**Directions**. Adam through Leanna have been invited to play frisbee (D). They each get some potential happiness (Y0, Y1) from playing frisbee. Use the following table to answer these questions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Person** | **Y0** | **Y1** | **TE** | **D** | **Y** |
| Adam | 10 | 10 | 0 | 0 | 10 |
| Billy | 15 | 15 | 0 | 0 | 15 |
| Cynthia | 10 | 12 | 2 | 1 | 12 |
| Daniel | 8 | 11 | 3 | 1 | 11 |
| Elaine | 6 | 9 | 3 | 1 | 9 |
| Francis | 15 | 11 | -4 | 0 | 15 |
| Gia | 5 | 7 | 2 | 1 | 7 |
| Hank | 13 | 11 | -2 | 0 | 13 |
| Ida | 15 | 6 | -9 | 0 | 15 |
| Jane | 11 | 9 | -2 | 0 | 11 |
| Kelly | 10 | 13 | 3 | 1 | 13 |
| Leanna | 15 | 15 | 0 | 0 | 15 |

1. Calculate each person’s treatment effect which is the gain in happiness they will get if they play frisbee.
2. Imagine the “perfect best friend” comes along and advises each person to the task of either playing frisbee or not playing frisbee based on whether the return to playing frisbee is positive and non-zero or negative or zero. The best friend picks an activity for each person and each person does that activity. They play frisbee (D=1) if the treatment effect is positive and they do not (D=0) if the treatment is zero or less than zero.
3. What share of people are going to play frisbee after the perfect best friend’s assignment to the activity? **5/12 = 0.416667**
4. Use the switching equation to assign their happiness (Y) based on their assigned activity (D).
5. Calculate the following:
   1. Simple difference in mean outcomes: **SDO = 52/5 – 94.7 = -3.02857**
   2. ATE, ATT, ATU

**ATE = -0.3333 , ATT = 2.6 , ATU = -2.42857**

* 1. Selection bias

**SB = E[Y0|D=1] - E[Y0|D=0] = -5.62857**

* 1. Show that the decomposition of the simple difference in mean outcomes (5a) holds using the information in 5b and 5c and the formula we worked out together in the lesson.

**SDO = ATE + selection bias + heterogeneous treatment effect bias**

**SDO = ATE + SB + (1-pi)(ATT-ATU) = -3.02857**