated”) and their assignment to intervention (“intervention” or “control”). 3 points

1.2. The paper defines “treatment” as receiving mammograms. Order never takers, compliers, and always takers starting with (1) - the group most likely to receive mammograms and ending with (3) - the group least likely to receive mammograms. 2 points

1.3. The paper finds that women more likely to receive mammograms are healthier and have higher socioeconomic status. What does this finding imply about the health and socioeconomics status of compliers relative to never takers? 2 points

1.4. Define overdiagnosis. How does overdiagnosis differ from a false positive? 3 points

Part 2: Understanding the Model [75 points]

2.1. Of always takers, compliers, and never takers, which group drives the change in mammography rates between intervention and control? 3 points
2.2. In the data, can you identify any individual as a complier? If so, how? If not, explain why. **3 points**

2.3. Suppose you do not have a randomized experiment, but you can still observe that some individuals are treated and other individuals are untreated. Can you identify some individuals as always takers, compliers, or never takers? If so, how? If not, explain why. **3 points**

2.4. Is the fraction of never takers deduced from the intervention or control arm? What about always takers? **3 points**

2.5. How does this study identify the fraction of compliers? **3 points**

2.6. What assumption must hold for the above method to find the fraction of compliers, and what is the justification for it? **3 points**

2.7. Suppose we observe 15% of women in the control arm and 90% of women in the intervention arm receive mammograms. Deduce the probability of being a complier, always taker, and never taker in the sample. **3 points**

2.8. Label the fraction of always takers, compliers, and never takers that you calculated in the previous answer in the graphic below. **3 points**
2.9. Does the paper represent “treated” with D=1 or Z=1? **3 points**

2.10. Of always takers, compilers, and never takers, which groups are included if Z=0 and D=0? If Z=0 and D=1? **3 points**

2.11. What does the graph below imply about the relative breast cancer incidence of mammography NON-recipients in the intervention arm versus the control arm? **3 points**

2.12. Why is it important to compare mammography NON-recipients to examine heterogeneous selection? **3 points**
2.13. Based on the breast cancer incidence values in the figure above, calculate the breast cancer incidence for compliers in the control arm and the breast cancer incidence for compliers in the intervention arm and label both values on the figure. 5 points

2.14. Using the numbers you calculated, what is the value of the local average treatment effect? 3 points

2.15. Interpret the magnitude of the local average treatment effect in words. 3 points

2.16. Using the numbers you calculated, what is the implied 20-year breast cancer overdiagnosis rate among compliers? 3 points

2.17. Using the numbers you calculated, what is the difference between the breast cancer incidence of untreated compliers and never takers? 3 points

2.18. Interpret the sign of the difference that you obtained in the previous question by modifying language from the abstract of the paper. Your answer should give an intuition for what the difference means while avoiding technical jargon. 3 points

2.19. Based on this difference, in words, what would the paper assume about the breast cancer incidence of always takers relative to compliers? Would the breast cancer incidence of compliers give an upper or lower bound on the breast cancer incidence of untreated never takers? 3 points

2.20. Using the numbers you calculated and the approach from the paper, calculate a bound on the average treatment effect on always takers. 3 points

2.21. Using the numbers you calculated and the approach from the paper, calculate a lower bound on the overdiagnosis rate for always takers. 5 points
2.22. Does the bound that you calculated on the average treatment effect for always takers include the average treatment effect for compliers? **5 points**

2.23. Interpret this comparison in words using language by modifying language from the abstract of the paper as necessary. **3 points**

**Part 3: Concluding Questions** [15 points]

3.1 What is novel about this study? **2 points**

3.2. What does this study conclude with regards to treatment effect heterogeneity and heterogenous selection in words? **2 points**

3.3. What is the main threat to the validity of the finding of treatment effect heterogeneity? **2 points**

3.4. What are some reasons why the harms of overdiagnosis might have decreased from the time of the clinical trial to the present? **2 points**

3.5. Why are we concerned about overdiagnosis, even if the harms of overdiagnosis have decreased over time? **1 point**

3.6. Of always takers, compliers, and never takers in the CNBSS, which group does the study relate to women who receive mammograms under the current guidelines? **2 points**

3.7. What are the current USPSTF guidelines for women in their 40’s? **2 points**

3.8. What is the main takeaway from this study in terms of guideline implications for mammography guidelines for women in their 40s? **2 points**