

Is There Racial Discrimination in the Labor Market?

(Based on Marianne Bertrand and Sendhil Mullainathan. 2004. "Are Emily and Greg more employable than Lakisha and Jamal? A field experiment on labor market discrimination." *American Economic Review*, 94 (4): 991–1013.)

Let's answer this question by using data from a randomized experiment where researchers sent out resumes of fictitious candidates to apply for jobs advertised in Boston and Chicago newspapers from mid 2001 to mid 2002. In this experiment, the presumed race of the applicant was randomly assigned. Some of the resumes were given names common among African-Americans (the treatment group) and others were given names common among Whites (the control group).

The dataset is in a file called *resumes.csv*. Table 1 shows the names and descriptions of the variables in this dataset, where the unit of observation is fictitious job applicants.

variable	description
<i>resume_id</i>	identifying number of each resume
<i>firstname</i>	first name of fictitious job applicant
<i>sex</i>	presumed sex of applicant based on name (female or male)
<i>race</i>	presumed race of applicant based on name (black or white)
<i>call</i>	whether candidate received a call back for a job interview (1=yes, 0=no)

Table 1: Variables in "resumes.csv"

In this problem set, we practice answering the following four questions related to causal studies: (1) What is the estimated average treatment effect? (2) Is the effect statistically significant at the 5% level? (3) Can we interpret the effect as causal? And (4) Can we generalize the results?

As always, let's start by loading and looking at the data:

```
## load and look at the data
resumes <- read.csv("resumes.csv") # reads and stores data
head(resumes) # shows first observations
## resume_id firstname sex race call
## 1 1 Allison female white 0
## 2 2 Kristen female white 0
## 3 3 Lakisha female black 0
## 4 4 Latonya female black 0
## 5 5 Carrie female white 0
## 6 6 Jay male white 0
```

1. What is the estimated average causal effect of having a black sounding name on the probability of being called back for a job interview?
 - a. Given our research question, what should be our outcome variable (Y)? Visualize its distribution and comment on the proportion of candidates who were called back for a job interview (i.e., is the proportion large, small, or very small?).
 - b. Given our research question, a binary variable identifying the presumed race of the fictitious job candidate should be our treatment variable (X). Since we do not have it in the dataset, we need to create it. Create this variable, name it *black*, and store it inside the dataframe *resumes*. (Hint: the function `ifelse()` might be a useful here). Visualize its distribution and comment on the number of resumes assigned to treatment and control groups.
 - c. Now that we have both our Y and X variables, fit a linear model to the data in such a way that the estimated slope coefficient is equivalent to the difference-in-means estimator you are interested in and store the fitted model in an object called *fit* (R code only).
 - d. Create a visualization of the relationship between X and Y and add the fitted line. (Hint: The functions `plot()` and `abline()` might be helpful here.)
 - e. What is the estimated slope coefficient, $\hat{\beta}$?
 - f. Now, let's answer the question: What is the estimated average treatment effect? Provide a full substantive answer (make sure to include the assumption, why the assumption is reasonable, the treatment, the outcome, as well as the direction, size, and unit of measurement of the average treatment effect)
2. Is the effect statistically significant at the 5% level?
 - a. Let's start by specifying the null and alternative hypotheses. Please provide both the mathematical notations and their meaning.
 - b. What is the value of the observed test statistic, z^{obs} ? (Hint: the code `summary()$coeff` might be helpful here.)
 - c. What is the associated p-value?
 - d. Now, let's answer the question: Is the effect statistically significant at the 5% level? Please provide your reasoning.
3. Can we interpret the estimated effect as causal? In other words, how strong is the internal validity of this study? Have the researchers accurately measured the average causal effect on the sample of candidates who were part of the study? Please explain your reasoning.
4. Can we generalize the results? In other words, how strong is the external validity of this study? Please explain your reasoning and be specific about what population you think the findings can or cannot be generalized to.