13. [**15 marks**] **[Causation Questions]**

The table below shows the data collected from 12 individuals. The goal of the study was to estimate the effect of daily low-dose aspirin ($T = 1$) on the risk of heart disease ($Y = 1$). The table also shows the values of the potential outcomes that would have been observed given treatment Y_1 and no treatment Y_0. Recall also that a treatment effect depends on these potential outcomes and is defined by $P(Y_1) - P(Y_0)$.

ID	1	2	3	4	5	6	7	8	9	10	11	12
T	0	0	0	0	0	0	1	1	1	1	1	1
Y	0	0	0	1	1	1	0	0	1	1	1	1
Y_0	0	0	0	1	1	1	1	1	0	0	1	1
Y_1	0	0	0	0	0	1	0	0	1	1	1	1

14. [**2 marks**] Are the populations of individuals who were treated and those who were not treated **exchangeable**? Explain.

15. [**3 marks**] Suppose that you are given the first three rows of the table above, i.e. ID, T, and Y, but not the potential outcomes Y_0 and Y_1. In this case, might it be possible for the true treatment effect to be negative? If yes, provide viable values for Y_0 and Y_1 that will make for a treatment effect that is negative. If not, write the value that corresponds with the **smallest possible treatment effect** next to the table below.

ID	1	2	3	4	5	6	7	8	9	10	11	12
Y_0												
Y_1												

16. [**3 marks**] Might it be possible for the treatment effect to be 1? If yes, provide viable values for Y_0 and Y_1 that will make for a treatment effect of 1. If not, write the value that corresponds with the **largest possible treatment effect** next to the table below.

ID	1	2	3	4	5	6	7	8	9	10	11	12
Y_0												
Y_1												

17. [**1 mark**] Based on your analysis above, can you confidently suggest one takes aspirin to reduce the risk of heart disease?