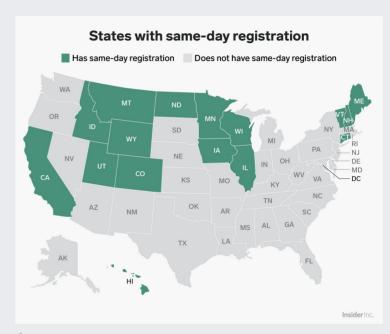
Final exercise

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Election day registration & voter turnout in the US

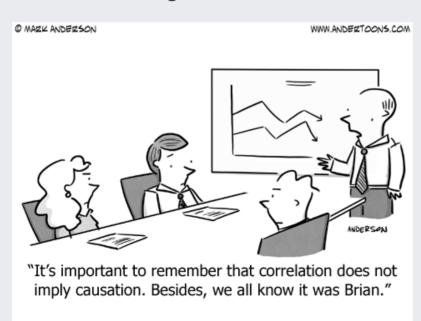
- The majority of states require voters to register two to four weeks before an election. (Wikipedia)
- "There is strong evidence that same day and Election Day registration increases voter turnout, but the extent of the impact is difficult to conclude.
- Multiple studies place the effect between an increase of 3 to 7 percent, with an average of a 5 percent increase." (NCLS)



(Source: businessinsider.com, November 2018.)

Exercise

- We want to examine the effect of election day registration upon voter turnout.
- Specifically, what is the *causal effect* of EDR upon voter turnout?
- Is our estimate in the range of values provided in the literature, i.e., 3-7% with 5% on average?



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The data set

We use data on **US states** for all **presidential elections from 1920 to 2012**.

```
# load data set
library(gsynth)
data(gsynth)
rm(list = c("simdata"))
```

Reference: Melanie Jean Springer. 2014. How the States Shaped the Nation: American Electoral Institutions and Voter Turnout, 1920-2000. University of Chicago Press.

```
# inspect data
str(turnout)
## 'data.frame': 1128 obs. of 6 variables:
  $ abb : chr "AL" "AL" "AL" "AL" ...
##
## $ year : int 1920 1924 1928 1932 1936 1940 1944 1948 1952 1956 .
## $ turnout : num 21 13.6 19 17.6 18.7 ...
## $ policy_edr : num 0 0 0 0 0 0 0 0 0 ...
## $ policy_mail_in: num 0 0 0 0 0 0 0 0 0 ...
## $ policy_motor : num 0 0 0 0 0 0 0 0 0 ...
# unique states
length(unique(turnout$abb))
## [1] 47
# unique years
length(unique(turnout$year))
## [1] 24
```

Exercise 1 (~ 20 min)

The state **Maine** introduced election day registration in the year **1976**.

- 1) **Plot turnout** in Maine over the 1920-2012 period.
- 2) **Distinguish between the period before and after EDR was introduced**: These are commonly called the **"pre-" and "post-treatment"** periods, respectively, where "treatment" refers to the introduction of EDR.
- 3) **Update your plot**: we want to visualise the time EDR was introduced, the accompanying pre- and post-treatment periods and the mean values of pre- and post-treatment turnout in Maine.
- 4) **Bonus**: Did mean turnout change significantly before and after 1976?

1) Plot turnout in Maine over 1920 - 2012.

```
turnout_maine <- turnout %>%
  filter(abb == 'ME')

ggplot(turnout_maine) +
  aes(y=turnout, x=year) +
  geom_line() +
  geom_point() +
  theme_xaringan()
```



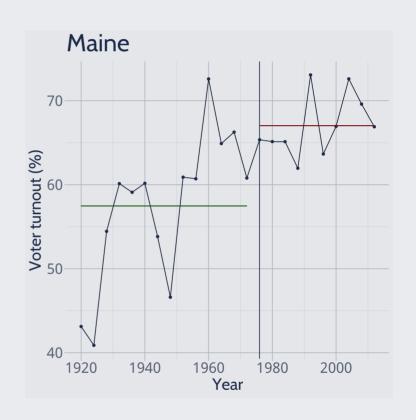
2) Distinguish between pre- and post-EDR periods

```
# filter and mutate
turnout_maine <- turnout_maine %>%
   mutate(treatment=ifelse(year >= 1976, 1, 0))

# disentangle treatment groups
pre <- turnout_maine %>%
   filter(treatment == 0)
post <- turnout_maine %>%
   filter(treatment == 1)
```

3) Update plot

```
ggplot(turnout_maine) +
  aes(y=turnout, x=year) +
  geom line() +
  geom_point() +
  geom_vline(xintercept=1976) +
  geom_segment(
    x=first(pre$year),
    xend=last(pre$year),
    y=mean(pre$turnout),
    yend=mean(pre$turnout),
    color='darkgreen') +
  geom_segment(
    x=first(post$year),
    xend=last(post$year),
    y=mean(post$turnout),
    yend=mean(post$turnout),
    color='darkred') +
  labs(
    title = "Maine",
    x = "Year",
    y = "Voter turnout (%)") +
  theme_xaringan()
```



4) Bonus: Significance check

```
ttest <- t.test(
  x=pre$turnout,
  y=post$turnout,
  mu=0,
  conf.level = 0.05,
  alternative = "two.sided"
)</pre>
```

The pre-treatment mean turnout rate in Maine is 57.46%, while the post-treatment mean turnout rate is 67.04%.

The difference between pre- and post-treatment is 9.58%.

A t-test confirms that this result is statistically significant at the 95% confidence level (p = 0.002).

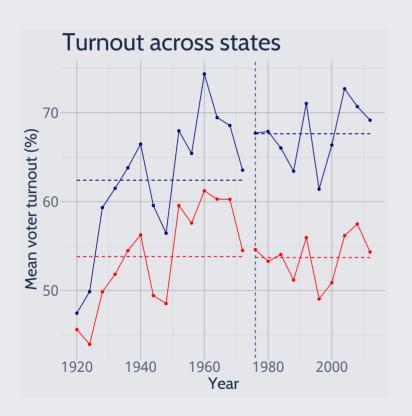
Exercise 2 (~ 20 min)

Plot turnout across all states over time, distinguishing between election day registration states and non-election day registration states, as well as when election day registration was introduced.

TODO: provide better description

Solution to Exercise 2

TODO: break down into many smaller chunks that fit one slide each TODO: tidyversify code. use functions that were introduced by Colin.



Of the 47 states included in the data set, 3 (ME, MN, WI) have introduced election day registration in 1976. 38 states have not introduced it at all throughout the 1920-2012 time period. This leaves us with 6 states that introduced election day registration in years other than 1976.

The figure shows group-aggregated mean voter turnout over time. It can easily be seen that the treatment-group mean increased between preand post-treatment, while the control-group mean actually declined minimally.

Exercise 3

Estimate the average effect of EDR on voter turnout.

TODO: provide better description

Solution to Exercise 3 (~ 5 min)

TODO: tidyversify TODO: add barplot

```
# treatment group difference
diff_treatment <-
    mean(E1T1$turnout) -
    mean(E1T0$turnout)

# control group difference
diff_control <-
    mean(E0T1$turnout) -
    mean(E0T0$turnout)

# treatment - control
DID <- diff_treatment -
    diff_control</pre>
```

The effect of EDR on voter turnout is 5.34%.