

Ultimate Challenge - part 2 - Experiment and metric design  
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*1) What would you choose as the key measure of success of this experiment in encouraging driver partners to serve both cities, and why would you choose this metric?*

We would want to see how many \*more\* drivers serve both cities vs. one city exclusively. Let's say that the number of driver partners who serve both cities is truly very low/almost zero. Then we could use the # of toll reimbursements given to driver partners (divided by two, assuming that each driver partner is based in the city to which they used to be exclusive) as our measure of success.

Alternately, we could simply count the # of driver partners who serve both cities before and after the toll reimbursement is instituted.

*2) Describe a practical experiment you would design to compare the effectiveness of the proposed change in relation to the key measure of success. Please provide details on:*

- a) how you will implement the experiment;*
- b) what statistical test(s) you will conduct to verify the significance of the observation;*
- c) how you would interpret the results and provide recommendations to the city operations team along with any caveats.*

Let's create a Null Hypothesis and Alternative Hypothesis:

H0: Drivers serving both cities = N

If the null hypothesis holds, the toll reimbursement has no effect, and the same number of drivers remain exclusive to each city.

HA: Drivers serving both cities > N

If the alternative hypothesis is true, the toll reimbursement encourages more drivers to serve both cities.

We'll want to use a one-sided, paired sample t-test for proportions.

- We have two samples (before intervention and after intervention) that are dependent on one another. Therefore the paired sample t-test will allow us to measure whether or not the intervention is significant.
- We want to know if MORE drivers will serve both cities (>N, the original value). Therefore we will use a one-sided statistical test for significance.

Given this experiment setup, we will first calculate how many driver partners serve both cities after the toll reimbursement intervention (B).

We will also determine the critical value ( $z$ ): the point at which, given some alpha (say alpha = 0.05 which is standard), values fall outside of  $c$  = the confidence interval =  $1 - \alpha = 0.95$  of the probability distribution.

If  $B > z$ , then we have a statistically significant change. That is, the toll reimbursement is a meaningful intervention. As a result, a statistically significant number of drivers who were previously exclusive to one city switch to driving in both cities.