تکلیف ۲ ـ اقتصادسنجی پیشرفته

سروش زاهدیه – ۴۰۲۲۱۱۰۲۶

۱.

a)

The first member is talking about calculating the Population-Level Effect which focuses on the **Intent-to-Treat (ITT) or Average Treatment Effect**, which measures how the intervention influences the overall population, including both recipients and non-recipients of the nets. The ITT is useful when you want to measure program effectiveness at a macro level, accounting for potential indirect effects like spillovers. This effect is broader and relevant when assessing public health impacts across the population, not just the direct effect on treated individuals.

$$\mathrm{ATE} = E[Y(1)] - E[Y(0)]$$

The second member is talking about calculating the Individual Treatment Effect which measures **the average treatment effect on the treated (ATT)**, which refers to the difference in malaria incidence among individuals who received a mosquito net compared to what their malaria rate would have been without the intervention. This effect is appropriate when the goal is to understand how effective the intervention was for those targeted directly (those who received the mosquito nets).

$$ATT = E[Y(1) - Y(0) \mid D = 1]$$

Y(1) = Outcome (malaria incidence) with the net.

Y(0) = Outcome without the net.

D=1 indicates individuals who received the net.

When talking about which method is more appropriate the answer is it depends. If the goal is to assess the direct impact of mosquito nets on malaria for those who received them (for example, to understand whether the program works for its intended beneficiaries), the ATT is more appropriate. However, if the aim is to measure the public health impact across the entire population—including both recipients and non-recipients—and to determine if the program is worth scaling up, the ATE is more suitable.

b)

The team made a mistake by handing out nets to visitors at temporary centers and only measuring the change in sickness rates among these visitors, then declaring that to be the effect of the intervention. This causes a selection bias, as the people who choose to visit the centers and pick up the nets may not represent the broader population. For instance, these visitors could be more health-conscious or already at higher risk of malaria, which means their behavior and outcomes may differ systematically from non-visitors. This means that this group may not be comparable to the rest of the population. Any difference in malaria rates may be due to pre-existing differences between the visitors and non-visitors, rather than the nets themselves.

$$\underbrace{E[Y^1|D=1] - E[Y^0|D=0]}_{\text{SDO or Observed difference}} = \underbrace{E[Y^1|D=1] - E[Y^0|D=1]}_{\text{Average Treatment Effect on Treated}} + \underbrace{E[Y^0|D=1] - E[Y^0|D=0]}_{\text{Selection bias}}$$

The best way to fix this issue is to do a **Randomized Controlled Trial (RCT)**. The most reliable way to measure the effect of the mosquito nets is to randomly assign individuals or villages to two groups a treatment group which receives the mosquito nets and a control group which does not receive the mosquito nets (or receives them later). This ensures that the two groups are statistically comparable, and any differences in malaria rates can be attributed to the nets rather than pre-existing differences. There are other ways to we can tackle this issue like finding quasi-experimental setups to use DiD method or IV approaches that I won't explain in more detail here.

c)

There are several factors that could lead to misleading conclusions from this approach. One issue is **non-compliance**, where not everyone may use the mosquito nets as intended. Even though nets are distributed, some people might not use them consistently, or they might use them incorrectly. This partial usage would corrupt the observed effect when measuring the overall impact, leading to a smaller reduction in malaria rates than expected.

Another problem is **behavioral responses** or risky behavior. After receiving nets, some individuals may believe they are fully protected and engage in riskier behaviors, such as leaving windows open or neglecting other protective measures. These behaviors could offset the positive impact of the nets.

The presence of **spillover effects** also complicates the analysis. Even individuals who do not use the nets may benefit from reduced malaria transmission if mosquito populations decline throughout the community. Simply averaging malaria rates across the entire population might underestimate these positive spillover effects.

Measurement errors could also affect the results. Malaria incidence might be underreported, especially in areas with less developed healthcare infrastructure. Conversely, regions with better healthcare access may report more cases, even if the incidence rate is lower, because of better diagnostic practices.