Power Analysis

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In our experiment, we aim to assess if there is bias present towards Latino people when booking on MisterB&B in two major US cities. To do so, we are anticipating on using the following criteria to assess this:

- We will use 20 male profiles in the control (with Caucasian sounding names), and 20 male profiles in the treatment (with Latino/Hispanic sounding names)
- We will evenly distribute our number of booking between two cities - Austin & Salt Lake City - to assess geographical areas that vary in population diversity
- We will collect supplementary data on the host to understand if there are any external factors that may impact or influence their decision to accept/reject a requester.

In our Power Analysis, we plan to assess the power behind the sample size of listings that we are choosing. We will be conducting three different scenarios of varying booking acceptance rates to corroborate our decision to use the booking sample size that we have chosen.

The three scenarios are: * Treatment effect of 8% difference * Treatmnet effect of 10% difference * Treatment effect of 6% difference

We determined our three expected treatment effects based on the "Racial Discrimination in the Sharing Economy: Evidence from a Field Experiment" study. A similar study analyzed acceptance rates of users through AirBnb on black and white users. The difference in acceptance rate was about 8% lower for black users, so that is our first potential treatment effect. We wanted to analyze two other scenarios where the treatment effect was 25% higher or lower than the original 8%, so we have two potential treatment effects of 10% and 6% for additional scenarios. Our assumption is that there will be similar rates of racism against black people as there are against hispanic people at about 8%. That being said, hosts using a pro-LGBTQ platform like MisterBnb may be more inclusive than the average AirBnb host, decreasing the treatment effect.

```
library(data.table)
library(ggplot2)
knitr::opts_chunk$set(dpi = 300)
set.seed(3)
```

```
scenarios <- c(.42,.40,.44)
num_samples <- c(40, 60, 80, 100, 160, 200, 260, 300, 400, 500, 760, 1000, 1500, 2000)
ri <- function(simulations = 100, table, scenario) {

  p_values <- c()
  for(sim in 1:simulations) {
    table[is_latino == 0, accepted := sample(rep(c(0,1)), nrow(d)/2, replace = TRUE, prob = c(0.5, 0.5)
    table[is_latino == 1, accepted := sample(rep(c(0,1)), nrow(d)/2, replace = TRUE, prob = c(1-scenari
    linear <- lm(accepted ~ is_latino + host_city + rating, data=table)
    p_values[sim] <- summary(linear)$coefficients[2, 4]
  }
```

```
  return(p_values)
}
```

```
power_df <- data.frame(matrix(ncol = 3, nrow = 0))
colnames(power_df) <- c('lat_prob', 'size', 'pow')
```

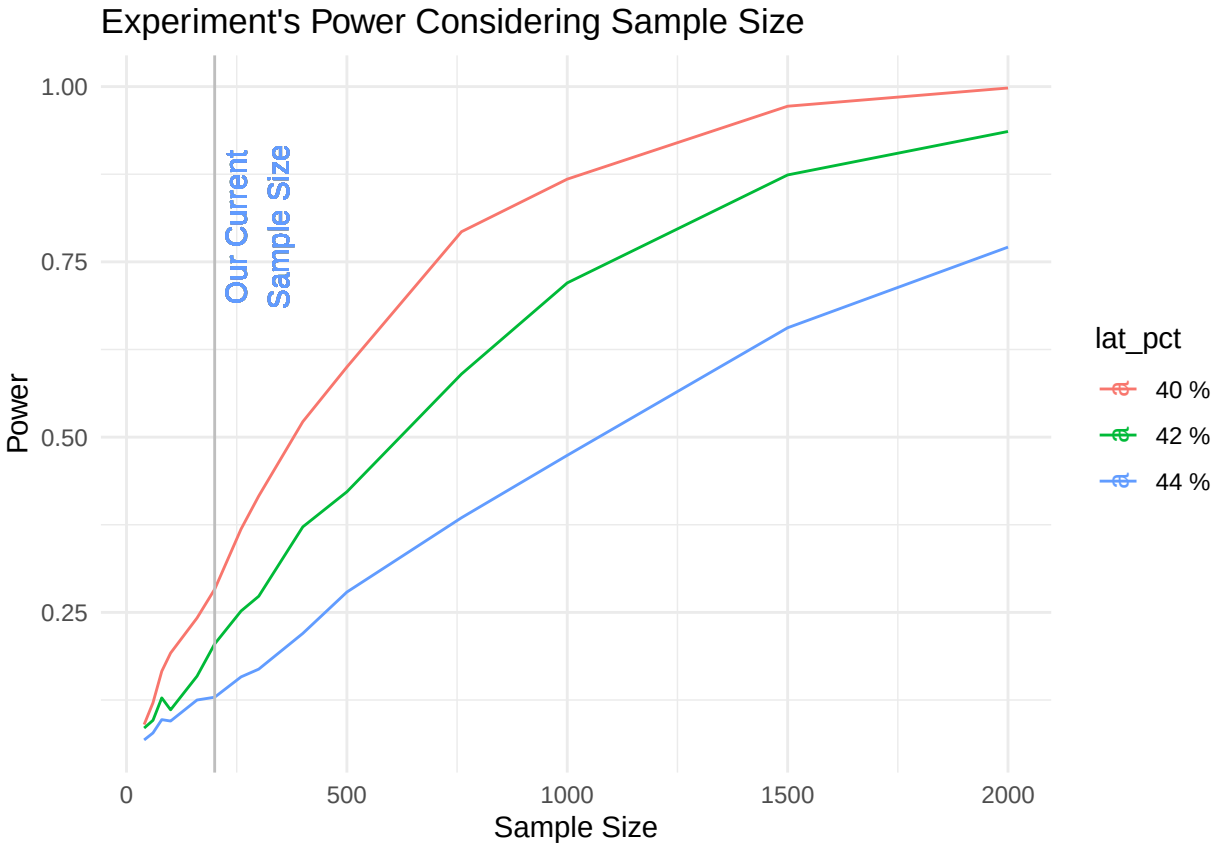
```
for (scenario in scenarios) {
  for (i in num_samples){
    d <- data.table(listing_num = c(1:i), host_city = sample(c(0,1), replace=TRUE, size=i), rating = rou
    )
    #Assigning even number of results in Austin & Salt Lake
    d$host_city <- sample(rep(c(0,1), nrow(d)/2))
    #Assigning even # of treatment & control in the two cities
    salt_lake <- subset(d,host_city %in% c(0))
    salt_lake$is_latino <- sample(rep(c(0,1), nrow(salt_lake)/2))
    austin <- subset(d,host_city %in% c(1))
    austin$is_latino <- sample(rep(c(0,1), nrow(austin)/2))
  #Recombining dataset back together
    d <- rbind(salt_lake, austin)
    p_values <- ri(1000, d, scenario)
    row_power <-sum(p_values<=0.05)/length(p_values)
    new_row <- c(scenario, i, row_power)
    power_df[nrow(power_df) + 1,] <- new_row
  }}

#This was mainly just to confirm there were equal distribution of all cities & treatments
# output <- aggregate(d$is_latino, by=list(d$is_latino, d$host_city), FUN=length)
# output
```

```
power_df$lat_pct <- paste(as.character(power_df$lat_prob*100),'%')

ggplot(power_df, aes(x=size, y=pow, color = lat_pct)) +
  geom_line() +
  geom_vline(xintercept = 200, colour = "gray") + geom_text(aes(x=200, y=.80, label = "\n\nOur Current\n
  ggtitle("Experiment's Power Considering Sample Size") +
  xlab("Sample Size") +
  ylab("Power") +
  theme_minimal()
```

```
## Warning: Ignoring unknown parameters: text
```



Our power analysis has shown that we need a larger sample size than originally expected. Our original sample size of 200 will need to increase to about 1500 in order to have statistically significant results. Additionally, if the effect size is only a difference in 6% acceptance rates, we may need >2000 samples to have a statistically significant study. Based on these findings, our team plans to attempt to use a script to automatically request stays with a profile previously created. There are enough stays in each of our cities for us to have 1500 total samples, so finding stays should not be an issue. Our next goal will be to identify a method to send out mass requests for stays to decrease our team's efforts manually requesting stays.