

# Project3

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*2/6/2020*

## Contents

```
library(AER)
```

```
## Warning: package 'AER' was built under R version 3.6.2
```

```
## Loading required package: car
```

```
## Loading required package: carData
```

```
## Loading required package: lmtest
```

```
## Loading required package: zoo
```

```
##
```

```
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      as.Date, as.Date.numeric
```

```
## Loading required package: sandwich
```

```
## Warning: package 'sandwich' was built under R version 3.6.2
```

```
## Loading required package: survival
```

```
library(sqldf)
```

```
## Loading required package: gsubfn
```

```
## Loading required package: proto
```

```
## Loading required package: RSQLite
```

```
library(kableExtra)
```

```
library(knitr)
```

```
library(latexpdf)
```

Make suggestions to policymakers to take certain measures by discovering variables that caused the reduction or increase of traffic fatalities.

```
data("Fatalities")
data = Fatalities
head(data)
```

```
##      state year spirits unemp  income  emppop  beertax baptist  mormon drinkage
## 1    al 1982    1.37  14.4 10544.15 50.69204 1.539379 30.3557 0.32829   19.00
## 2    al 1983    1.36  13.7 10732.80 52.14703 1.788991 30.3336 0.34341   19.00
## 3    al 1984    1.32  11.1 11108.79 54.16809 1.714286 30.3115 0.35924   19.00
## 4    al 1985    1.28   8.9 11332.63 55.27114 1.652542 30.2895 0.37579   19.67
## 5    al 1986    1.23   9.8 11661.51 56.51450 1.609907 30.2674 0.39311   21.00
## 6    al 1987    1.18   7.8 11944.00 57.50988 1.560000 30.2453 0.41123   21.00
##      dry youngdrivers  miles breath jail service fatal nfatal sfatal
## 1 25.0063    0.211572 7233.887    no  no      no   839   146    99
## 2 22.9942    0.210768 7836.348    no  no      no   930   154    98
## 3 24.0426    0.211484 8262.990    no  no      no   932   165    94
## 4 23.6339    0.211140 8726.917    no  no      no   882   146    98
## 5 23.4647    0.213400 8952.854    no  no      no  1081   172   119
## 6 23.7924    0.215527 9166.302    no  no      no  1110   181   114
##      fatal1517 nfatal1517 fatal1820 nfatal1820 fatal2124 nfatal2124  afatal
## 1         53         9         99         34        120         32 309.438
## 2         71         8        108         26        124         35 341.834
## 3         49         7        103         25        118         34 304.872
## 4         66         9        100         23        114         45 276.742
## 5         82        10        120         23        119         29 360.716
## 6         94        11        127         31        138         30 368.421
##      pop  pop1517  pop1820  pop2124 milestot  unempus  emppopus      gsp
## 1 3942002 208999.6 221553.4 290000.1  28516     9.7    57.8 -0.02212476
## 2 3960008 202000.1 219125.5 290000.2  31032     9.6    57.9  0.04655825
## 3 3988992 197000.0 216724.1 288000.2  32961     7.5    59.5  0.06279784
## 4 4021008 194999.7 214349.0 284000.3  35091     7.2    60.1  0.02748997
## 5 4049994 203999.9 212000.0 263000.3  36259     7.0    60.7  0.03214295
## 6 4082999 204999.8 208998.5 258999.8  37426     6.2    61.5  0.04897637
```

*Question:* Which factor variables change across time within each state?

```
factorchange = sqldf("SELECT state, year, breath, jail, service FROM data")

factorchange_table = data.frame(State = c("CO","CT","IL","IN","IA","KS","KY","LA","MS","NV","NH","OH","PA","RI","SC","SD","TN","TX","VA","WI","WY"),
                                Breath = c("1982-1983","NA","1986 - 1987","1983-1984","1982-1983","1985-1986","1984-1985","1987-1988","1988-1989","1989-1990","1990-1991","1991-1992","1992-1993","1993-1994","1994-1995","1995-1996","1996-1997","1997-1998","1998-1999","1999-2000","2000-2001","2001-2002","2002-2003","2003-2004","2004-2005","2005-2006","2006-2007","2007-2008","2008-2009","2009-2010","2010-2011","2011-2012","2012-2013","2013-2014","2014-2015","2015-2016","2016-2017","2017-2018","2018-2019","2019-2020","2020-2021","2021-2022","2022-2023","2023-2024","2024-2025","2025-2026","2026-2027","2027-2028","2028-2029","2029-2030","2030-2031","2031-2032","2032-2033","2033-2034","2034-2035","2035-2036","2036-2037","2037-2038","2038-2039","2039-2040","2040-2041","2041-2042","2042-2043","2043-2044","2044-2045","2045-2046","2046-2047","2047-2048","2048-2049","2049-2050","2050-2051","2051-2052","2052-2053","2053-2054","2054-2055","2055-2056","2056-2057","2057-2058","2058-2059","2059-2060","2060-2061","2061-2062","2062-2063","2063-2064","2064-2065","2065-2066","2066-2067","2067-2068","2068-2069","2069-2070","2070-2071","2071-2072","2072-2073","2073-2074","2074-2075","2075-2076","2076-2077","2077-2078","2078-2079","2079-2080","2080-2081","2081-2082","2082-2083","2083-2084","2084-2085","2085-2086","2086-2087","2087-2088","2088-2089","2089-2090","2090-2091","2091-2092","2092-2093","2093-2094","2094-2095","2095-2096","2096-2097","2097-2098","2098-2099","2099-2100","2100-2101","2101-2102","2102-2103","2103-2104","2104-2105","2105-2106","2106-2107","2107-2108","2108-2109","2109-2110","2110-2111","2111-2112","2112-2113","2113-2114","2114-2115","2115-2116","2116-2117","2117-2118","2118-2119","2119-2120","2120-2121","2121-2122","2122-2123","2123-2124","2124-2125","2125-2126","2126-2127","2127-2128","2128-2129","2129-2130","2130-2131","2131-2132","2132-2133","2133-2134","2134-2135","2135-2136","2136-2137","2137-2138","2138-2139","2139-2140","2140-2141","2141-2142","2142-2143","2143-2144","2144-2145","2145-2146","2146-2147","2147-2148","2148-2149","2149-2150","2150-2151","2151-2152","2152-2153","2153-2154","2154-2155","2155-2156","2156-2157","2157-2158","2158-2159","2159-2160","2160-2161","2161-2162","2162-2163","2163-2164","2164-2165","2165-2166","2166-2167","2167-2168","2168-2169","2169-2170","2170-2171","2171-2172","2172-2173","2173-2174","2174-2175","2175-2176","2176-2177","2177-2178","2178-2179","2179-2180","2180-2181","2181-2182","2182-2183","2183-2184","2184-2185","2185-2186","2186-2187","2187-2188","2188-2189","2189-2190","2190-2191","2191-2192","2192-2193","2193-2194","2194-2195","2195-2196","2196-2197","2197-2198","2198-2199","2199-2200","2200-2201","2201-2202","2202-2203","2203-2204","2204-2205","2205-2206","2206-2207","2207-2208","2208-2209","2209-2210","2210-2211","2211-2212","2212-2213","2213-2214","2214-2215","2215-2216","2216-2217","2217-2218","2218-2219","2219-2220","2220-2221","2221-2222","2222-2223","2223-2224","2224-2225","2225-2226","2226-2227","2227-2228","2228-2229","2229-2230","2230-2231","2231-2232","2232-2233","2233-2234","2234-2235","2235-2236","2236-2237","2237-2238","2238-2239","2239-2240","2240-2241","2241-2242","2242-2243","2243-2244","2244-2245","2245-2246","2246-2247","2247-2248","2248-2249","2249-2250","2250-2251","2251-2252","2252-2253","2253-2254","2254-2255","2255-2256","2256-2257","2257-2258","2258-2259","2259-2260","2260-2261","2261-2262","2262-2263","2263-2264","2264-2265","2265-2266","2266-2267","2267-2268","2268-2269","2269-2270","2270-2271","2271-2272","2272-2273","2273-2274","2274-2275","2275-2276","2276-2277","2277-2278","2278-2279","2279-2280","2280-2281","2281-2282","2282-2283","2283-2284","2284-2285","2285-2286","2286-2287","2287-2288","2288-2289","2289-2290","2290-2291","2291-2292","2292-2293","2293-2294","2294-2295","2295-2296","2296-2297","2297-2298","2298-2299","2299-2300","2300-2301","2301-2302","2302-2303","2303-2304","2304-2305","2305-2306","2306-2307","2307-2308","2308-2309","2309-2310","2310-2311","2311-2312","2312-2313","2313-2314","2314-2315","2315-2316","2316-2317","2317-2318","2318-2319","2319-2320","2320-2321","2321-2322","2322-2323","2323-2324","2324-2325","2325-2326","2326-2327","2327-2328","2328-2329","2329-2330","2330-2331","2331-2332","2332-2333","2333-2334","2334-2335","2335-2336","2336-2337","2337-2338","2338-2339","2339-2340","2340-2341","2341-2342","2342-2343","2343-2344","2344-2345","2345-2346","2346-2347","2347-2348","2348-2349","2349-2350","2350-2351","2351-2352","2352-2353","2353-2354","2354-2355","2355-2356","2356-2357","2357-2358","2358-2359","2359-2360","2360-2361","2361-2362","2362-2363","2363-2364","2364-2365","2365-2366","2366-2367","2367-2368","2368-2369","2369-2370","2370-2371","2371-2372","2372-2373","2373-2374","2374-2375","2375-2376","2376-2377","2377-2378","2378-2379","2379-2380","2380-2381","2381-2382","2382-2383","2383-2384","2384-2385","2385-2386","2386-2387","2387-2388","2388-2389","2389-2390","2390-2391","2391-2392","2392-2393","2393-2394","2394-2395","2395-2396","2396-2397","2397-2398","2398-2399","2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                                Jail = c("NA","1984-1985","NA","NA","NA","NA","NA","NA","NA","NA","1982-1983","1983-1984","1984-1985","1985-1986","1986-1987","1987-1988","1988-1989","1989-1990","1990-1991","1991-1992","1992-1993","1993-1994","1994-1995","1995-1996","1996-1997","1997-1998","1998-1999","1999-2000","2000-2001","2001-2002","2002-2003","2003-2004","2004-2005","2005-2006","2006-2007","2007-2008","2008-2009","2009-2010","2010-2011","2011-2012","2012-2013","2013-2014","2014-2015","2015-2016","2016-2017","2017-2018","2018-2019","2019-2020","2020-2021","2021-2022","2022-2023","20
```

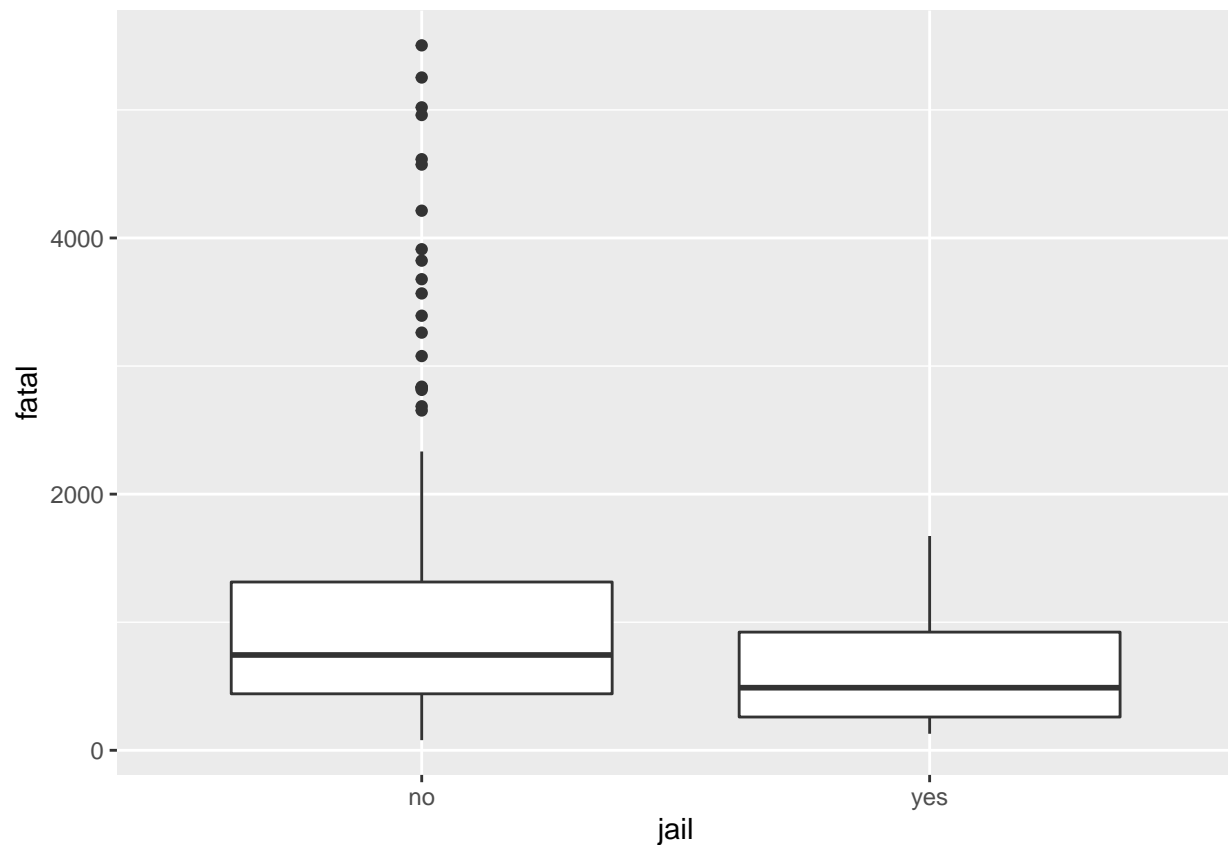
State	Breath	Jail	Service
CO	1982-1983	NA	NA
CT	NA	1984-1985	1984-1985
IL	1986 - 1987	NA	NA
IN	1983-1984	NA	NA
IA	1982-1983	NA	NA
KS	1985-1986	NA	NA
KY	1983-1984	NA	NA
LA	1982-1983	NA	NA
MS	1982-1983	NA	NA
NV	NA	1982-1983	1982-1983
NH	1982-1983	NA	NA
OH	NA	1982-1983 & 1986 - 1987	NA
OR	NA	1983-1984	1983-1984
UT	NA	1982-1983	1982-1983

```
library(ggplot2)
```

```
data = data[complete.cases(data),]
dim(data)
```

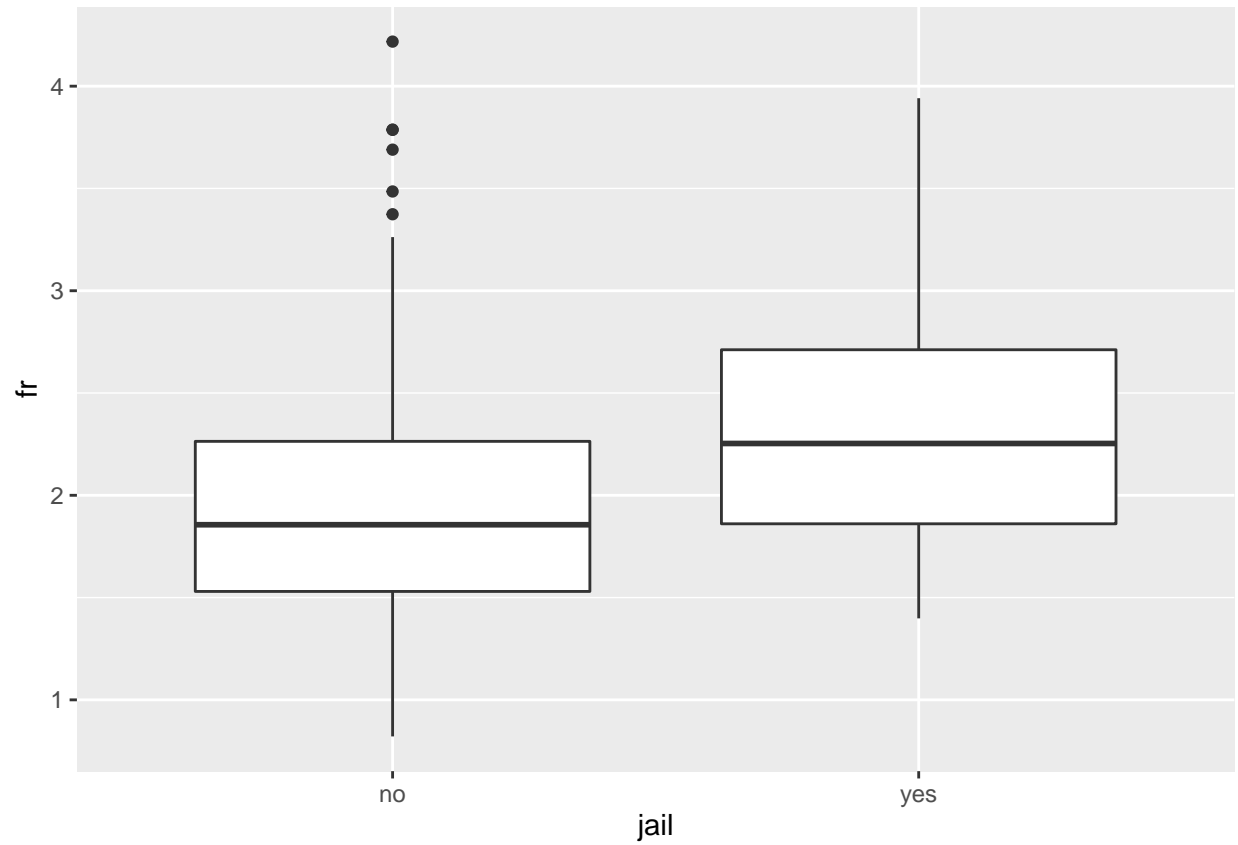
```
## [1] 335 34
```

```
ggplot(data, aes(x = jail, y = fatal)) +
  geom_boxplot()
```



```
data['fr'] = data$fatal/data$pop*10000
```

```
ggplot(data, aes(x = jail, y = fr)) +  
  geom_boxplot()
```



```
ggplot(data, aes(x = drinkage, y = fr)) +  
  geom_point()
```

