Regression Discontinuity Design: Effect of Legal Minimum Drinking Age on Mortality

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This coding exercise was from the Statistics for Public Policy course taught by Dr. Matthew Levendusky at the University of Pennsylvania. Data was provided by the instructor and taken from Christopher Carpenter and Carlos Dobkin's American Economics Journal article in 2009.

Load packages and data

Key variables are "all" (number of people who die in a given month in a given age group) and "agecell" (age of the given group).

```
library(readstata13)
alcohol <- read.dta13(file = "rdd_alcohol_data.dta")

# View variables
  summary(alcohol)
```

```
##     agecell           all           allfitted         internal
##  Min.   :19.07   Min.   : 88.43   Min.   : 91.71   Min.   :15.98
##  1st Qu.:20.08   1st Qu.: 92.79   1st Qu.: 93.04   1st Qu.:18.60
##  Median :21.00   Median : 95.69   Median : 95.18   Median :20.29
##  Mean   :21.00   Mean   : 95.67   Mean   : 95.80   Mean   :20.29
##  3rd Qu.:21.92   3rd Qu.: 98.03   3rd Qu.: 97.79   3rd Qu.:21.98
##  Max.   :22.93   Max.   :105.27   Max.   :102.89   Max.   :24.37
##                  NA's   :2                         NA's   :2
##  internalfitted     external     externalfitted     alcohol
##  Min.   :16.74   Min.   :71.34   Min.   :73.16   Min.   :0.6391
##  1st Qu.:18.67   1st Qu.:73.04   1st Qu.:74.06   1st Qu.:0.9962
##  Median :20.54   Median :74.81   Median :74.74   Median :1.2119
##  Mean   :20.28   Mean   :75.39   Mean   :75.52   Mean   :1.2573
##  3rd Qu.:21.66   3rd Qu.:77.24   3rd Qu.:76.06   3rd Qu.:1.4701
##  Max.   :24.04   Max.   :83.33   Max.   :81.78   Max.   :2.5193
##                  NA's   :2                       NA's   :2
##  alcoholfitted       homicide     homicidefitted     suicide
##  Min.   :0.7943   Min.   :14.95   Min.   :16.26   Min.   :10.89
##  1st Qu.:1.0724   1st Qu.:16.61   1st Qu.:16.54   1st Qu.:11.61
##  Median :1.2471   Median :16.99   Median :16.99   Median :12.20
##  Mean   :1.2674   Mean   :16.91   Mean   :16.95   Mean   :12.35
##  3rd Qu.:1.4455   3rd Qu.:17.29   3rd Qu.:17.25   3rd Qu.:12.82
##  Max.   :1.8174   Max.   :18.41   Max.   :17.76   Max.   :14.83
```

```
##                   NA's   :2                       NA's   :2
##  suicidefitted        mva          mvafitted         drugs
##  Min.   :11.59   Min.   :26.86   Min.   :27.87   Min.   :3.202
##  1st Qu.:11.61   1st Qu.:30.12   1st Qu.:30.17   1st Qu.:3.755
##  Median :12.25   Median :31.64   Median :31.73   Median :4.314
##  Mean   :12.36   Mean   :31.62   Mean   :31.68   Mean   :4.250
##  3rd Qu.:13.04   3rd Qu.:33.10   3rd Qu.:33.40   3rd Qu.:4.756
##  Max.   :13.55   Max.   :36.39   Max.   :34.82   Max.   :5.565
##                  NA's   :2                       NA's   :2
##   drugsfitted    externalother    externalotherfitted
##  Min.   :3.449   Min.   : 7.973   Min.   : 8.388
##  1st Qu.:3.769   1st Qu.: 9.149   1st Qu.: 9.347
##  Median :4.323   Median : 9.561   Median : 9.690
##  Mean   :4.255   Mean   : 9.599   Mean   : 9.610
##  3rd Qu.:4.679   3rd Qu.:10.122   3rd Qu.: 9.939
##  Max.   :5.130   Max.   :11.483   Max.   :10.353
##                  NA's   :2
```

Reformat Variables

Age range: 19.07-22.93 years old

```
alcohol$age <- alcohol$agecell - 21 # how many years before / after legal age

alcohol$over21 <- ifelse(alcohol$agecell >= 21, 1, 0) # forcing/dummy variable
```

Create linear model

```
summary(lm(all ~ age + over21, alcohol))
```

```
##
## Call:
## lm(formula = all ~ age + over21, data = alcohol)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.0559 -1.8483  0.1149  1.4909  5.8043
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  91.8414     0.8050 114.083  < 2e-16 ***
## age          -0.9747     0.6325  -1.541     0.13
## over21        7.6627     1.4403   5.320 3.15e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.493 on 45 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.5946, Adjusted R-squared:  0.5765
## F-statistic: 32.99 on 2 and 45 DF,  p-value: 1.508e-09
```

RDD plot: Legal Age & Mortality

```
library(rdrobust)

rdplot(y = alcohol$all,
       x = alcohol$agecell,
       c = 21,
       n = dim(alcohol) [1],
       p = 1,
       x.label = "Age",
       y.label = "Fatalities per 100,000",
       y.lim = c(85, 110),
       title = "Legal Drinking Age & Mortality")
```