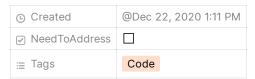
Power analysis - Part 2



The main objective is to decide the lower bound for the number of people to be kept in ML group, Random group and to see what to expect from the existing lifetime members for the Referral group and UMAA group.

ML group and Random Group

From the pilot, the take up on the offer from the ranked group is 0.4% and for mittens offer it is 0.01%

We can consider the proportion of 0.004 as the lower bound for ML group. Anything high will work in our favor as the power will increase for the same sample size.

We consider 0.0001 as the lower bound for the random group as 2:1 offer seems to be better than mittens offer.

Lets consider five scenarios: (All effects are in same direction ML > Random)

1. Status quo - ML group - 0.004, Random group - 0.0001

2. Better ML group (50% better performance) - ML group - 0.006, Random group - 0.0001

3. Better Random group (100% better performance) - ML group - 0.004, Random group - 0.0002

Power analysis - Part 2

4. Optimistic scenario (50% better ML, 100% better Random) - ML group - 0.006, Random group - 0.0002

5. Worst case scenario (500% better Random) - ML group - 0.004, Random group - 0.0005



Considering the worst case scenario, sample size of around 2500 people per group seems to be the best for ML, random groups

Referral group and Random group

There are 12,183 Lifetime members. If we follow the same power calculation between ML and random group, we would need atleast 2500 members to be referred. That brings the conversion rate in Lifetime members to 20%. This seems pretty high. If we need 2500 members per each of referral and UMAA groups (split), then the conversion rate need to be 40%.



Lifetime members conversion rate needs to be 40% in order to detect the same effect of that of worst case ML and random groups.

Referral group (or UMAA group) and ML group (Two sided)

Best case scenario (200% better Referral group) - ML group - 0.004, Referral group - 0.008 or vice versa

Worst case scenario (0.1% better Referral group) - ML group - 0.004, Referral group - 0.008 or vice versa

```
power.prop.test(p1 = 0.004, p2 = 0.005, sig.level = 0.05, power = .80, alternative ='two.sided')
Two-sample comparison of proportions power calculation
n = 70320.86
```

Power analysis - Part 2 2

```
p1 = 0.004
    p2 = 0.005
    sig.level = 0.05
    power = 0.8
    alternative = two.sided

NOTE: n is number in *each* group
```



Worst case scenario here is practically unattainable

Fixing one sample size to determine the other

As there is a constraint on Lifetime members availability, lets see the n required from other group in we fix n from the lifetime group

```
pwr.2p2n.test(h = ES.h(0.004,0.008), n1=2500, sig.level = 0.05, power=0.8, alternative ='less')Two-sample comparison of proportions
difference of proportion power calculation for binomial distribution (arcsine transformation)

h = -0.05254923
    n1 = 25000
    n2 = 21437.54
    sig.level = 0.05
    power = 0.8
    alternative = less
NOTE: different sample sizes
```



If we fix the lifetime members referrals at 2500, then we would need atleast 21000 people in ML group to detect the effect.

```
pwr.2p2n.test(h = ES.h(0.004,0.008), n1=2300, sig.level = 0.05, power=0.8, alternative ='less')Two-sample comparison of proportions
difference of proportion power calculation for binomial distribution (arcsine transformation)

h = -0.05254923
n1 = 2300
n2 = 84284.88
sig.level = 0.05
power = 0.8
alternative = less
```



For the same effect, If we fix the lifetime members referrals at 2300, then we would need atleast 85000 people in ML group to detect the effect.

Power analysis - Part 2 3