

DaigleInClassLabWk12D1EDA.R

daiglechris

Wed Apr 11 19:45:36 2018

```
# Chris Daigle
```

```
# Week12 Day 1 - 9 April
```

```
setwd("/Users/daiglechris/Library/Mobile Documents/com~apple~CloudDocs/Education/UConn/Spring 2018/R/Daigle")
```

```
# Importing #####
```

```
compiled <- read.csv('1999-2016 Opioid Mortailty.csv')
```

```
head(compiled)
```

```
##      State Year StateCode Population AllOpioids AllOpioidsRate
## 1  Alabama 2016         1   4863300        351  7.21732e-05
## 2  Alaska 2016         2    741894        101  1.36138e-04
## 3  Arizona 2016         4   6931071        806  1.16288e-04
## 4  Arkansas 2016         5   2988248        175  5.85627e-05
## 5 California 2016         6  39250017       2146  5.46751e-05
## 6  Colorado 2016         8   5540545        560  1.01073e-04
## AllOpioidsRatePer100k T40.1   T40.1Rate T40.1RatePer100k T40.2
## 1              7.217322   129 2.65252e-05      2.6525199    99
## 2             13.613805    51 6.87430e-05      6.8742974    51
## 3             11.628794   304 4.38605e-05      4.3860465   348
## 4              5.856274    13 4.35038e-06      0.4350375   120
## 5              5.467514   606 1.54395e-05      1.5439484  1035
## 6             10.107309   241 4.34975e-05      4.3497526   223
##      T40.2Rate T40.2RatePer100k T40.3   T40.3Rate T40.3RatePer100k T40.4
## 1 2.03565e-05      2.035655    35 7.19676e-06      0.7196759   158
## 2 6.87430e-05      6.874297    17 2.29143e-05      2.2914325    10
## 3 5.02087e-05      5.020869    80 1.15422e-05      1.1542228   127
## 4 4.01573e-05      4.015731    32 1.07086e-05      1.0708616    40
## 5 2.63694e-05      2.636942   300 7.64331e-06      0.7643309   371
## 6 4.02487e-05      4.024875    60 1.08293e-05      1.0829260    75
##      T40.4Rate T40.4RatePer100k T40.6   T40.6Rate T40.6RatePer100k
## 1 3.24882e-05      3.2488228   13 2.67308e-06      0.2673082
## 2 1.34790e-05      1.3479015   26 3.50454e-05      3.5045438
## 3 1.83233e-05      1.8323287   52 7.50245e-06      0.7502448
## 4 1.33858e-05      1.3385770   14 4.68502e-06      0.4685019
## 5 9.45223e-06      0.9452225  169 4.30573e-06      0.4305731
## 6 1.35366e-05      1.3536574   26 4.69268e-06      0.4692679
## fracwhite fracblack fracother yr_st_age_0_15 yr_st_age_16_35
## 1 0.7035696 0.26345053 0.03297986    0.1988286    0.2649606
## 2 0.6812896 0.03441275 0.28429764    0.2250861    0.3054493
## 3 0.8476953 0.04394622 0.10835844    0.2085151    0.2714895
## 4 0.8033158 0.15570431 0.04097989    0.2089385    0.2655971
## 5 0.7418381 0.06674590 0.19141602    0.2053502    0.2891537
## 6 0.8849572 0.04273427 0.07230858    0.2024178    0.2882922
## yr_st_age_36_64 yr_st_age_65plus
## 1      0.3748901      0.1613207
## 2      0.3653986      0.1040661
## 3      0.3510570      0.1689384
```

```
## 4      0.3625817      0.1628827
## 5      0.3692762      0.1362199
## 6      0.3750931      0.1341969
```

summary(compiled)

```
##      State      Year      StateCode      Population
## Alabama : 18 Min. :1999 Min. : 1.00 Min. : 491780
## Alaska : 18 1st Qu.:2003 1st Qu.:16.00 1st Qu.: 1599830
## Arizona : 18 Median :2008 Median :29.00 Median : 4131636
## Arkansas : 18 Mean :2008 Mean :28.96 Mean : 5921295
## California: 18 3rd Qu.:2012 3rd Qu.:42.00 3rd Qu.: 6686474
## Colorado : 18 Max. :2016 Max. :56.00 Max. :39250017
## (Other) :810
## AllOpioids AllOpioidsRate AllOpioidsRatePer100k
## Min. : 1.0 Min. :1.552e-06 Min. : 0.1552
## 1st Qu.: 83.0 1st Qu.:3.901e-05 1st Qu.: 3.9011
## Median : 248.0 Median :5.994e-05 Median : 5.9942
## Mean : 400.0 Mean :7.332e-05 Mean : 7.3325
## 3rd Qu.: 542.8 3rd Qu.:9.449e-05 3rd Qu.: 9.4493
## Max. :3688.0 Max. :4.178e-04 Max. :41.7781
##
## T40.1 T40.1Rate T40.1RatePer100k T40.2
## Min. : 0.00 Min. :0.000e+00 Min. : 0.0000 Min. : 0.0
## 1st Qu.: 4.00 1st Qu.:2.002e-06 1st Qu.: 0.2002 1st Qu.: 34.0
## Median : 30.00 Median :8.152e-06 Median : 0.8152 Median : 95.0
## Mean : 94.99 Mean :1.494e-05 Mean : 1.4943 Mean : 169.1
## 3rd Qu.: 109.00 3rd Qu.:1.898e-05 3rd Qu.: 1.8981 3rd Qu.: 228.0
## Max. :1501.00 Max. :1.835e-04 Max. :18.3508 Max. :1226.0
##
## T40.2Rate T40.2RatePer100k T40.3 T40.3Rate
## Min. :0.000e+00 Min. : 0.000 Min. : 0.00 Min. :0.000e+00
## 1st Qu.:1.449e-05 1st Qu.: 1.449 1st Qu.: 17.00 1st Qu.:6.396e-06
## Median :2.504e-05 Median : 2.504 Median : 47.00 Median :1.191e-05
## Mean :3.246e-05 Mean : 3.246 Mean : 72.54 Mean :1.421e-05
## 3rd Qu.:4.149e-05 3rd Qu.: 4.149 3rd Qu.: 98.00 3rd Qu.:1.859e-05
## Max. :2.587e-04 Max. :25.871 Max. :581.00 Max. :6.111e-05
##
## T40.3RatePer100k T40.4 T40.4Rate T40.4RatePer100k
## Min. :0.0000 Min. : 0.00 Min. :0.000e+00 Min. : 0.0000
## 1st Qu.:0.6396 1st Qu.: 11.00 1st Qu.:4.343e-06 1st Qu.: 0.4343
## Median :1.1911 Median : 30.00 Median :7.816e-06 Median : 0.7816
## Mean :1.4212 Mean : 72.53 Mean :1.389e-05 Mean : 1.3890
## 3rd Qu.:1.8586 3rd Qu.: 72.00 3rd Qu.:1.279e-05 3rd Qu.: 1.2786
## Max. :6.1109 Max. :2328.00 Max. :2.764e-04 Max. :27.6447
##
## T40.6 T40.6Rate T40.6RatePer100k fracwhite
## Min. : 0.00 Min. :0.000e+00 Min. :0.0000 Min. :0.2516
## 1st Qu.: 8.00 1st Qu.:3.100e-06 1st Qu.:0.3100 1st Qu.:0.7359
## Median : 25.00 Median :6.016e-06 Median :0.6016 Median :0.8347
## Mean : 58.28 Mean :1.055e-05 Mean :1.0553 Mean :0.8057
## 3rd Qu.: 62.00 3rd Qu.:1.170e-05 3rd Qu.:1.1695 3rd Qu.:0.9011
## Max. :641.00 Max. :9.116e-05 Max. :9.1160 Max. :0.9858
##
## fracblack fracother yr_st_age_0_15 yr_st_age_16_35
```

```
## Min. :0.0004202 Min. :0.003638 Min. :0.1560 Min. :0.2162
## 1st Qu.:0.0301175 1st Qu.:0.032980 1st Qu.:0.2131 1st Qu.:0.2483
## Median :0.0742914 Median :0.056435 Median :0.2313 Median :0.2580
## Mean :0.1117680 Mean :0.082574 Mean :0.2307 Mean :0.2607
## 3rd Qu.:0.1542234 3rd Qu.:0.091252 3rd Qu.:0.2473 3rd Qu.:0.2703
## Max. :0.6511871 Max. :0.726881 Max. :0.3201 Max. :0.3859
##
## yr_st_age_36_64 yr_st_age_65plus
## Min. :0.2851 Min. :0.04659
## 1st Qu.:0.3691 1st Qu.:0.11421
## Median :0.3807 Median :0.12734
## Mean :0.3806 Mean :0.12792
## 3rd Qu.:0.3936 3rd Qu.:0.14174
## Max. :0.4475 Max. :0.19866
##
```

```
# Subsetting
```

```
simple <- compiled[, 1:7]
head(simple)
```

```
##      State Year StateCode Population AllOpioids AllOpioidsRate
## 1   Alabama 2016         1  4863300        351  7.21732e-05
## 2    Alaska 2016         2   741894        101  1.36138e-04
## 3   Arizona 2016         4  6931071        806  1.16288e-04
## 4   Arkansas 2016         5  2988248        175  5.85627e-05
## 5 California 2016         6 39250017       2146  5.46751e-05
## 6   Colorado 2016         8  5540545        560  1.01073e-04
## AllOpioidsRatePer100k
## 1              7.217322
## 2             13.613805
## 3             11.628794
## 4              5.856274
## 5              5.467514
## 6             10.107309
```

```
simple <- as.data.frame(simple)
```

```
anova(lm(simple$AllOpioids ~ simple$Year))
```

```
## Analysis of Variance Table
```

```
##
```

```
## Response: simple$AllOpioids
```

```
##           Df      Sum Sq Mean Sq F value    Pr(>F)
## simple$Year  1 24896839 24896839 135.25 < 2.2e-16 ***
## Residuals  916 168614327  184077
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# x <- pull(simple, State)
```

```
x <- simple[["State"]]
```

```
x1 <- t(x)
```

```
colnames(x1) <- x1[1,]
```

```
x1 <- x1[-1, ]
```

```
x1 <- x1[,1:51]
```

```
statesAsVar <- x1
```

```

empty <- rep(NA, 51)

for (i in 1:18) {
  statesAsVar <- rbind(statesAsVar, empty)
}
row.names(statesAsVar) <- c(2016:1999)

states <- unique(simple$State)

for (i in x) {
  statesAsVar[,i] <- simple$AllOpioids[simple$State == i]
}
# Test Case: Alabama <- simple$AllOpioids[simple$State == 'Alabama'], also view(simple) and sort it by
# Locate states with the highest values
maxes <- rep(NA, length(1999:2016))
for (i in 1:18) {
  maxes[i] <- max(simple$AllOpioids[which(simple$Year == (i+1998))])
}

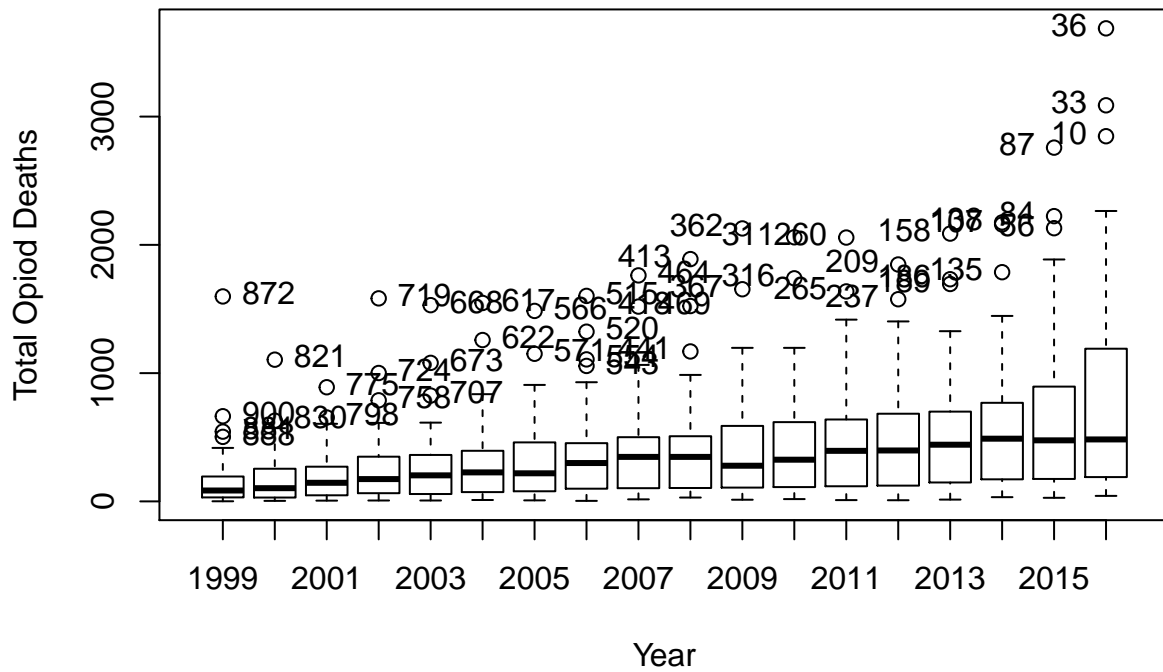
byYrStateMaxes <- rep(NA, length(1999:2016))
for (i in 1999:2016) {
  byYrStateMaxes[i-1998] <- simple$State[which(simple$AllOpioids == maxes[i-1998] & simple$Year == i)]
}
byYrStateMaxes <- simple$State[byYrStateMaxes]

# Graphics
library(car)

## Warning: package 'car' was built under R version 3.4.4
## Loading required package: carData
## Warning: package 'carData' was built under R version 3.4.4
Boxplot(simple$AllOpioids, simple$Year, xlab = 'Year', ylab = 'Total Opioid Deaths', main = 'Total USA Opioid Deaths')

```

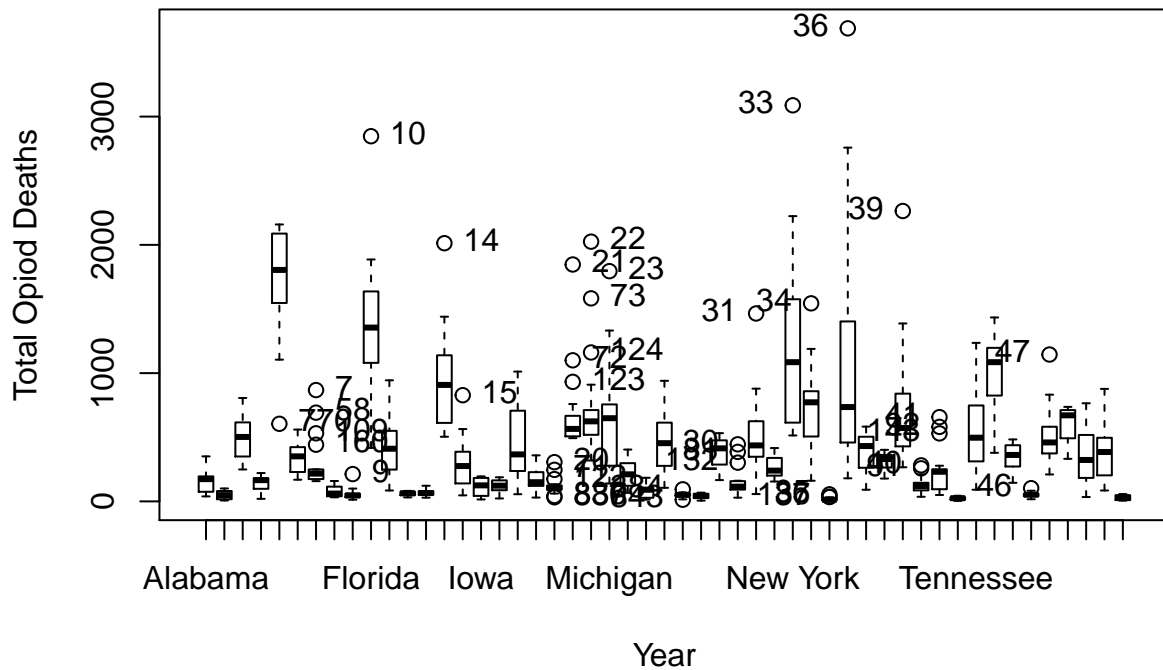
Total USA Opiod Deaths from 1999 – 2016



```
## [1] "872" "881" "888" "900" "821" "830" "775" "798" "719" "724" "758"
## [12] "668" "673" "707" "617" "622" "566" "571" "515" "520" "543" "554"
## [23] "464" "469" "413" "418" "441" "362" "367" "311" "316" "260" "265"
## [34] "209" "237" "158" "186" "189" "107" "135" "138" "56" "84" "87"
## [45] "10" "33" "36"
```

```
Boxplot(simple$AllOpioids, simple$State, xlab = 'Year', ylab = 'Total Opioid Deaths', main = 'Total USA Opioid Deaths')
```

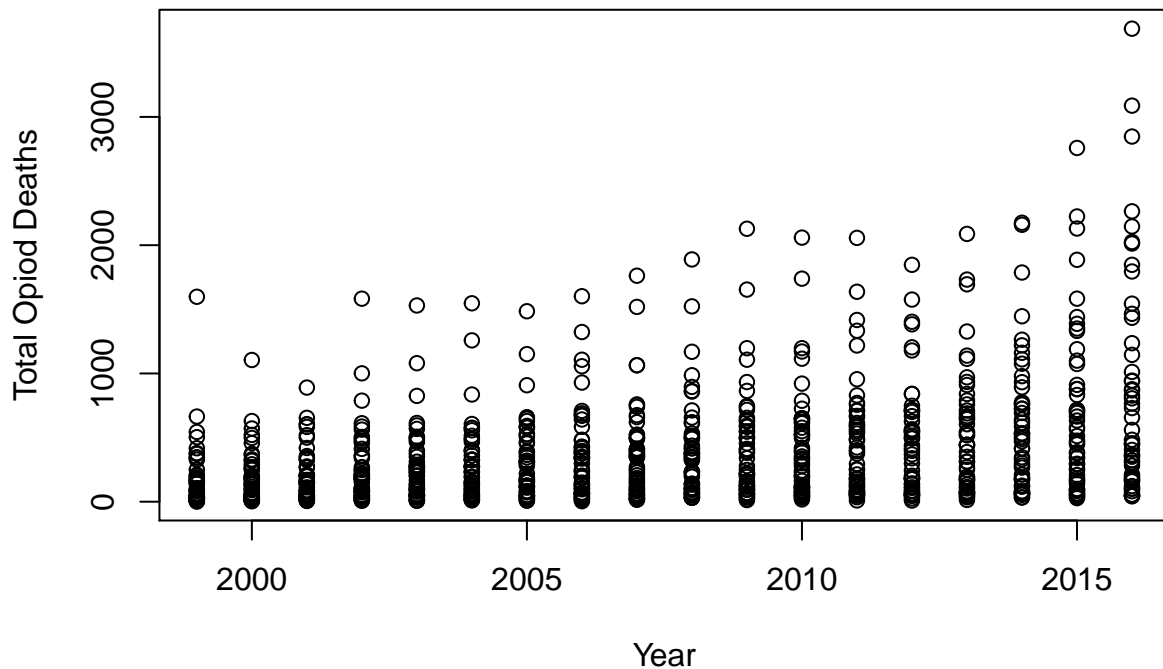
Total USA Opiod Deaths from 1999 – 2016



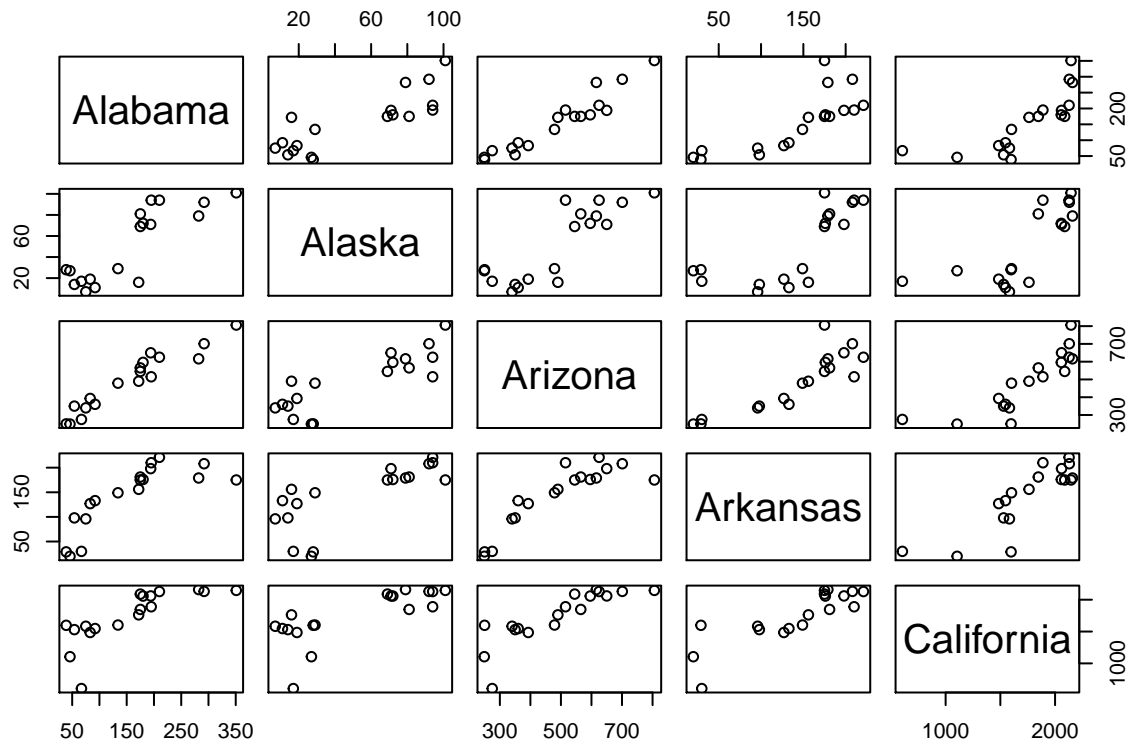
```
## [1] "770" "7" "58" "109" "160" "9" "10" "14" "15" "836" "887"
## [12] "20" "71" "122" "21" "72" "123" "22" "73" "124" "23" "843"
## [23] "384" "30" "81" "132" "31" "33" "34" "35" "86" "137" "36"
## [34] "39" "40" "91" "41" "92" "143" "46" "47"
```

```
plot(simple$AllOpioids ~ simple$Year, xlab = 'Year', ylab = 'Total Opiod Deaths', main = 'Total USA Opiod Deaths from 1999 – 2016')
```

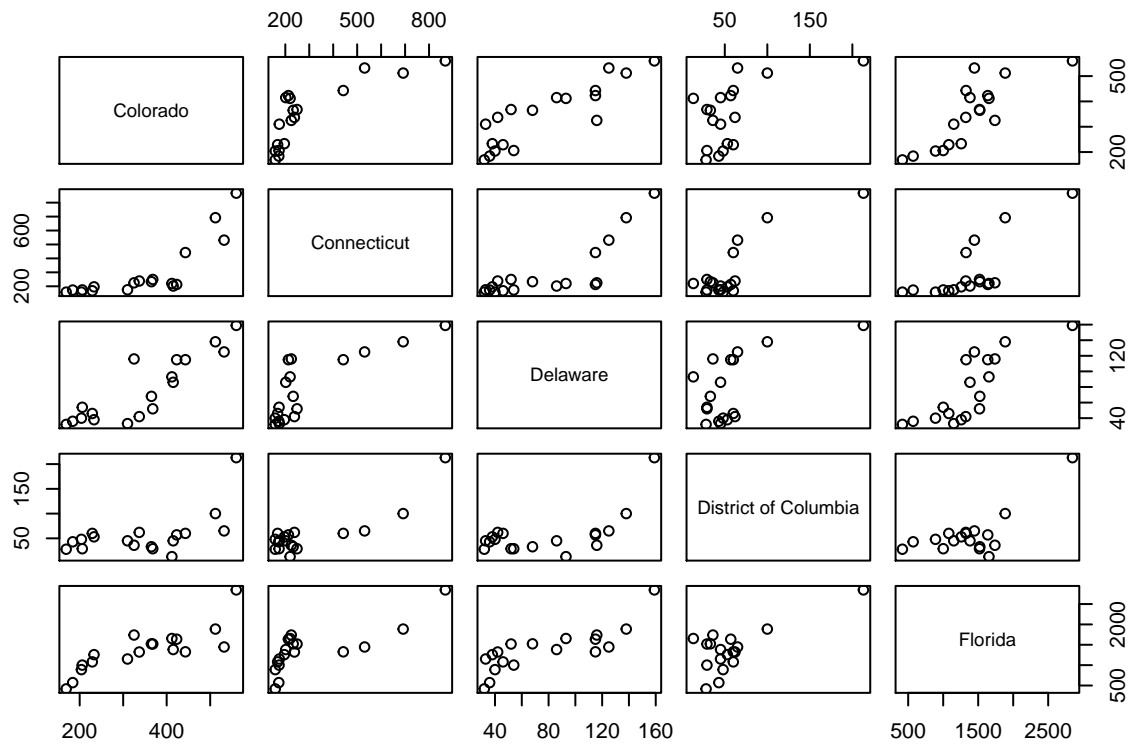
Total USA Opiod Deaths from 1999 – 2016



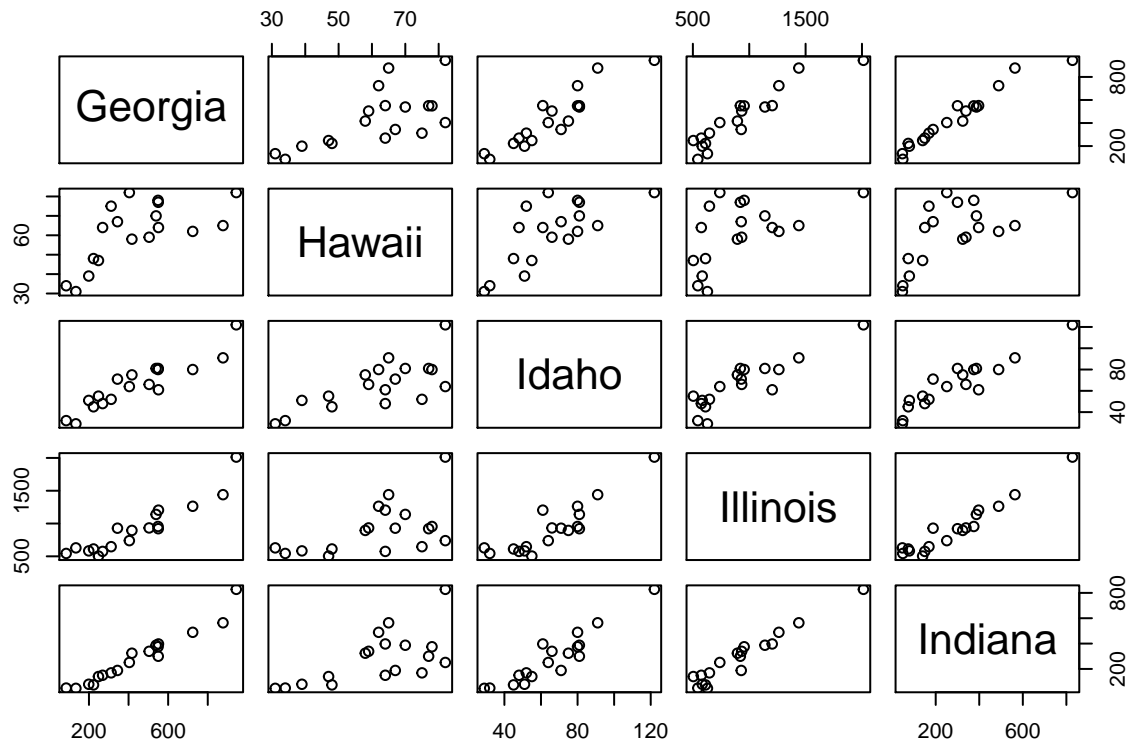
```
# I don't know how meaningful this is:
pairs(statesAsVar[,1:5])
```



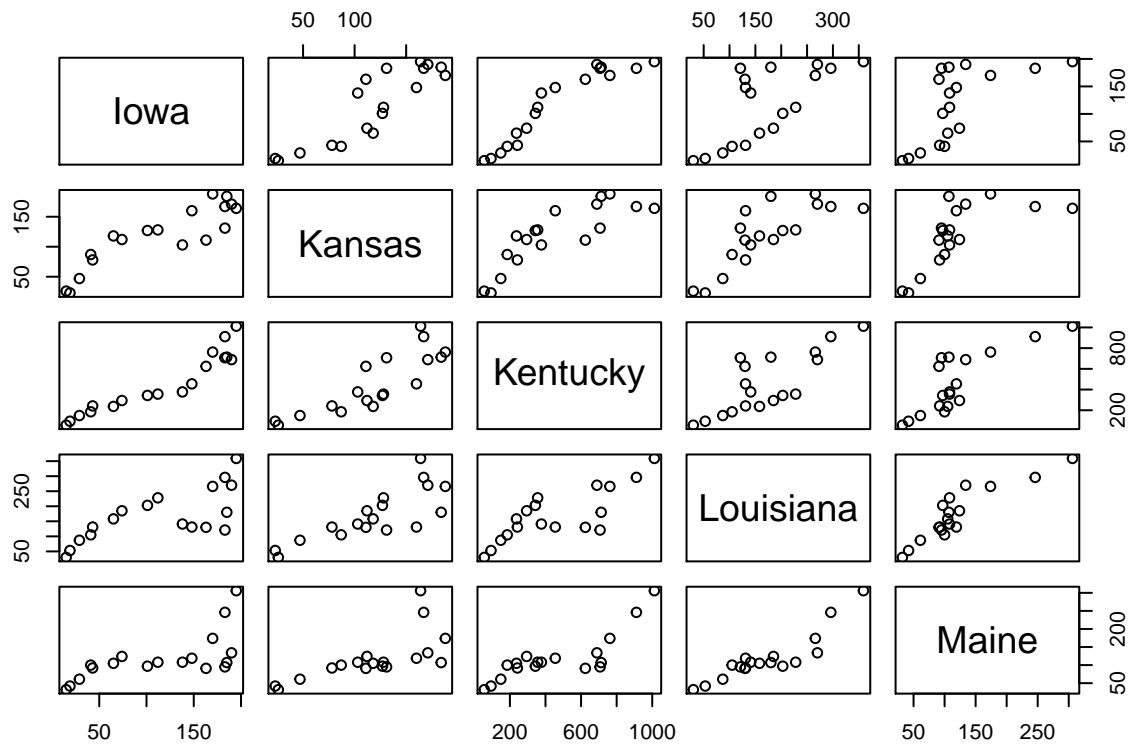
```
pairs(statesAsVar[,6:10])
```



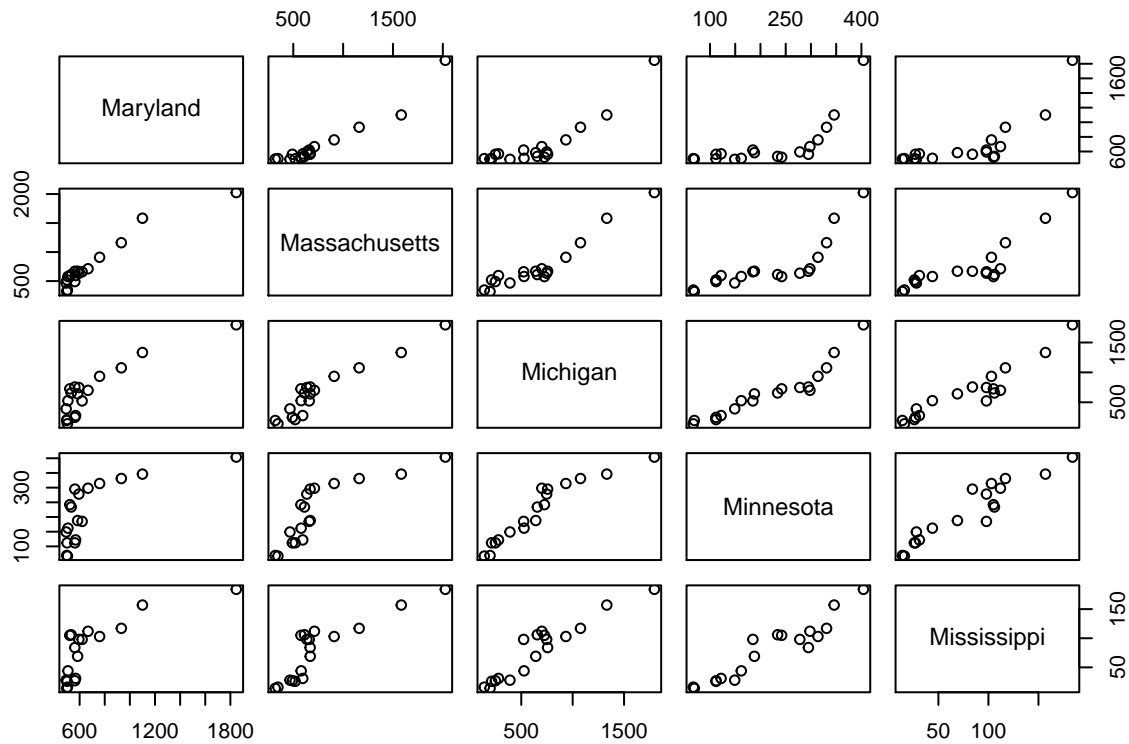
```
pairs(statesAsVar[,11:15])
```



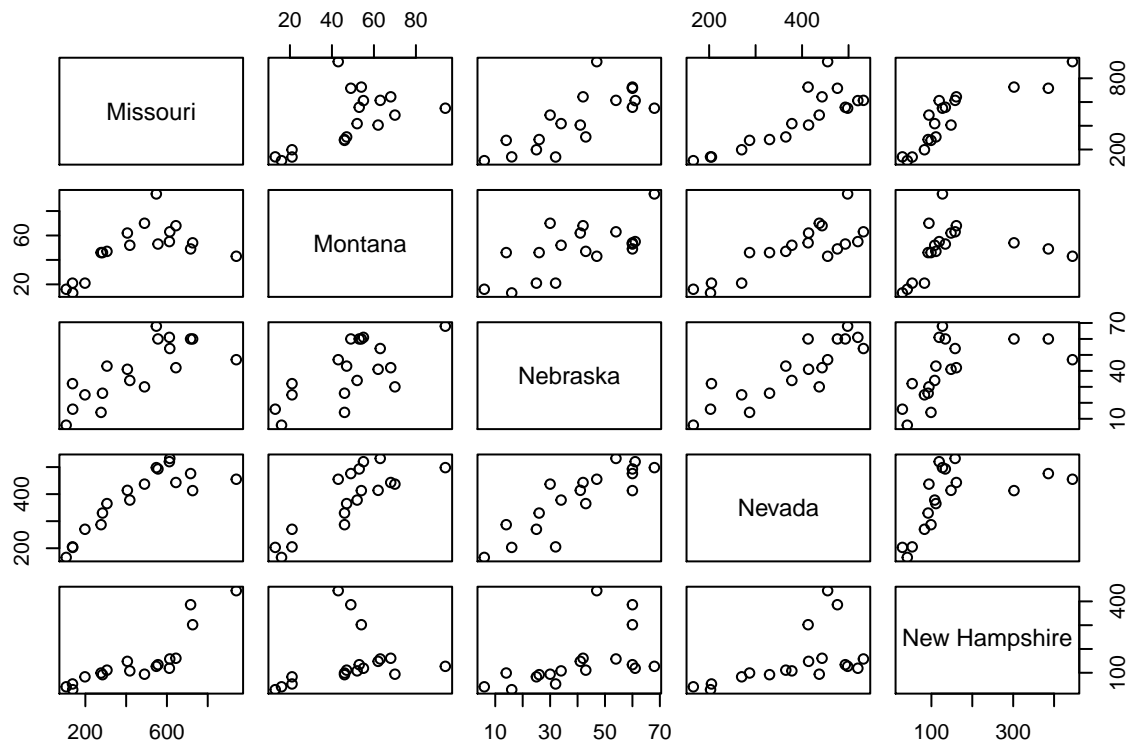
```
pairs(statesAsVar[,16:20])
```



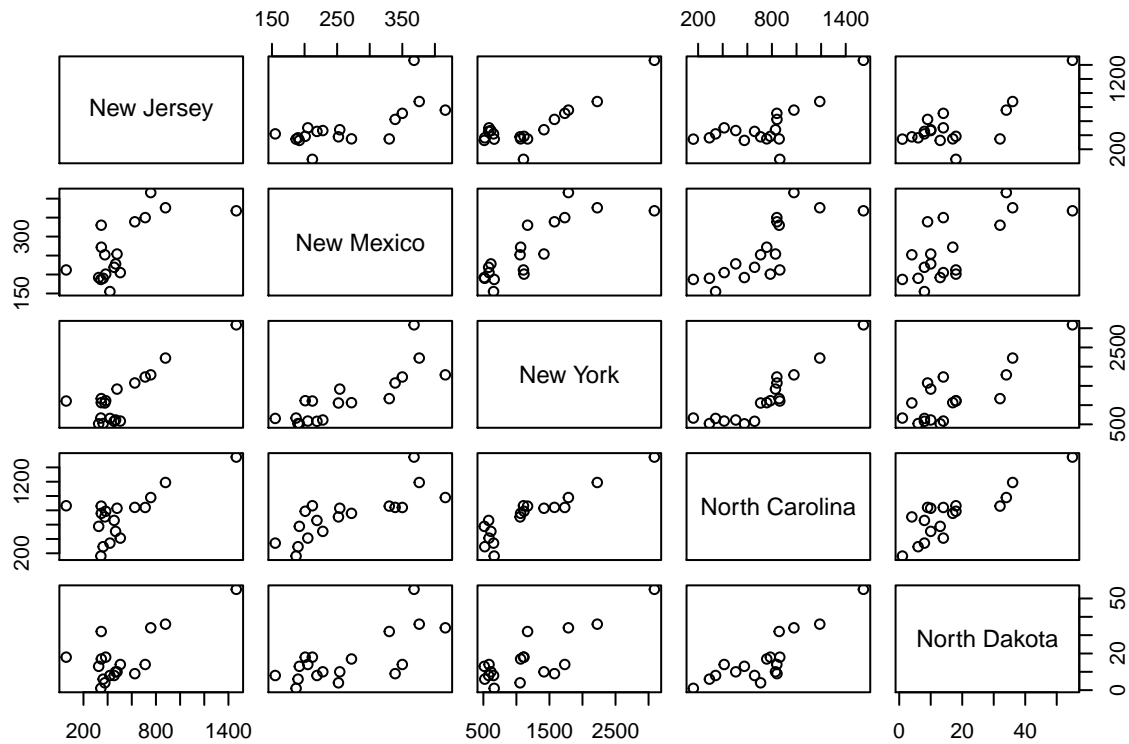
```
pairs(statesAsVar[,21:25])
```

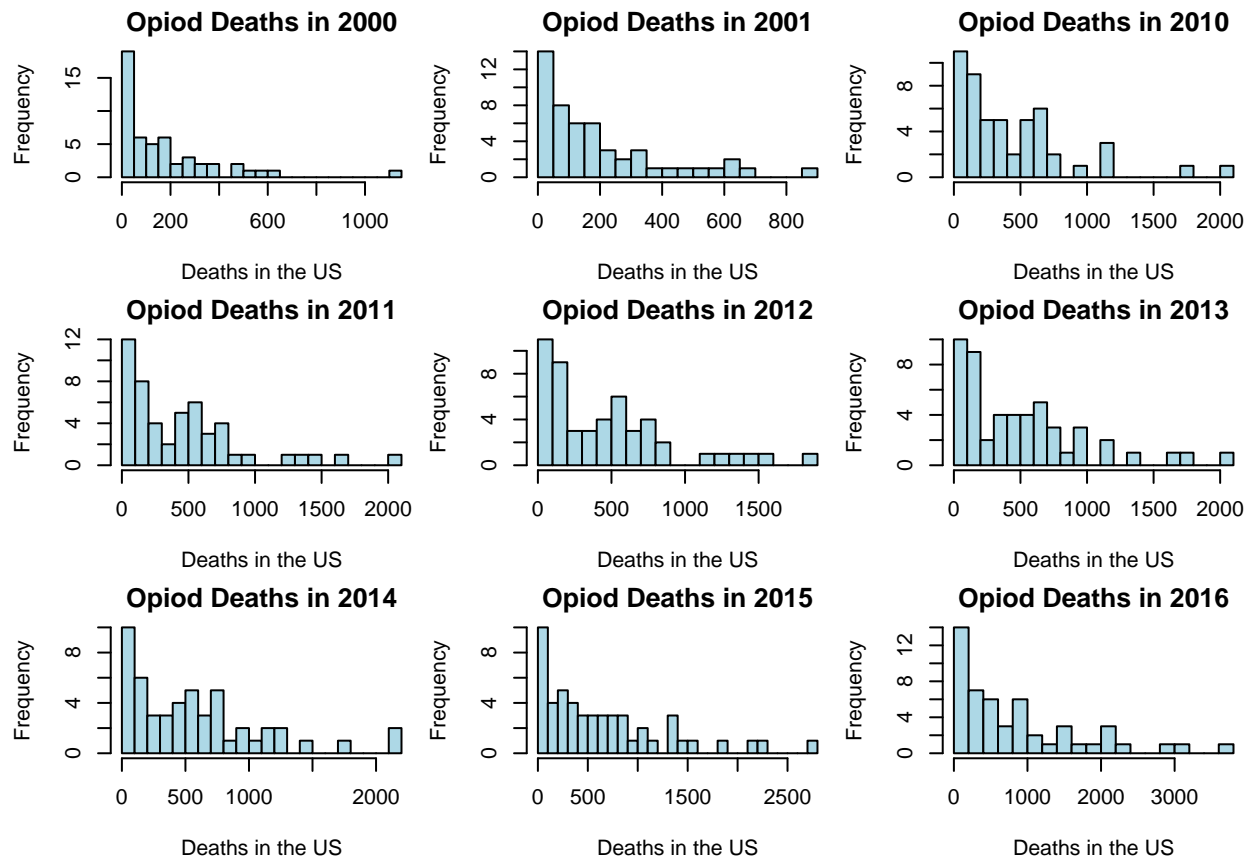
```
pairs(statesAsVar[,26:30])
```



```
pairs(statesAsVar[,31:35])
```



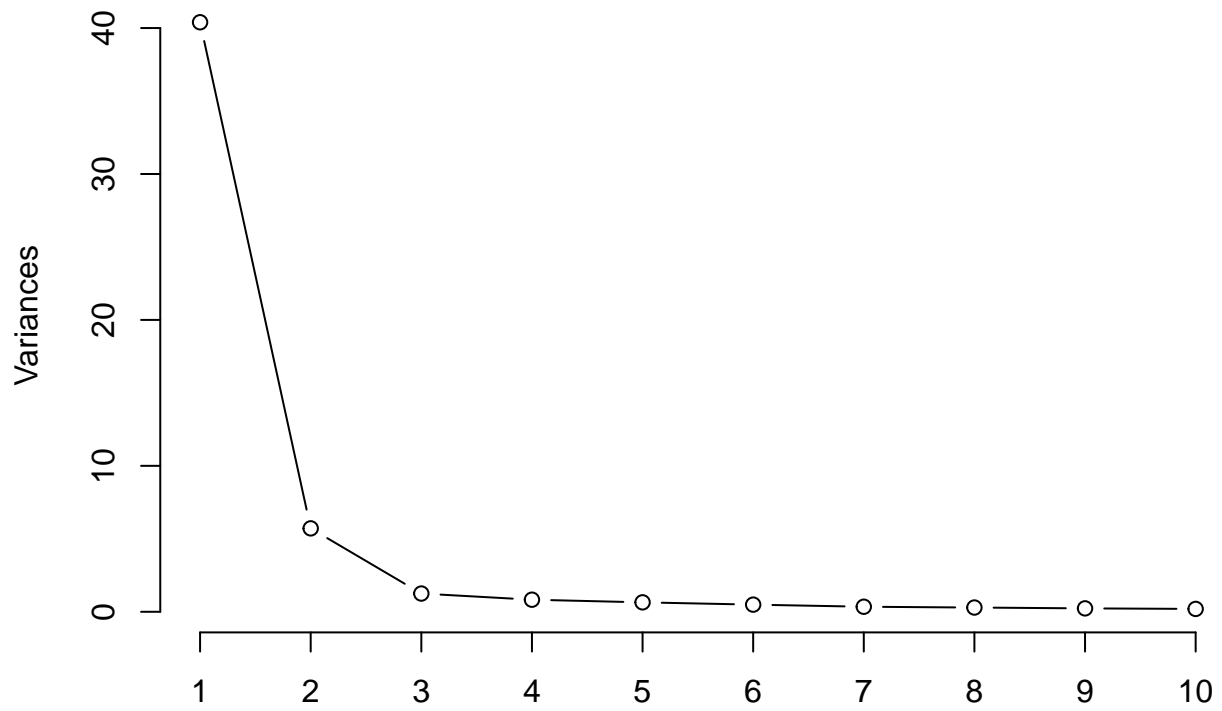
```
par(mfrow = c(3,3), mar = c(4,4,2,0.5)) # Setup the dimension for the matrix of multiple graphs and margins
for (i in c(2000, 2001, 2010, 2011, 2012, 2013, 2014, 2015, 2016)) {
  hist(simple$AllOpioids[which(simple$Year == i)], xlab = 'Deaths in the US', main = paste('Opioid Deaths in the US', i))
}
```



```
par(mfrow = c(1,1))

pcDeathsByStates <- prcomp(statesAsVar, scale. = TRUE)
#pcDeathsByStates$rotation
plot(pcDeathsByStates, type="l")
```

pcDeathsByStates



`biplot(pcDeathsByStates)`

