Propensity Scores

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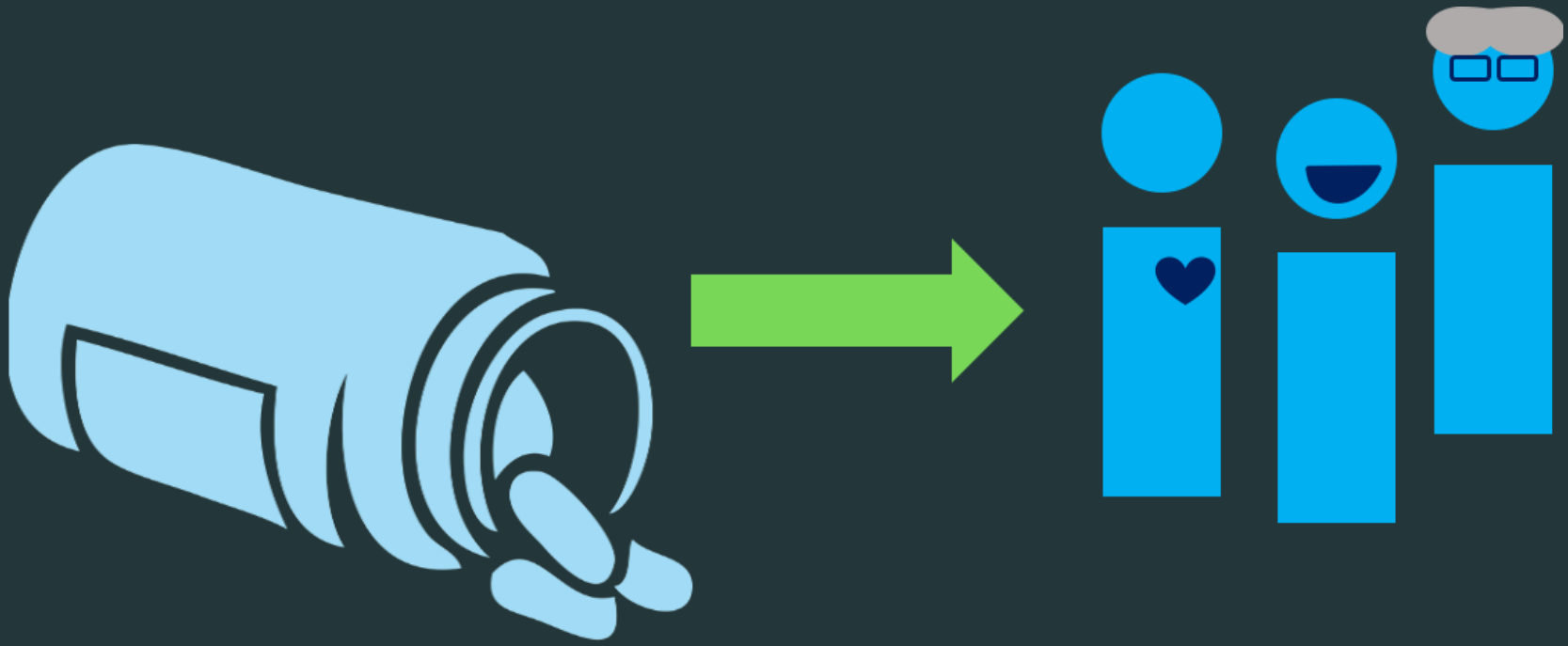
Observational Studies

Goal: To answer a research question



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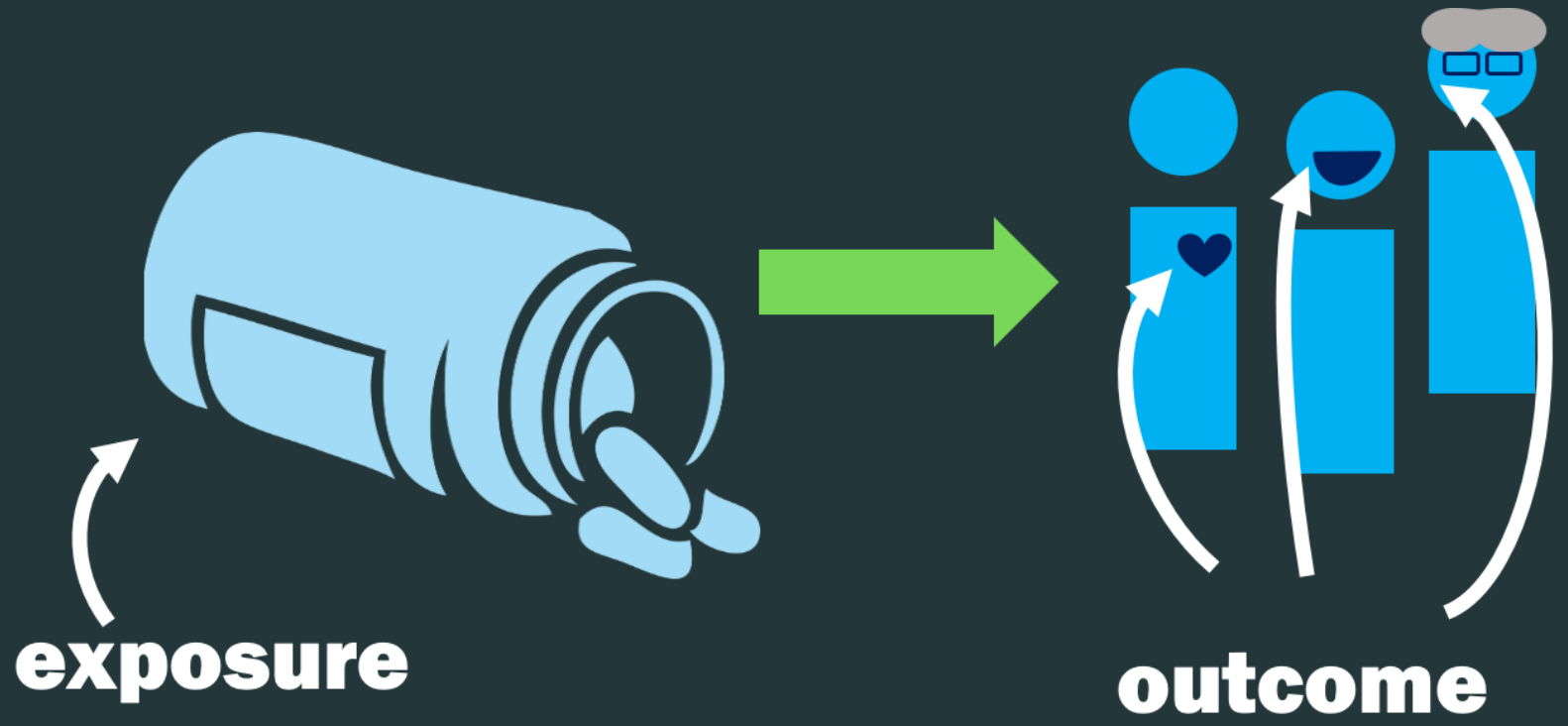

Observational Studies

Randomized Controlled Trial

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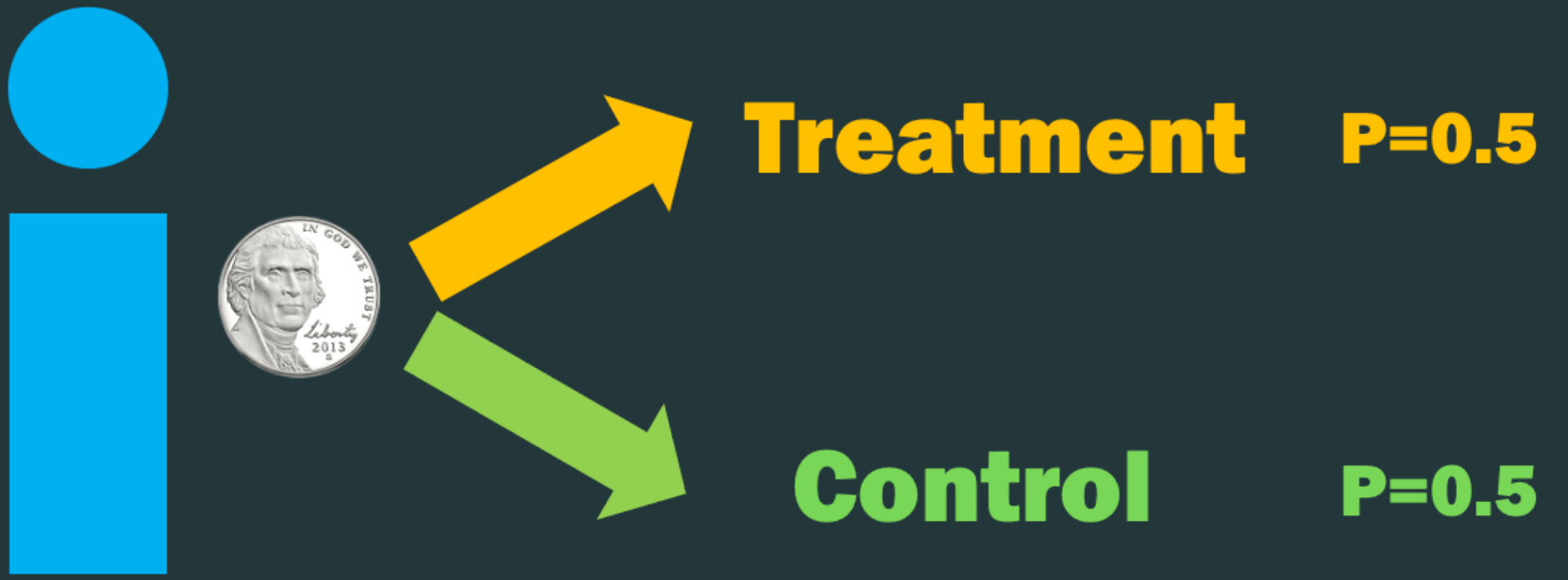
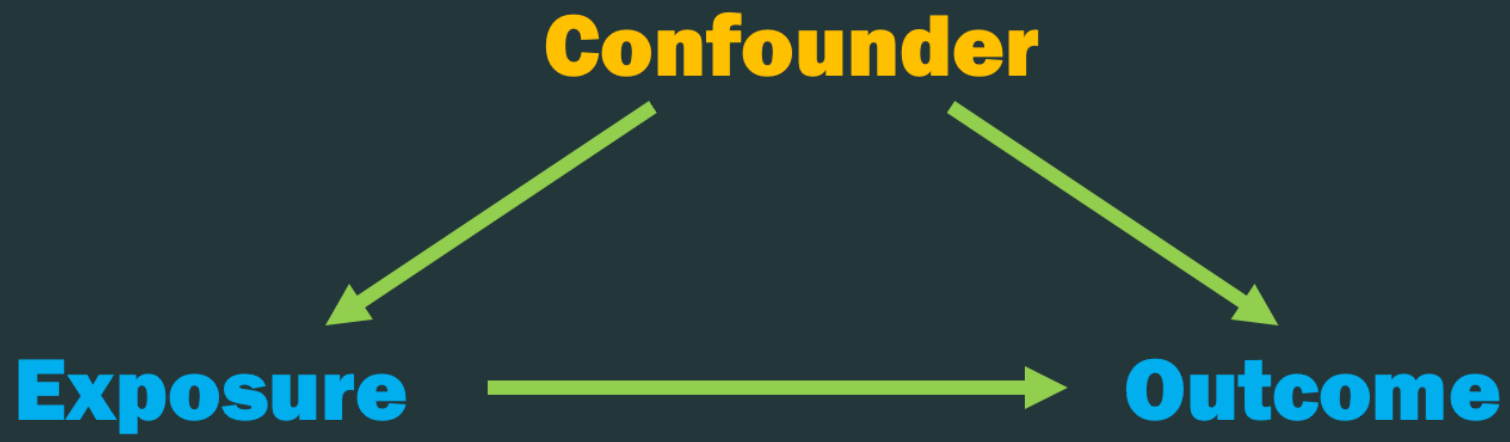
Randomized Controlled Trial

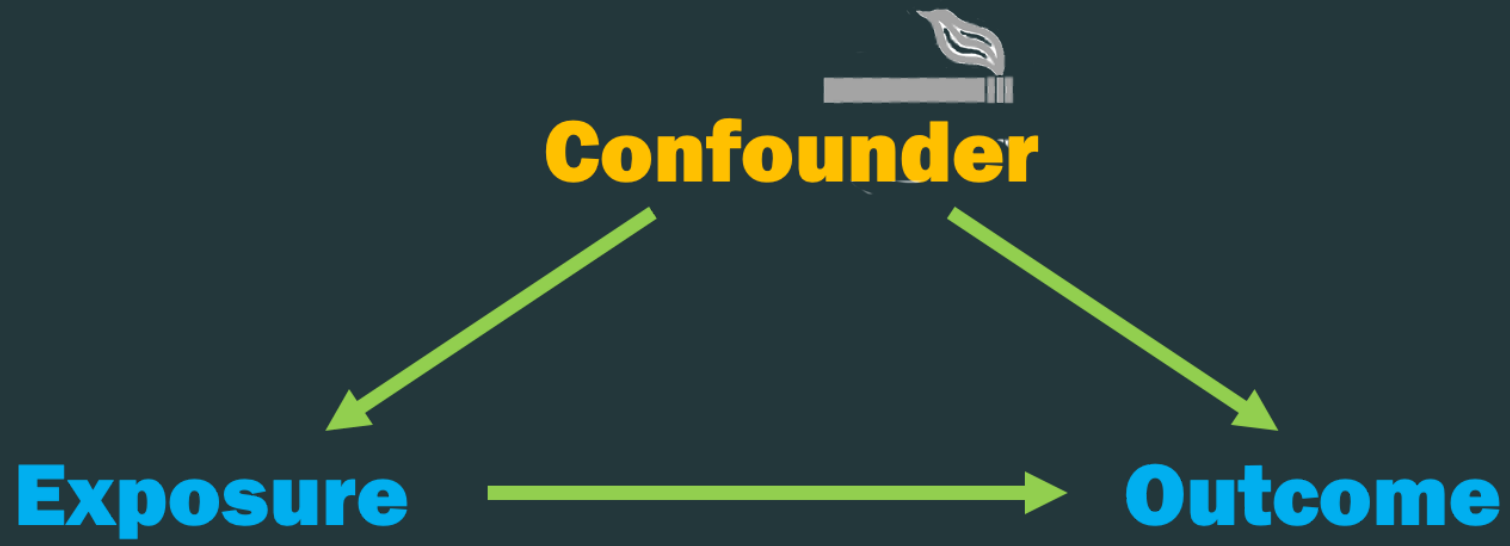


Observational Studies

Confounding



Confounding



Propensity scores

Rosenbaum and Rubin showed in observational studies, conditioning on **propensity scores** can lead to unbiased estimates of the exposure effect

1. **There are no unmeasured confounders**

2. **Every subject has a nonzero probability of receiving either exposure**

Propensity scores

Fit a **logistic regression** predicting exposure using known covariates

$$Pr(exposure = 1) = \frac{1}{1 + \exp(-X\beta)}$$

Each individuals' predicted values are the **propensity scores**

Propensity scores

```
library(tidyverse)
library(broom)
```

Propensity scores

```
glm(exposure ~ confounder_1 + confounder_2 + confounder_3 + ...,
    data = df,
    family = binomial())
```

Propensity scores

```
glm(exposure ~ confounder_1 + confounder_2 + confounder_3 + ...,
    data = df,
    family = binomial()) %>%
  augment(type.predict = "response", data = df)
```

Propensity scores

```
glm(exposure ~ confounder_1 + confounder_2 + confounder_3 + ...,
    data = df,
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```
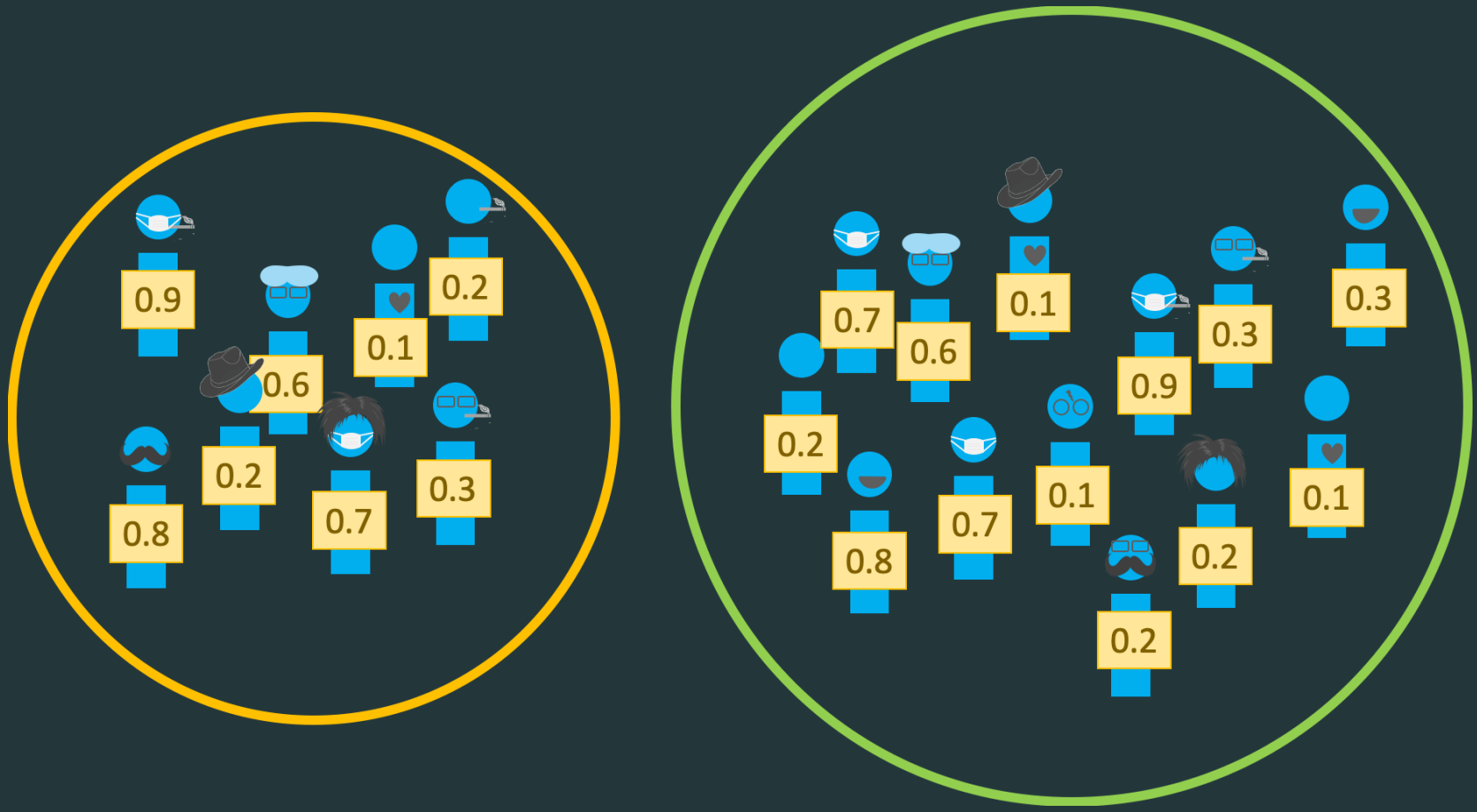
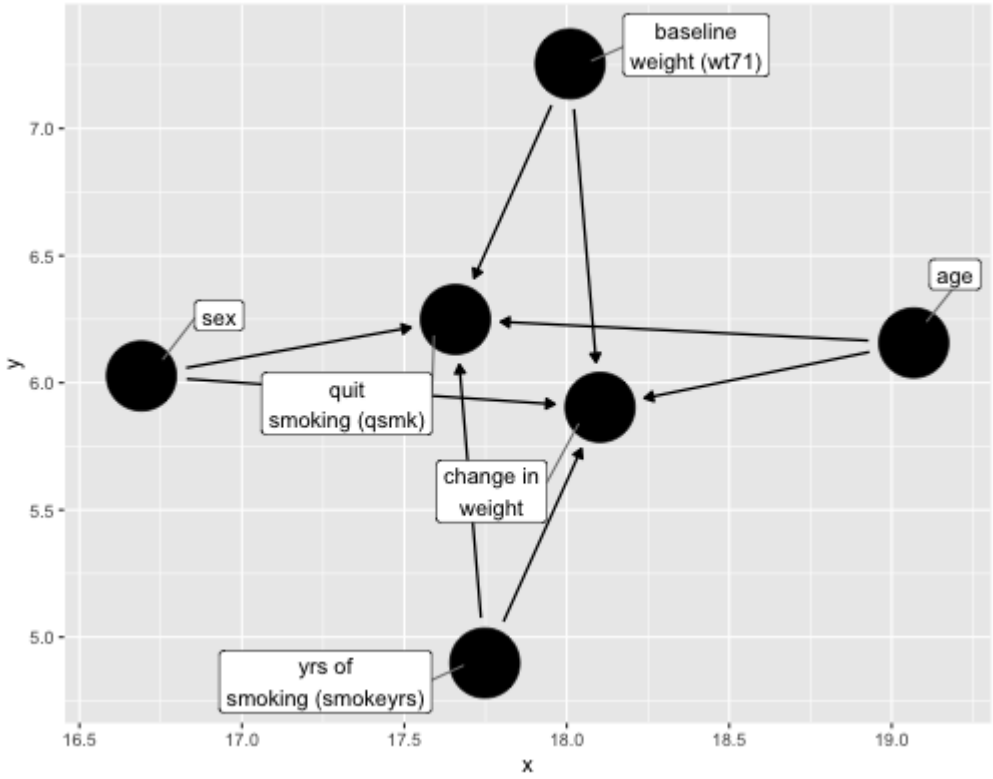

Propensity scores




baseline
weight (wt71)
sex
age
quit
smoking (qsmk)
change in
weight
yrs of
smoking (smokeyrs)
7.0
6.5
6.0
5.5
5.0
y
16.5
17.0
17.5
18.0
18.5
19.0
x

Your turn

1. **Using the confounders identified in the previous DAG, fit a propensity score model for** qsmk

2. **Stretch: Create two histograms, one of the propensity scores for those that quit smoking and one for those that do not**

05:00