Final

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Introduction

These three data sets all pertain to vaccinations. The first and second datasets are the same for everyone and are mainly included to provide context. Most of the substantive analyses occur with the third dataset. This third dataset is sample of California kindergartens that reported vaccination data. It includes their reported vaccination rates along with the specific exemptions unvaccinated students were elligible for.

```
load("~/IST 772/Final/reportSample16.RData")
load("~/IST 772/Final/allSchoolsReportStatus.RData")
load("~/IST 772/Final/usVaccines.RData")
```

allSchoolsReportStatus.RData ??? A list of California kindergartens and whether they reported vaccination data to the state in 2013

$ name : Name of the school
$ pubpriv : ???PUBLIC??? or ???PRIVATE???
$ reported: ???Y??? or ???N

```
summary(allSchoolsReportStatus)
```

```
##      name              pubpriv            reported
##  Length:7381        Length:7381        Length:7381
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
```

usVaccines.Rdata ??? Time series data from the World Health Organization reporting vaccination rates in the U.S. for five common vaccines Time-Series [1:38, 1:5] from 1980 to 2017: - attr(*, "dimnames")=List of 2 .. $: NULL .. $: chr [1:5] "DTP1" "HepB_BD" "Pol3" "Hib3" ???MCV1???...
DTP1 - First dose of Diphtheria/Pertussis/Tetanus vaccine; HepB_BD - Hepatitis B, Birth Dose; Pol3 - Polio third dose; Hib3 ??? Influenza third dose; Hib3 ??? Influenza third dose; MCV1 - Measles first dose

```
summary(usVaccines)
```

```
##       DTP1          HepB_BD           Pol3            Hib3
##  Min.   :97.00   Min.   :21.00   Min.   :24.00   Min.   :84.00
##  1st Qu.:98.00   1st Qu.:50.00   1st Qu.:90.00   1st Qu.:93.00
##  Median :98.00   Median :62.00   Median :93.00   Median :93.00
##  Mean   :98.22   Mean   :57.94   Mean   :87.68   Mean   :92.35
##  3rd Qu.:99.00   3rd Qu.:69.75   3rd Qu.:94.00   3rd Qu.:93.00
##  Max.   :99.00   Max.   :74.00   Max.   :97.00   Max.   :94.00
##  NA's   :20      NA's   :22                      NA's   :15
##       MCV1
##  Min.   :82.00
##  1st Qu.:90.00
##  Median :92.00
##  Mean   :91.24
##  3rd Qu.:92.00
```

```
##  Max.   :98.00
##
```

reportSampleX.RData ??? (Where X is the number of your particular dataset) A sample of California kindergartens that reported vaccination data, along with specific numbers and percentages for each school in the sample: $ code : CA School Code Number (included for completeness, can be ignored) $ name : Name of the school
$ pubpriv : Factor w/ 2 levels "PRIVATE","PUBLIC???
$ enrollment : An integer indicating the number of students enrolled at the school
$ allvaccs : The percent of enrolled students who had documented all required vaccinations
$ conditional: The percent of enrolled students needed follow-up on their records
$ medical : The percent of enrolled students with a medical exemption
$ religious : The percent of enrolled students with a religious/belief exemption
$ dptMiss : The percent of students missing the Diphtheria/Pertussis/Tetanus vaccine
$ polMiss : The percent of students missing the Polio vaccine
$ mmrMiss : The percent of students missing the Measles/Mumps/Rubella vaccine
$ hepMiss : The percent of students missing the Hepatitis vaccine
$ varMiss : The percent of students missing the Varicella (chickenpox) vaccine

```
summary(reportSample)
```

```
##       code                              name        pubpriv      enrollment
##  Min.   : 100024   LINCOLN ELEMENTARY    :  4   PRIVATE:130   Min.   : 10.00
##  1st Qu.:6013579   ROOSEVELT ELEMENTARY  :  4   PUBLIC :568   1st Qu.: 41.25
##  Median :6039948   WASHINGTON ELEMENTARY :  4                 Median : 77.50
##  Mean   :5403922   JEFFERSON ELEMENTARY  :  3                 Mean   : 77.54
##  3rd Qu.:6110743   LIBERTY ELEMENTARY    :  3                 3rd Qu.:106.00
##  Max.   :7104037   VALLEY VIEW ELEMENTARY:  3                 Max.   :248.00
##                    (Other)               :677
##     allvaccs        conditional        medical          religious
##  Min.   :  4.545   Min.   : 0.000   Min.   : 0.0000   Min.   : 0.000
##  1st Qu.: 85.611   1st Qu.: 0.000   1st Qu.: 0.0000   1st Qu.: 0.000
##  Median : 93.191   Median : 2.844   Median : 0.0000   Median : 1.149
##  Mean   : 89.029   Mean   : 6.461   Mean   : 0.2516   Mean   : 4.259
##  3rd Qu.: 97.567   3rd Qu.: 8.333   3rd Qu.: 0.0000   3rd Qu.: 4.762
##  Max.   :100.000   Max.   :70.213   Max.   :45.0000   Max.   :78.125
##
##     dptMiss          polMiss          mmrMiss          hepMiss
##  Min.   : 0.000   Min.   : 0.000   Min.   : 0.000   Min.   : 0.000
##  1st Qu.: 1.643   1st Qu.: 1.389   1st Qu.: 1.507   1st Qu.: 0.000
##  Median : 5.164   Median : 4.545   Median : 5.000   Median : 2.892
##  Mean   : 8.929   Mean   : 8.587   Mean   : 8.885   Mean   : 6.413
##  3rd Qu.:11.081   3rd Qu.:10.652   3rd Qu.:10.966   3rd Qu.: 7.216
##  Max.   :95.455   Max.   :95.455   Max.   :95.455   Max.   :78.125
##
##     varMiss
##  Min.   : 0.000
##  1st Qu.: 0.000
##  Median : 2.614
##  Mean   : 5.997
##  3rd Qu.: 6.667
##  Max.   :78.125
##
```

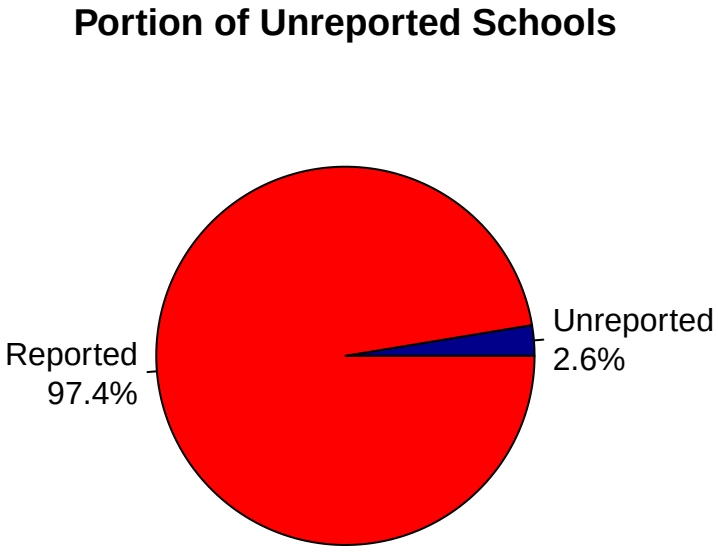
Descriptive Reports:

1. The proportion of public schools reported vaccination data

```
# Transformations
All_Schools <- allSchoolsReportStatus # store in temporary variable for data integrity
All_Schools$reported <- factor(All_Schools$reported, levels=c("N","Y")) # change from string to factor

All_Schools$reported <- as.integer(All_Schools$reported)-1 # change to int

Public_Schools <- All_Schools[All_Schools$pubpriv == 'PUBLIC',] # seperate public schools

sum(Public_Schools$reported == 1)/nrow(Public_Schools)
```

```
## [1] 0.97418
```

```
# Pie Chart with Percentages
pct <-round(table(Public_Schools[,2:3])/nrow(Public_Schools),3)*100#
lgd <-c( 'Unreported', 'Reported')
lbls <- paste(lgd, "\n",pct,"%",sep="") # ad % to labels

pie(pct,labels = lbls, col=c("darkblue","red"),
   main="Portion of Unreported Schools")
```

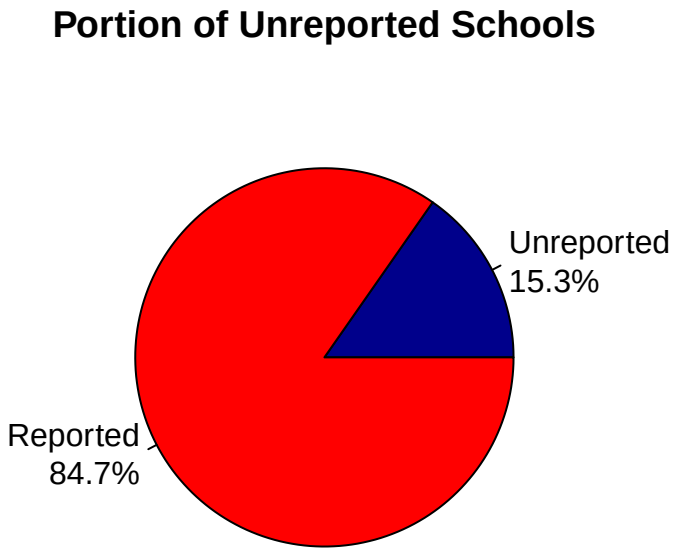


2. The proportion of private schools reported vaccination data

```
# Dsriptiv plots Box hist
Private_Schools <- All_Schools[All_Schools$pubpriv == 'PRIVATE',]
sum(Private_Schools$reported == 1)/nrow(Private_Schools)
```

```
## [1] 0.8471801
```

```
# Pie Chart with Percentages
pct <-round(table(Private_Schools[,2:3])/nrow(Private_Schools),3)*100#
lgd <-c( 'Unreported', 'Reported')
lbls <- paste(lgd, "\n",pct,"%",sep="") # ad % to labels

pie(pct,labels = lbls, col=c("darkblue","red"),
   main="Portion of Unreported Schools")
```



3. U.S. vaccinations rates over time

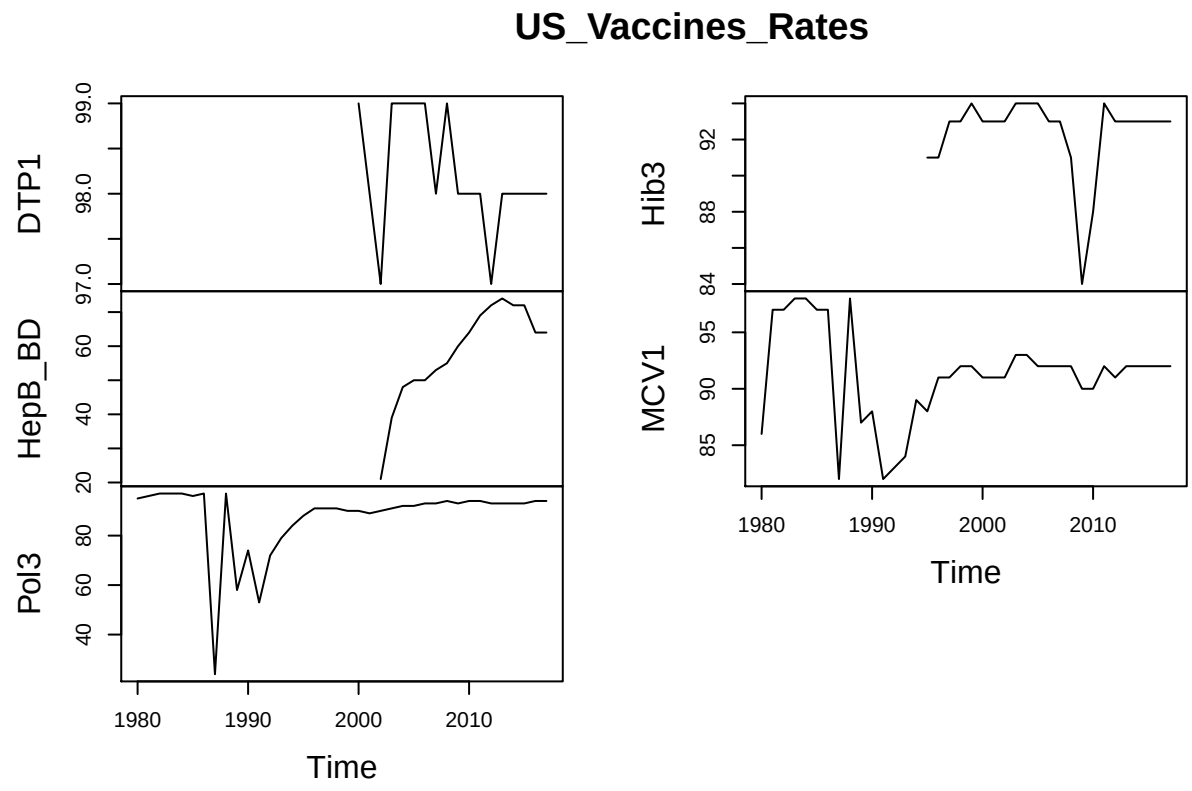
```
#install.packages("tseries")
 library(tseries)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

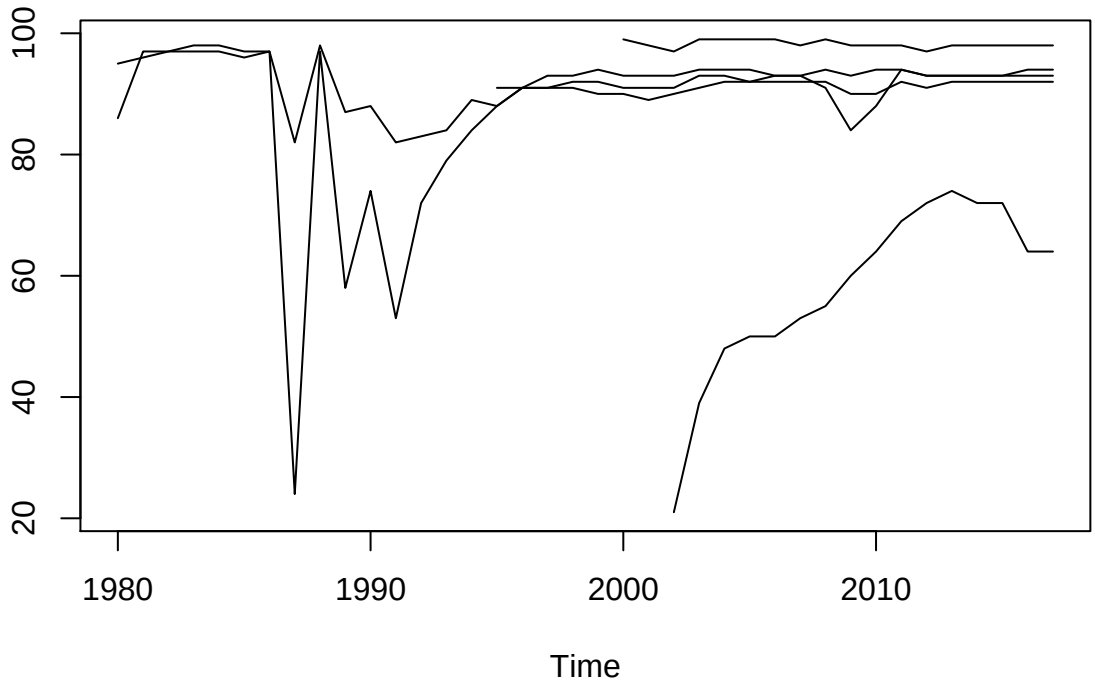
```
#install.packages("changepoint")
 library(changepoint)
```

```
## Loading required package: zoo
##
## Attaching package: 'zoo'
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
## Successfully loaded changepoint package version 2.2.2
##  NOTE: Predefined penalty values changed in version 2.2.  Previous penalty values with a postfix 1 i
```

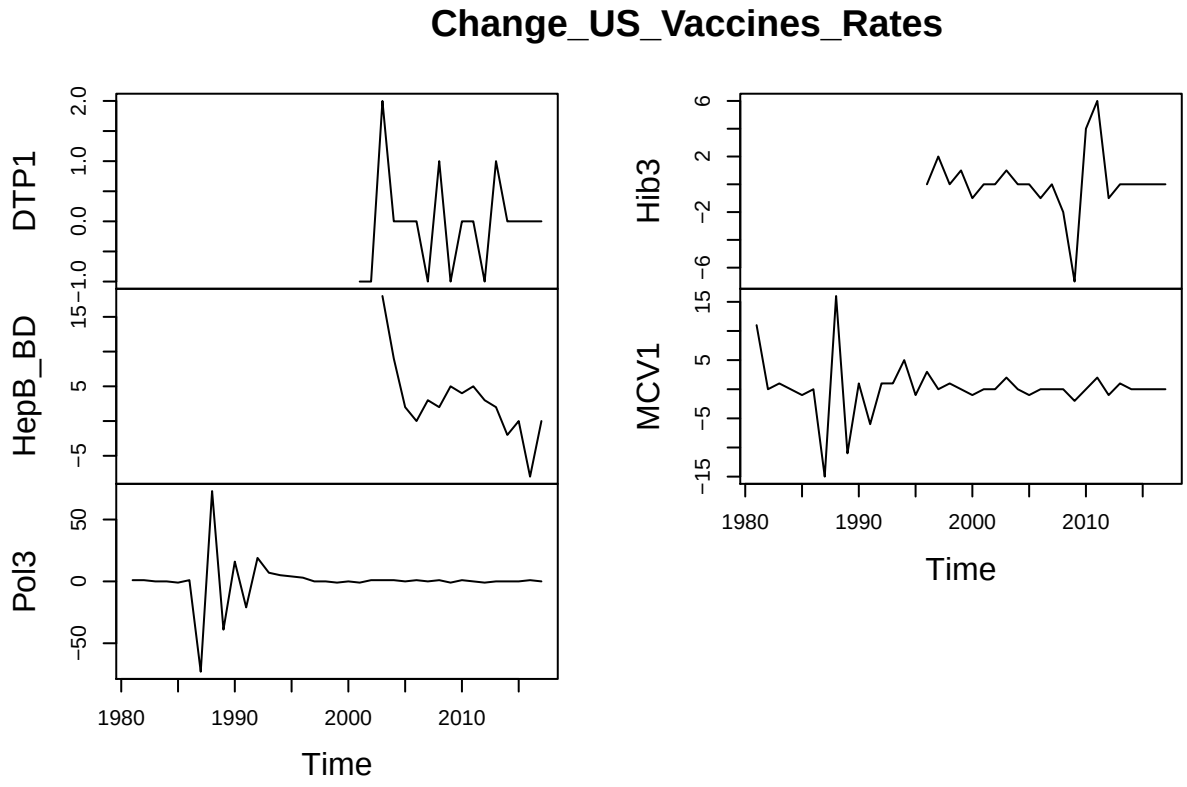
```
# Plot the time series
US_Vaccines_Rates <- usVaccines
plot(US_Vaccines_Rates )
```



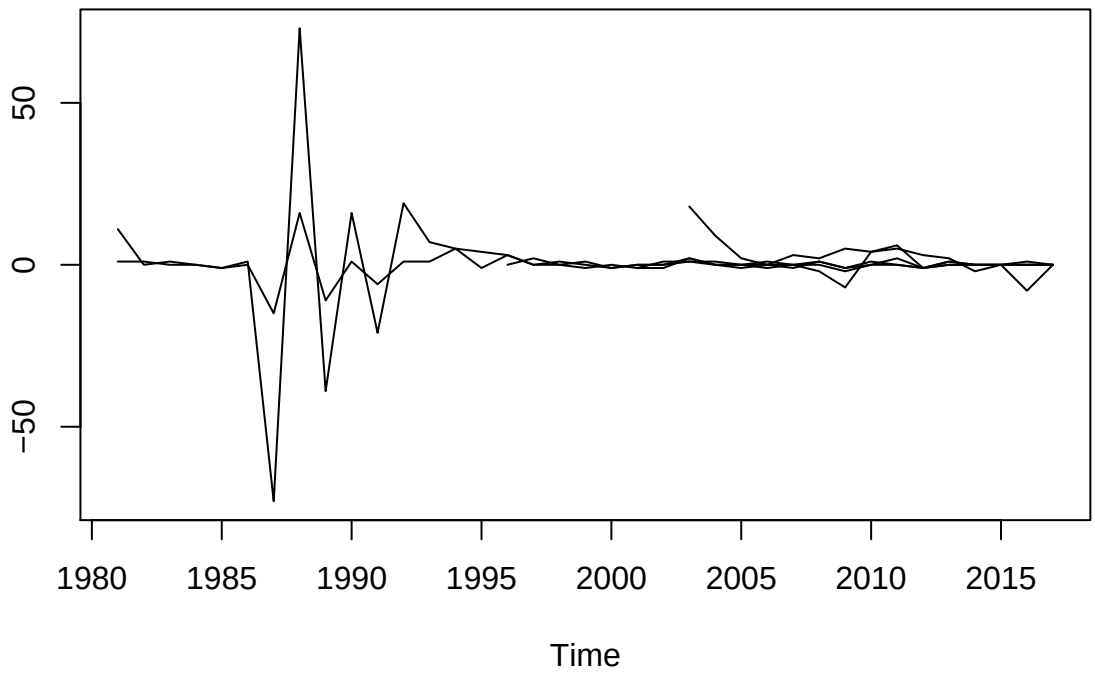

```
ts.plot(US_Vaccines_Rates)
```




```
# Plot the change in
Change_US_Vaccines_Rates <- diff(US_Vaccines_Rates )
plot(Change_US_Vaccines_Rates)
```




```
ts.plot (Change_US_Vaccines_Rates)
```




```
colnames(US_Vaccines_Rates)
```

```
## [1] "DTP1"    "HepB_BD" "Pol3"    "Hib3"    "MCV1"
```

We can see that US Vaccination rates have not been stable over time. From the 1970s to the mid 90's you see a large amount of variation. Then a quick flattening, with very little change from 1995 - 2005. Then in 2005 small variations appear, with occcaisional large dips and recovery.

```
# ADF Tests
adf.test(na.omit(Change_US_Vaccines_Rates[,'DTP1']))
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  na.omit(Change_US_Vaccines_Rates[, "DTP1"])
## Dickey-Fuller = -2.0876, Lag order = 2, p-value = 0.539
## alternative hypothesis: stationary
```

```
adf.test(na.omit(Change_US_Vaccines_Rates[,'HepB_BD']))
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  na.omit(Change_US_Vaccines_Rates[, "HepB_BD"])
## Dickey-Fuller = -3.1477, Lag order = 2, p-value = 0.1352
## alternative hypothesis: stationary
```

```
adf.test(na.omit(Change_US_Vaccines_Rates[,'Pol3']))
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  na.omit(Change_US_Vaccines_Rates[, "Pol3"])
## Dickey-Fuller = -3.4727, Lag order = 3, p-value = 0.06217
## alternative hypothesis: stationary
```

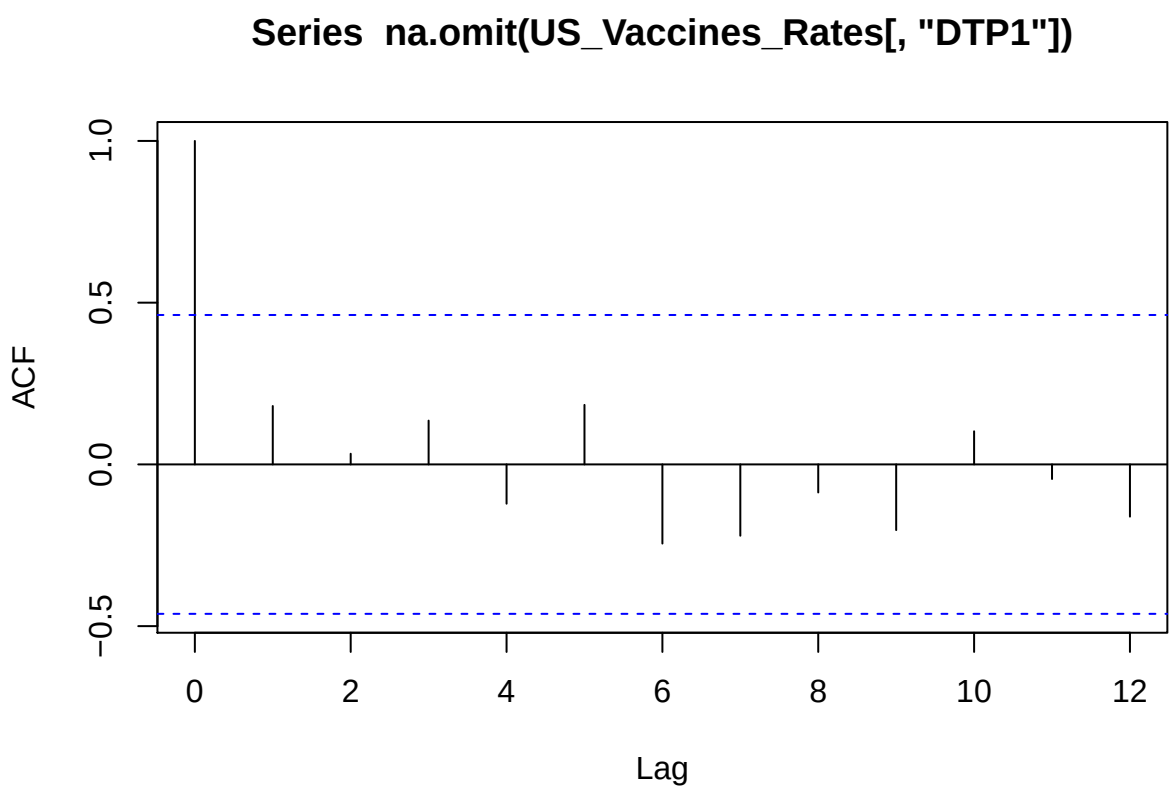
```
adf.test(na.omit(Change_US_Vaccines_Rates[,'Hib3']))
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  na.omit(Change_US_Vaccines_Rates[, "Hib3"])
## Dickey-Fuller = -2.7775, Lag order = 2, p-value = 0.2762
## alternative hypothesis: stationary
```

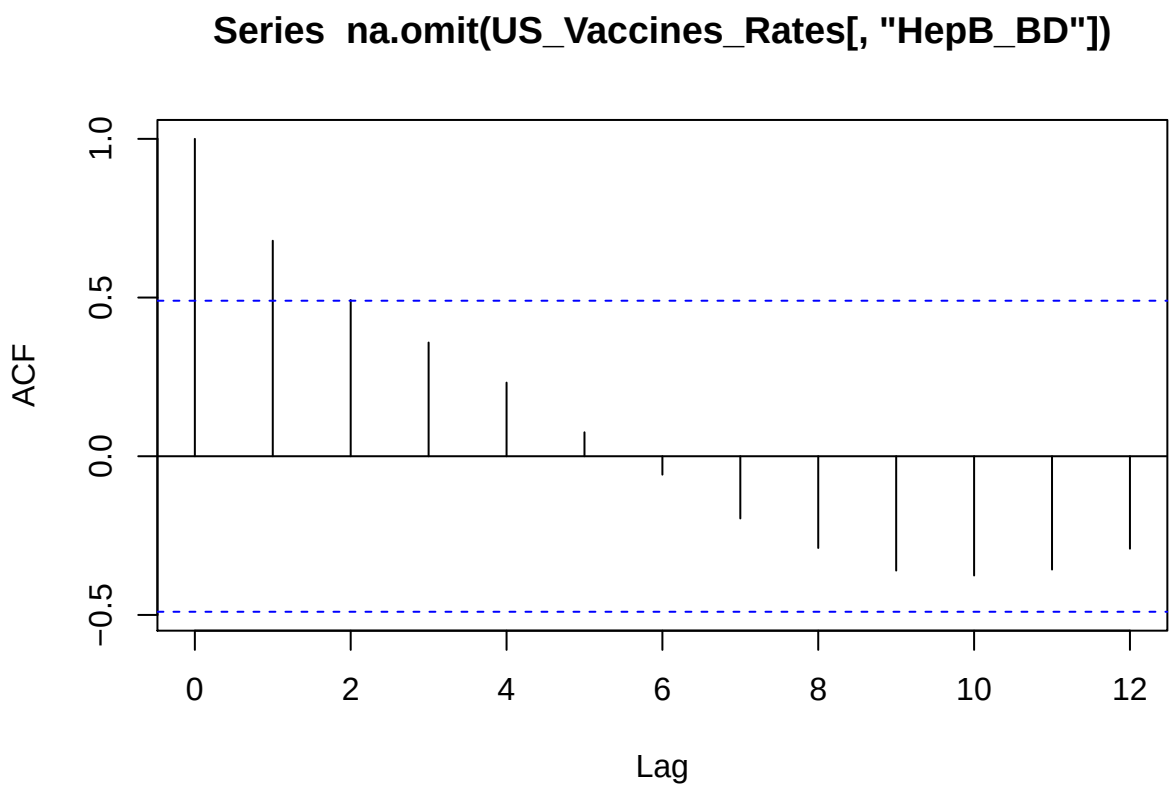
```
adf.test(na.omit(Change_US_Vaccines_Rates[,'MCV1']))
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  na.omit(Change_US_Vaccines_Rates[, "MCV1"])
## Dickey-Fuller = -3.3982, Lag order = 3, p-value = 0.07305
## alternative hypothesis: stationary
```

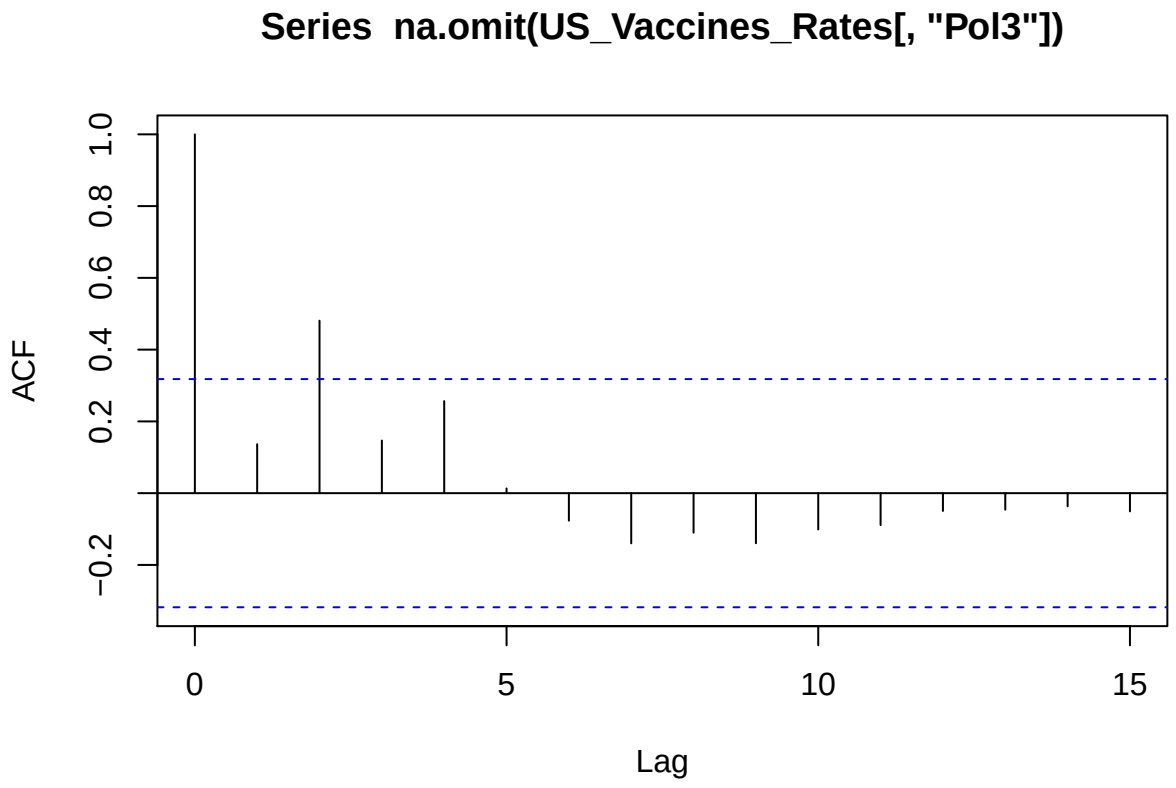
```
# Plot the auto correlations function to see paterns stationary means to pattern
acf(na.omit(US_Vaccines_Rates[,'DTP1']))
```



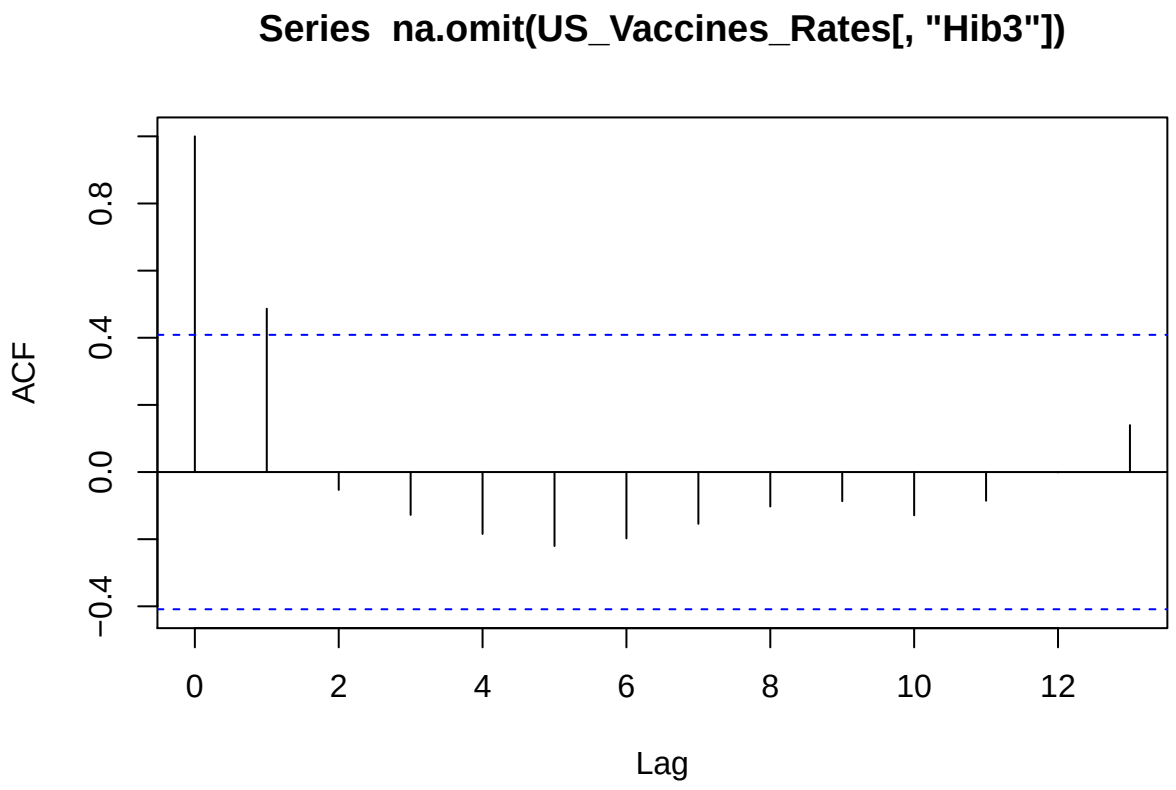
```r
acf(na.omit(US_Vaccines_Rates[,'HepB_BD']))
```



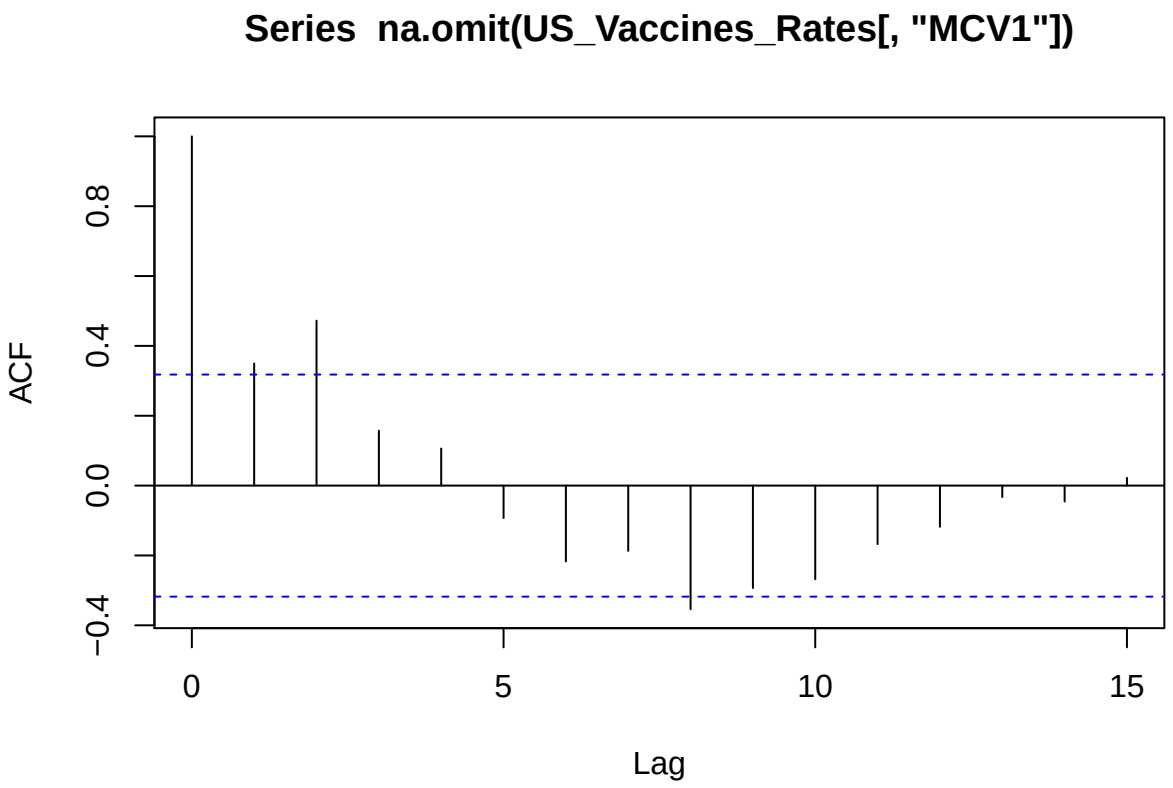

```r
acf(na.omit(US_Vaccines_Rates[,'Pol3']))
```




```
acf(na.omit(US_Vaccines_Rates[,'Hib3']))
```



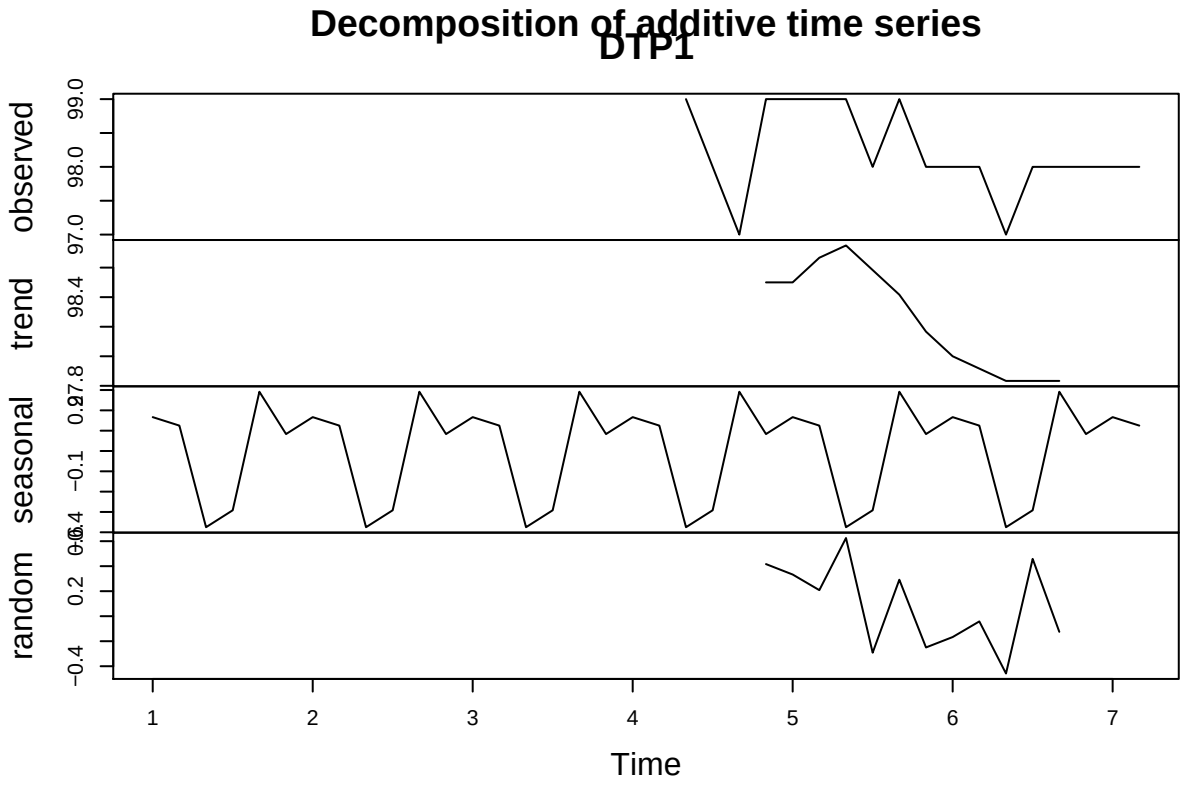

```
acf(na.omit(US_Vaccines_Rates[,'MCV1']))
```



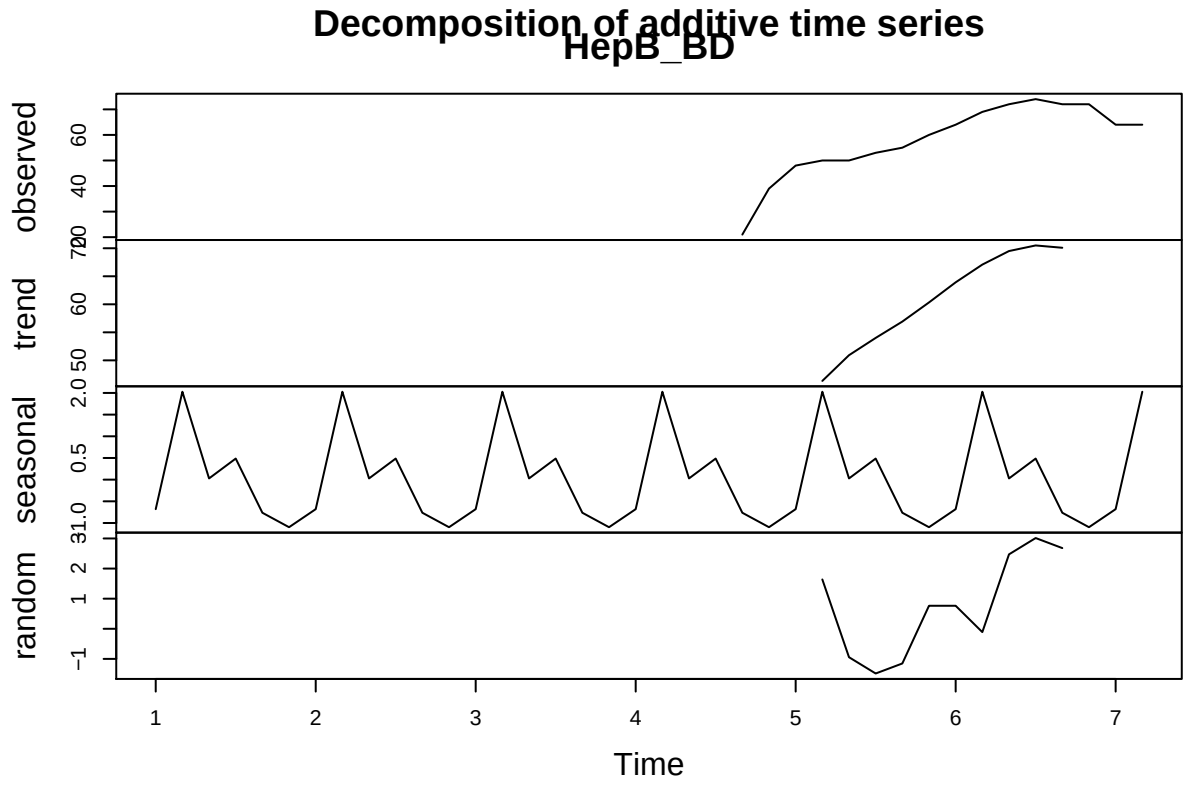
With the adf test we can examine the agumented Dickey-Fuller Test we cannot see confirm that these datasets have stationarity meaning that they do not contain trend or cyclinical components. We can also visulize this analysis with an auto correlation funtion. Here we can see that there does not appear to be any lagged correlations in DTP1, nut some significant seasonal influence in the other vaccines. We can separate this compnent below.

4. Total U.S. vaccinations rates over time Analysis

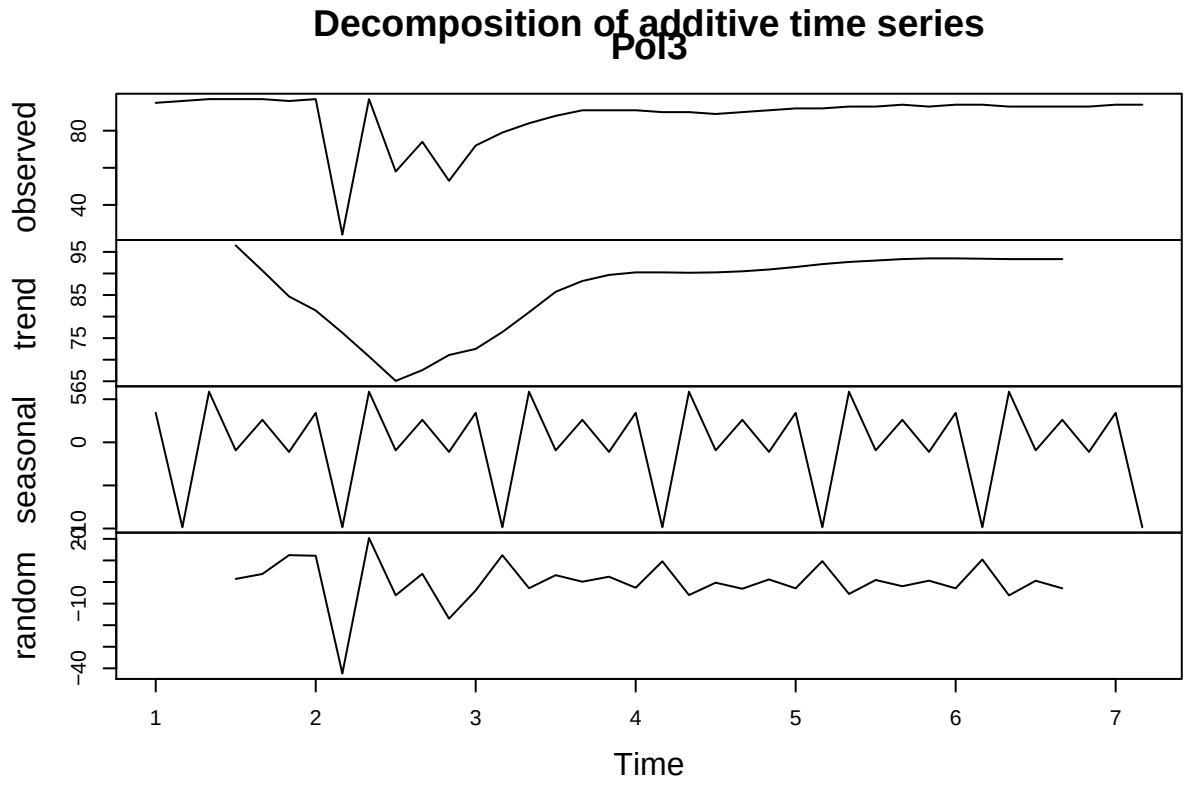
```
# Decompose DTP1
DTP1 <- US_Vaccines_Rates[,"DTP1"]
DTP1_dc <- decompose(ts(DTP1, frequency=6))
plot(DTP1_dc )
title(main ='DTP1')
```



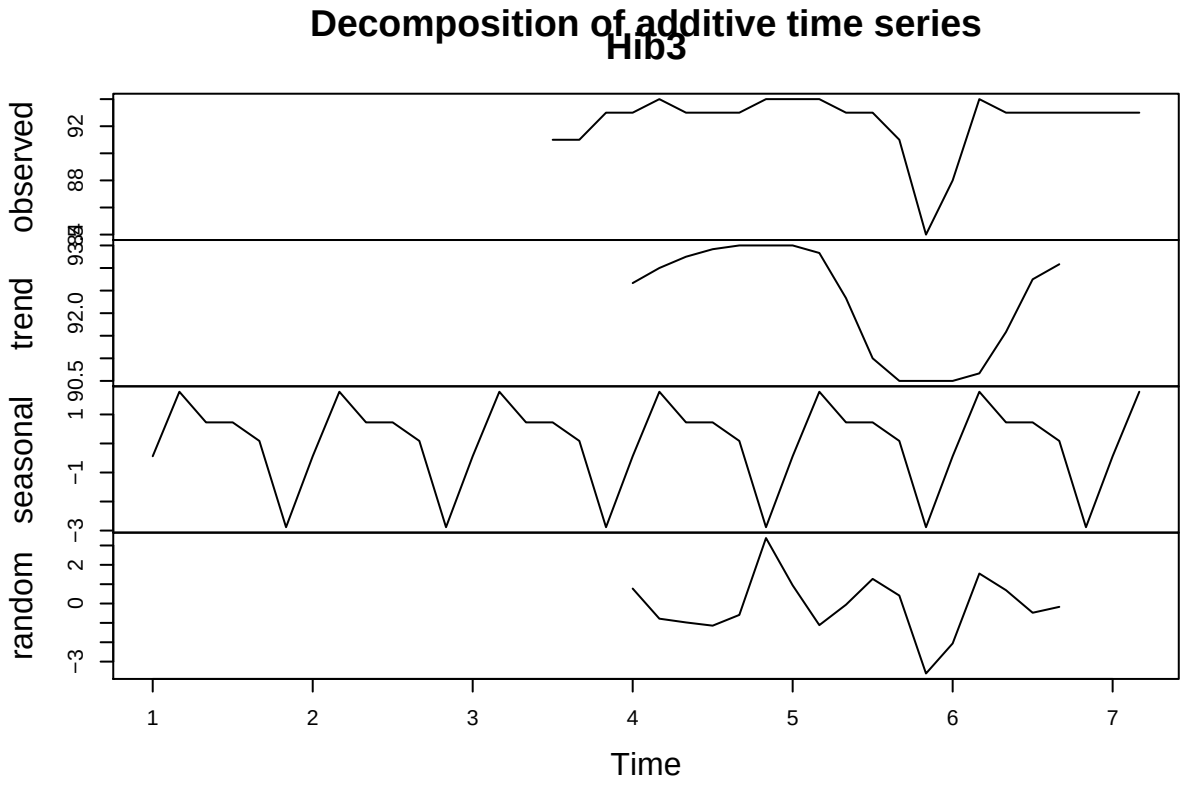

```
# Decompose Hepatitis B
HepB_BD <- US_Vaccines_Rates[,"HepB_BD"]
HepB_BD_dc <- decompose(ts(HepB_BD, frequency=6))
plot(HepB_BD_dc )
title(main = 'HepB_BD')
```



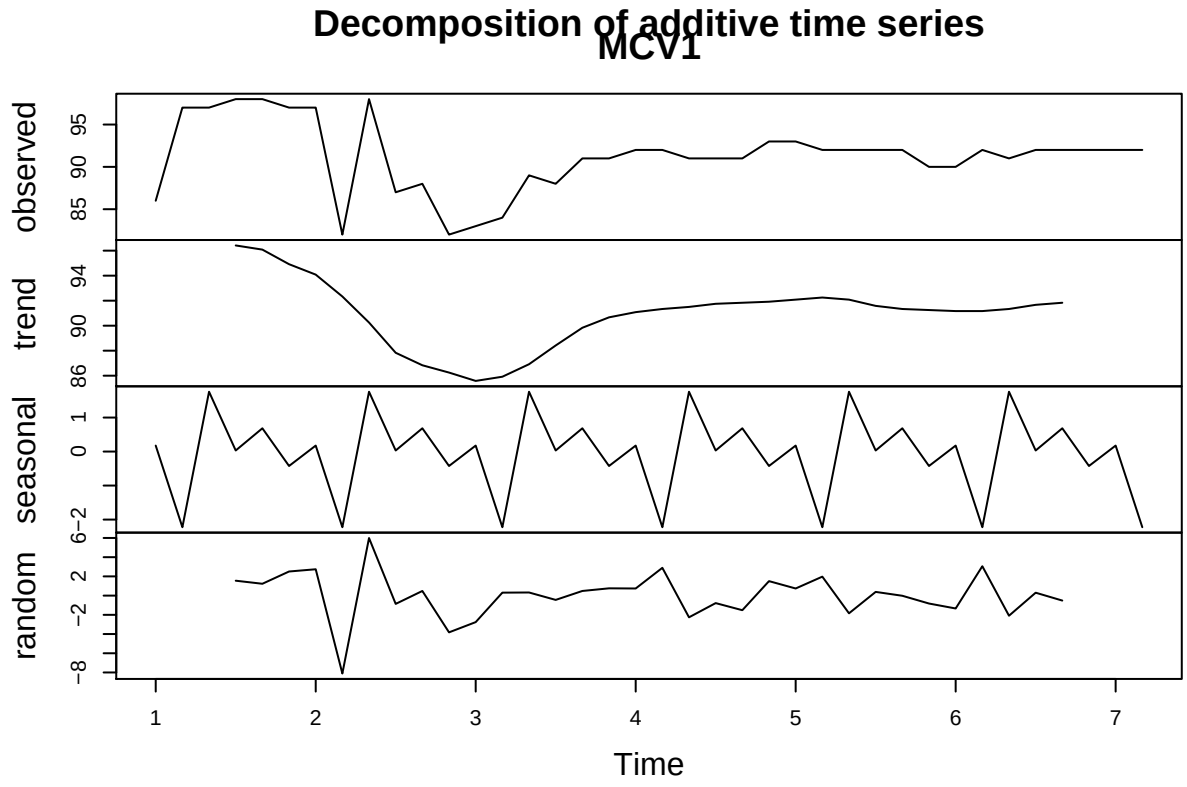

```
# Decompose Polio
Pol3 <- US_Vaccines_Rates[,"Pol3"]
Pol3_dc <- decompose(ts(Pol3, frequency=6))
plot(Pol3_dc)
title(main = "Pol3")
```




```
# Decompose FLu
Hib3 <- US_Vaccines_Rates[,"Hib3"]
Hib3_dc <- decompose(ts(Hib3, frequency=6))
plot(Hib3_dc)
title(main = "Hib3")
```




```
# Decompose Measles
MCV1 <- US_Vaccines_Rates[,"MCV1"]
MCV1_dc <- decompose(ts(MCV1, frequency=6))
plot(MCV1_dc)
title(main = "MCV1")
```




```
#Test Correlations of trends
cor(DTP1, DTP1_dc$random, use = "complete.obs")
```

```
## [1] 0.8017837
```

```
cor(HepB_BD, HepB_BD_dc$random, use = "complete.obs")
```

```
## [1] 0.7066933
```

```
cor(Pol3, Pol3_dc$random, use = "complete.obs")
```

```
## [1] 0.7521409
```

```
cor(Hib3, Hib3_dc$random, use = "complete.obs")
```

```
## [1] 0.6857767
```

```
cor(MCV1, MCV1_dc$random, use = "complete.obs")
```

```
## [1] 0.7360939
```

When seperating the data from seasonal patterns we can see some consistent trends across the different vaccines. for both polio and the MCV1 THere is a large amount of variation and a significant drop in vaccination coverage in the first quarter followed by a recovery and steadying.In the MCV1 vaccination we see another slight dig in the last quarter. For the influenza DTP1 and the Hepetitis B we see a quick adoption after introduction. For influenza and DTP1 there is a drop in the mid 2000s, where as the HepB vaccine stays at that introduction level of coverage. Below we have highlighted changes in variation and mean for each.

Change Point Detection

```r
#Chang point detection


# DTP1
  # Variance change tests
  #DTP1 <- na.remove(DTP1)
  cpt.var(na.omit(DTP1), class = FALSE)['conf.value']
```

```
## conf.value
##  0.3389818
```

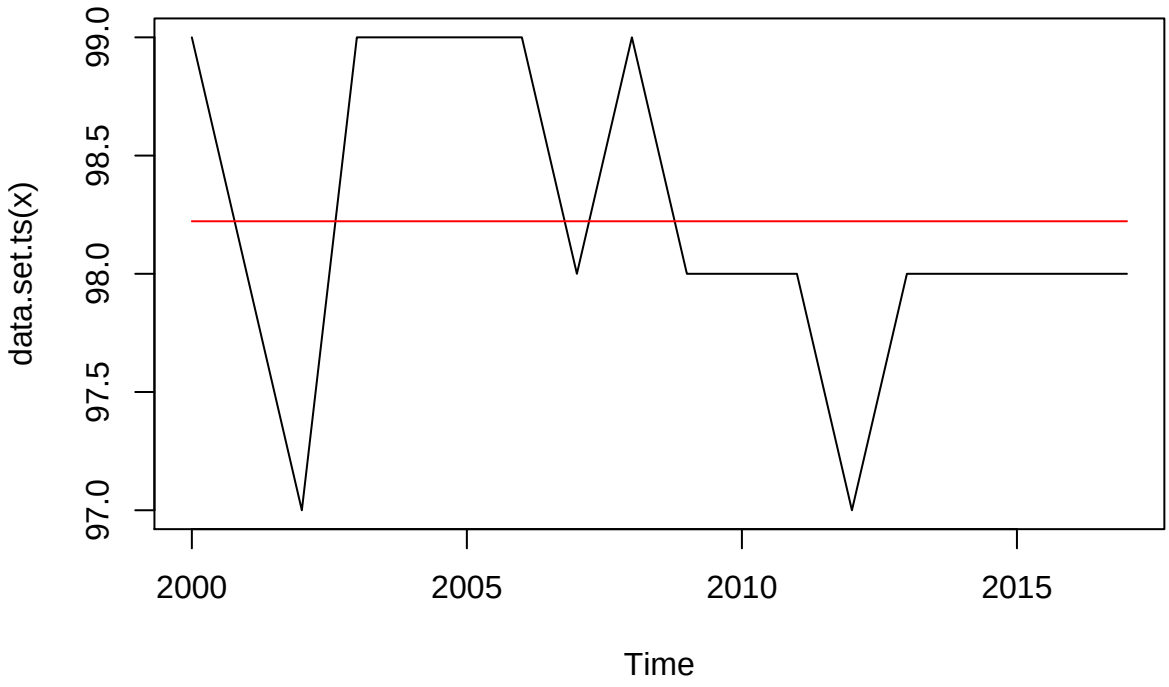
```r
  DTP1_vcp <- cpt.var(na.omit(DTP1),  method='BinSeg')
  #plot(DTP1_vcp)
  cpt.var(na.omit(DTP1), class = FALSE)['conf.value']
```

```
## conf.value
##  0.3389818
```

```r
  # Mean change tests
  cpt.mean(na.omit(DTP1))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in mean
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 8.671115
## Minimum Segment Length : 1
## Maximum no. of cpts   : 1
## Changepoint Locations :
```

```r
  DTP1_mcp <- cpt.mean(na.omit(DTP1), method='BinSeg')
  plot(DTP1_mcp)
```




```
  cpt.mean(na.omit(DTP1), class = FALSE)['conf.value']
```

```
##   conf.value
## 3.337577e-05
```

```
# Hepatitis B
  #HepB_BD <- na.remove(HepB_BD)
  cpt.var(na.omit(HepB_BD))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in variance
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 8.317766
## Minimum Segment Length : 2
## Maximum no. of cpts   : 1
## Changepoint Locations :
```

```
  HepB_BD_vcp <- cpt.var(na.omit(HepB_BD), method='BinSeg')
  #plot(HepB_BD_vcp)
  cpt.var(na.omit(HepB_BD), class = FALSE)['conf.value']
```

```
## conf.value
##  0.5148729
```

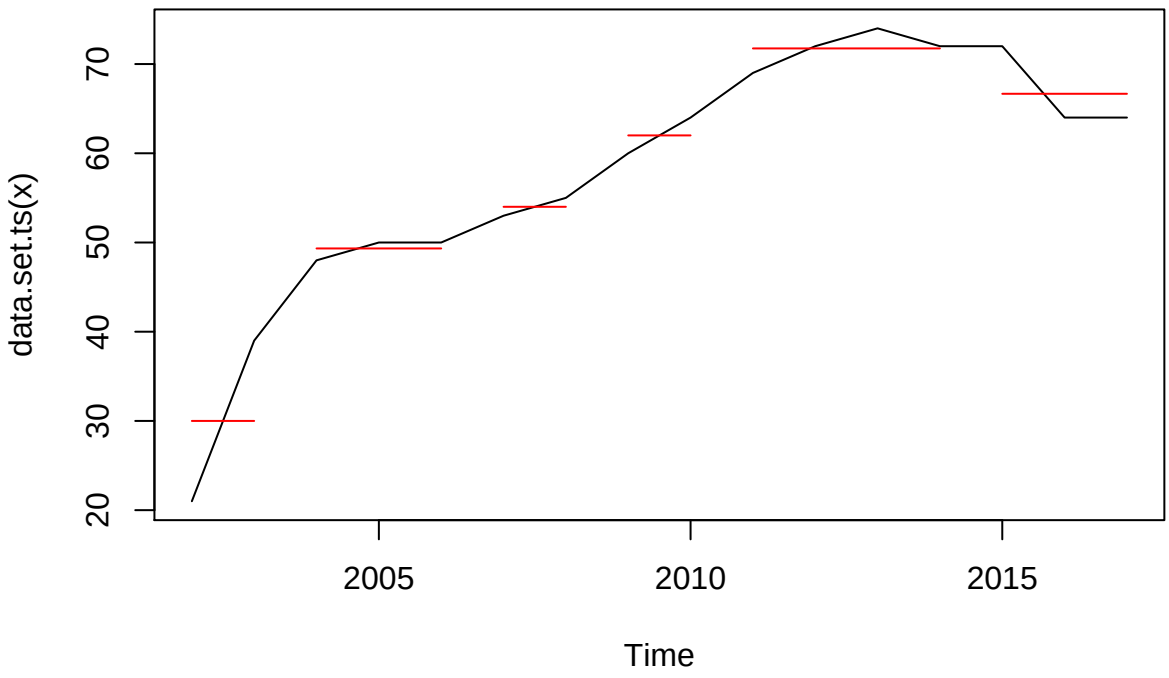
```
  # Mean change tests
  cpt.mean(na.omit(HepB_BD))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in mean
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 8.317766
## Minimum Segment Length : 1
## Maximum no. of cpts   : 1
## Changepoint Locations : 7
```

```
  HepB_BD_mcp <- cpt.mean(na.omit(HepB_BD), method='BinSeg')
```

```
## Warning in BINSEG(sumstat, pen = pen.value, cost_func = costfunc, minseglen
## = minseglen, : The number of changepoints identified is Q, it is advised to
## increase Q to make sure changepoints have not been missed.
```

```
  plot(HepB_BD_mcp)
```



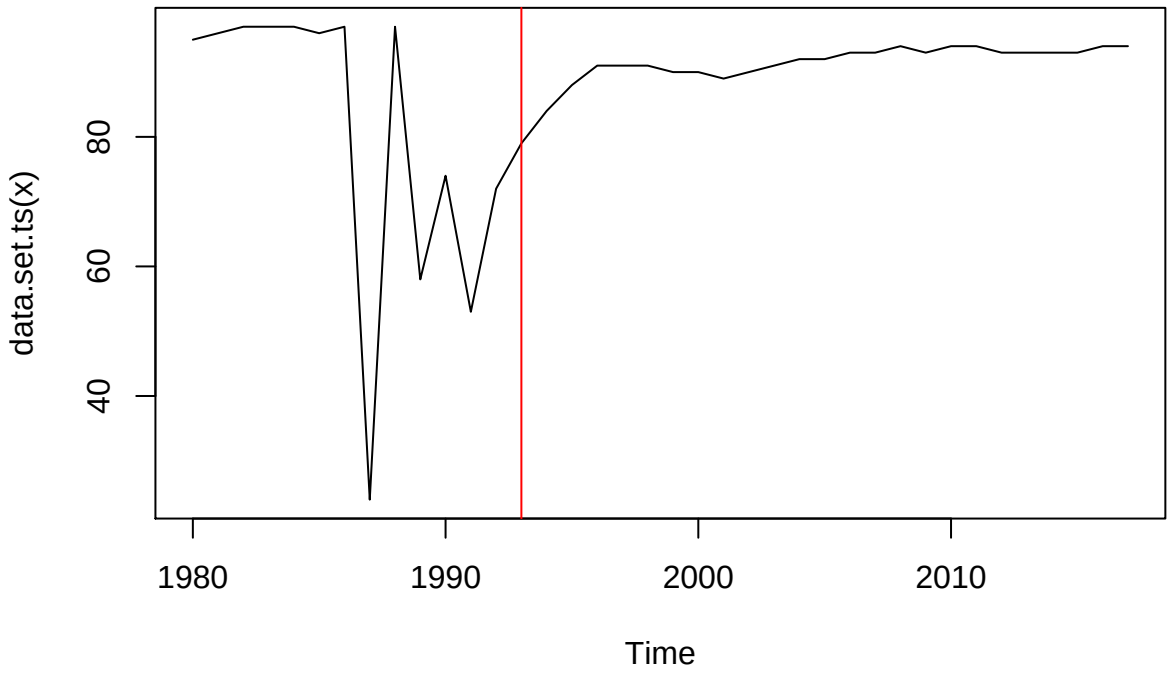

```
  cpt.mean(na.omit(HepB_BD), class = FALSE)['conf.value']
```

```
## conf.value
##          1
```

```
# Polio
  #DTP1 <- na.remove(Pol3)
  cpt.var(na.omit(Pol3))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in variance
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 10.91276
## Minimum Segment Length : 2
## Maximum no. of cpts   : 1
## Changepoint Locations : 14
```

```r
Pol3_cp <- cpt.var(na.omit(Pol3), method='BinSeg')
plot(Pol3_cp)
```




```r
cpt.var(na.omit(Pol3), class = FALSE)['conf.value']
```

```
## conf.value
##  0.9988217
```

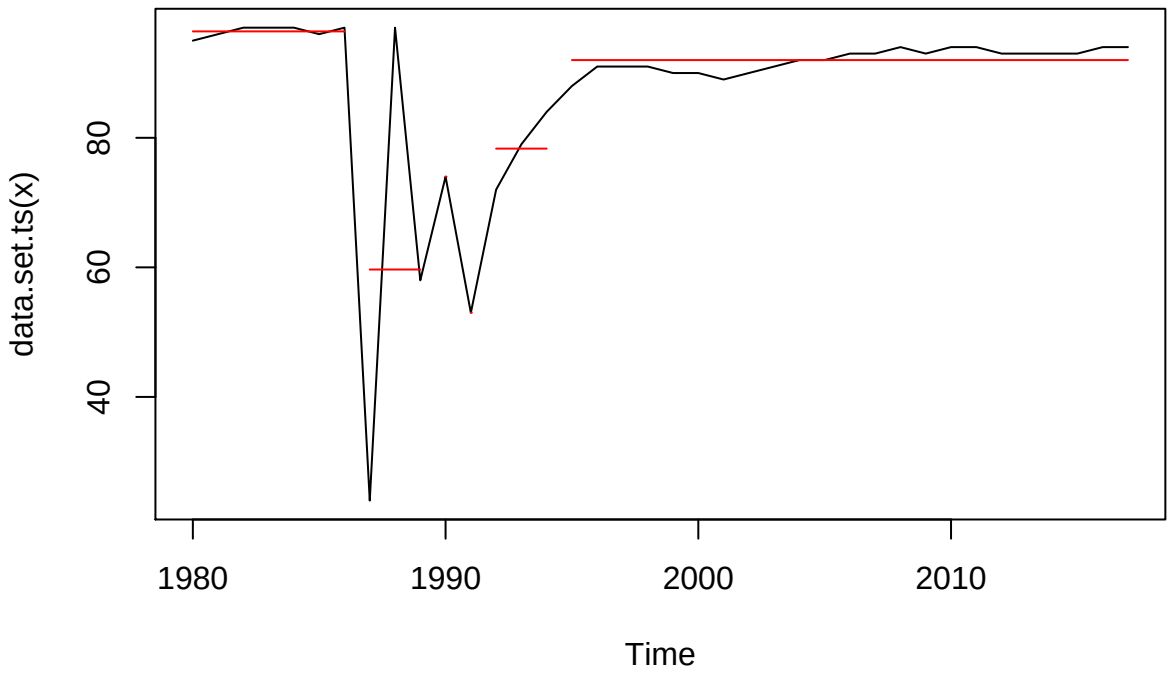
```r
# Mean change tests
cpt.mean(na.omit(Pol3))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in mean
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 10.91276
## Minimum Segment Length : 1
## Maximum no. of cpts   : 1
## Changepoint Locations : 15
```

```
  HepB_BD_mcp <- cpt.mean(na.omit(Pol3), method='BinSeg')
```

```
## Warning in BINSEG(sumstat, pen = pen.value, cost_func = costfunc, minseglen
## = minseglen, : The number of changepoints identified is Q, it is advised to
## increase Q to make sure changepoints have not been missed.
```

```
  plot(HepB_BD_mcp)
```




```
  cpts(HepB_BD_mcp)
```

```
## [1]  7 10 11 12 15
```

```
  cpt.mean(na.omit(Pol3), class = FALSE)['conf.value']
```

```
## conf.value
##   0.9999999
```

```
# Flu
  #DTP1 <- na.remove(Hib3)
  cpt.var(na.omit(Hib3))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
```

```
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in variance
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 9.406483
## Minimum Segment Length : 2
## Maximum no. of cpts   : 1
## Changepoint Locations :
```

```
  Hib3_BD_vcp <- cpt.var(na.omit(Hib3), method='BinSeg')
  #plot(Hib3)
  cpt.var(na.omit(Hib3), class = FALSE)['conf.value']
```

```
## conf.value
##   0.752266
```

```
  # Mean change tests
  cpt.mean(na.omit(Hib3))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
## Changepoint type      : Change in mean
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 9.406483
## Minimum Segment Length : 1
## Maximum no. of cpts   : 1
## Changepoint Locations :
```

```
  Hib3_BD_mcp <- cpt.mean(na.omit(Hib3), method='BinSeg')
  #plot(Hib3)
  cpt.mean(na.omit(Hib3), class = FALSE)['conf.value']
```

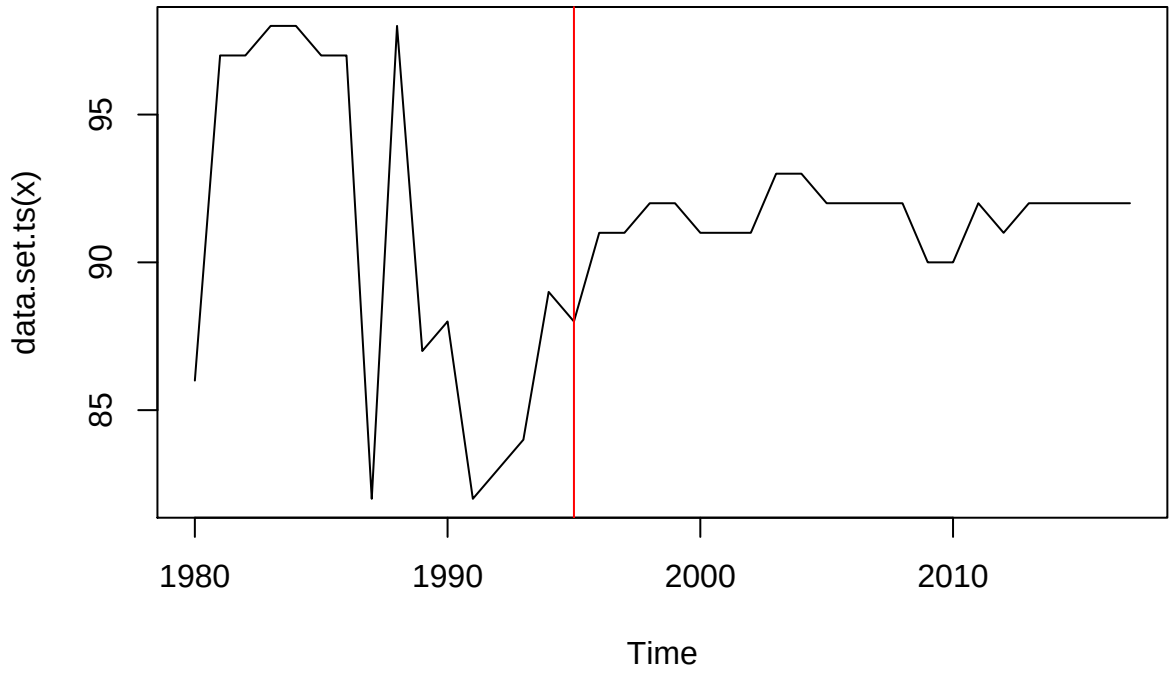
```
##  conf.value
## 0.002724824
```

```
# Decompose Measles
  #DTP1 <- na.remove(MCV1)
  cpt.var(na.omit(MCV1))
```

```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
```

```
## Changepoint type      : Change in variance
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 10.91276
## Minimum Segment Length : 2
## Maximum no. of cpts   : 1
## Changepoint Locations : 16
```

```
MCV1_BD_vcp <- cpt.var(na.omit(MCV1), method='BinSeg')
plot(MCV1_BD_vcp)
```




```
cpt.var(na.omit(MCV1), class = FALSE)['conf.value']
```

```
## conf.value
##  0.9997863
```

```
# Mean change tests
cpt.mean(na.omit(MCV1))
```

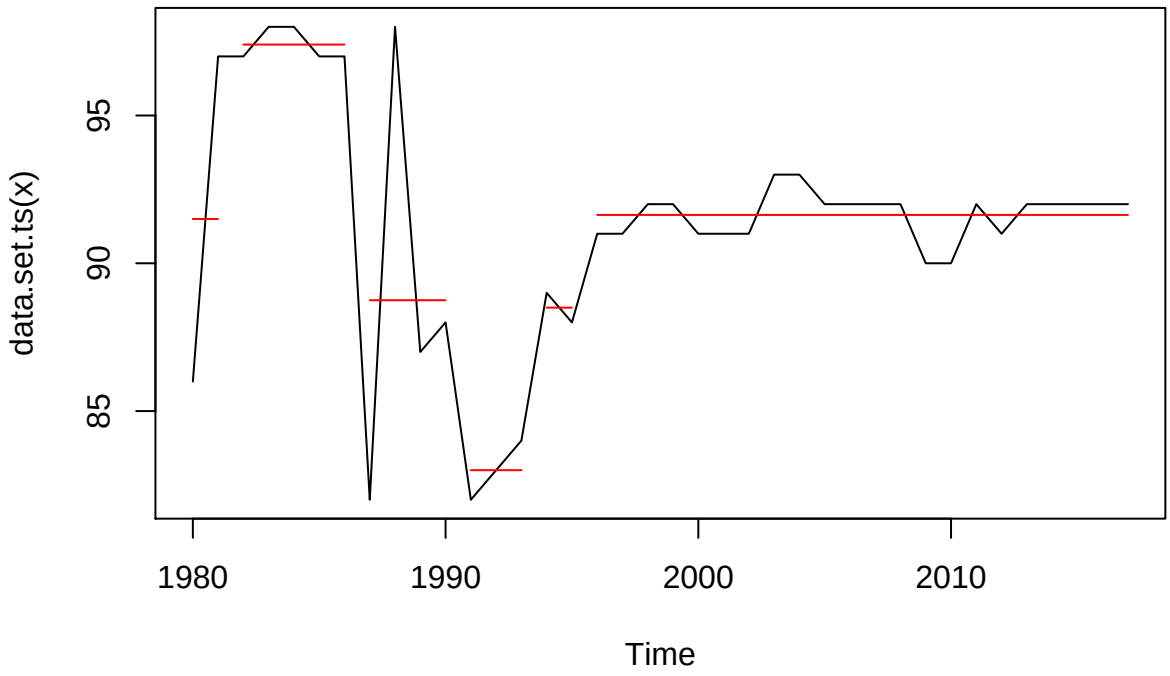
```
## Class 'cpt' : Changepoint Object
##         ~~   : S4 class containing 12 slots with names
##                cpttype date version data.set method test.stat pen.type pen.value minseglen cpts ncpts
##
## Created on  : Mon Mar 16 18:20:07 2020
##
## summary(.)  :
## ----------
## Created Using changepoint version 2.2.2
```

```
## Changepoint type      : Change in mean
## Method of analysis    : AMOC
## Test Statistic  : Normal
## Type of penalty       : MBIC with value, 10.91276
## Minimum Segment Length : 1
## Maximum no. of cpts   : 1
## Changepoint Locations : 7
```

```
MCV1_BD_mcp <- cpt.mean(na.omit(MCV1), method='BinSeg')
```

```
## Warning in BINSEG(sumstat, pen = pen.value, cost_func = costfunc, minseglen
## = minseglen, : The number of changepoints identified is Q, it is advised to
## increase Q to make sure changepoints have not been missed.
```

```
plot(MCV1_BD_mcp)
```




```
cpt.mean(na.omit(MCV1), class = FALSE)['conf.value']
```

```
## conf.value
##   0.9828291
```

By the mid-1980s, seven vaccines were available: diphtheria, tetanus, pertussis, measles,mumps, rubella and polio. Because six of these vaccines were combined into two shots (DTP and MMR), and one, the polio vaccine, was given by mouth, children received five shots by the time they were 2 years old and not more than one shot at a single visit. Measles, mumps, rubella, and varicella would later be combined into the MCV1 vaccine in 1995 widely increasing its coverage from the prior MMR combination

The hepatitis B vaccine was licensed in 1981 and recommended for high-risk groups such as healthcare workers, intravenous drug users, homosexual men and people with multiple sexual partners. After the failure

to control hepatitis B the recommendation was changed to immunize all infants in 1991. Following this recommendation, hepatitis B disease was virtually eliminated in children less than 18 years of age in the United States.

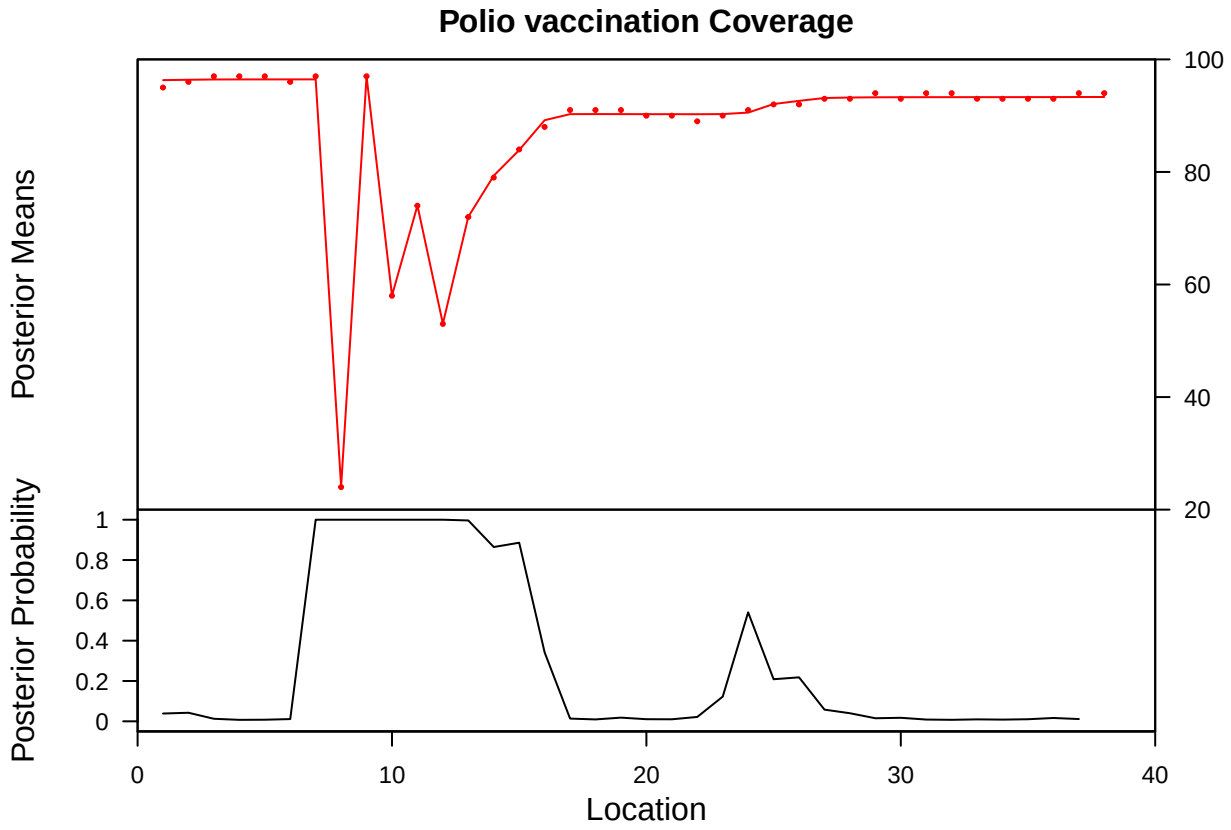
The polio vaccine, was given by mouth starting in 2000

Additional recommendation for influenza were created in 2002, a new version of intranasal influenza vaccines were intorduced in 2004. It was successful enought that the Intranasal influenza vaccine recommendation was discontinued in 2016. However, in 2018, it was put back onto the recommendation list.

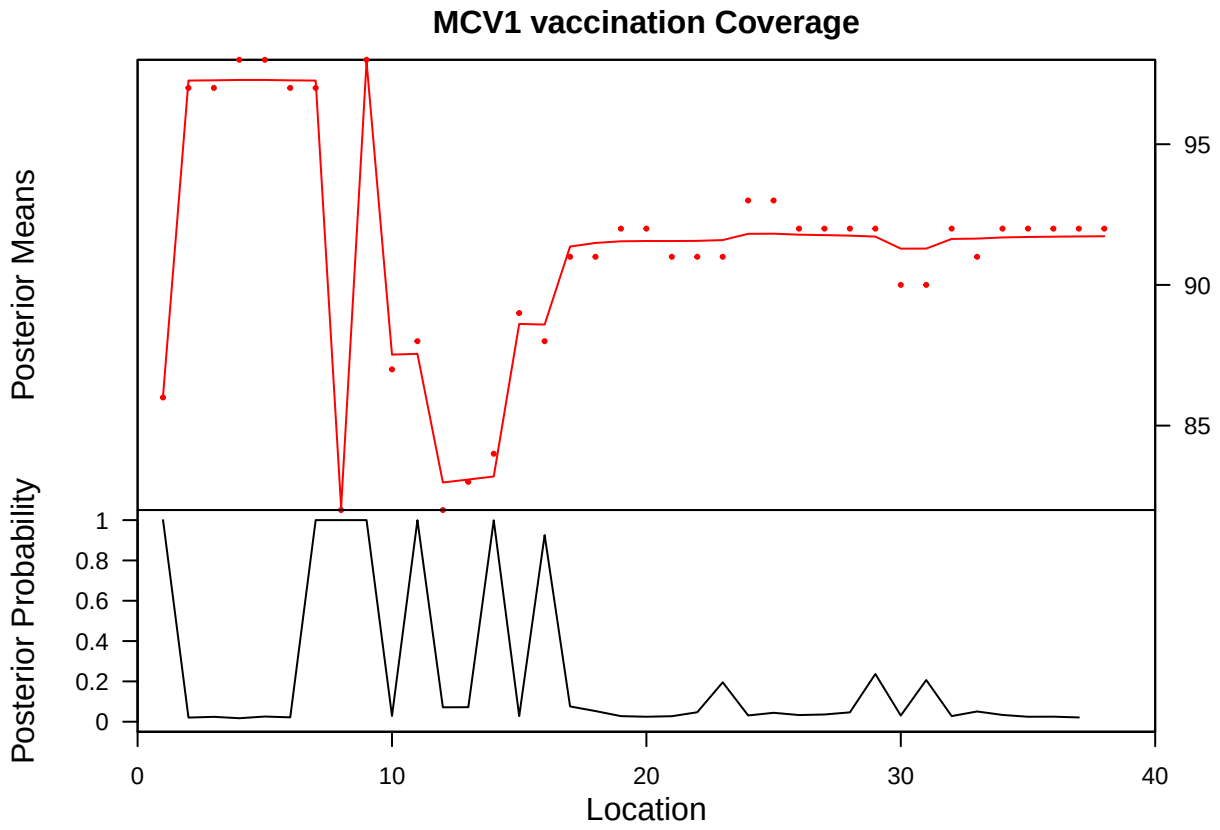
Source: https://www.chop.edu/centers-programs/vaccine-education-center/vaccine-history/developments-by-year

Bayesian Change Point Identification

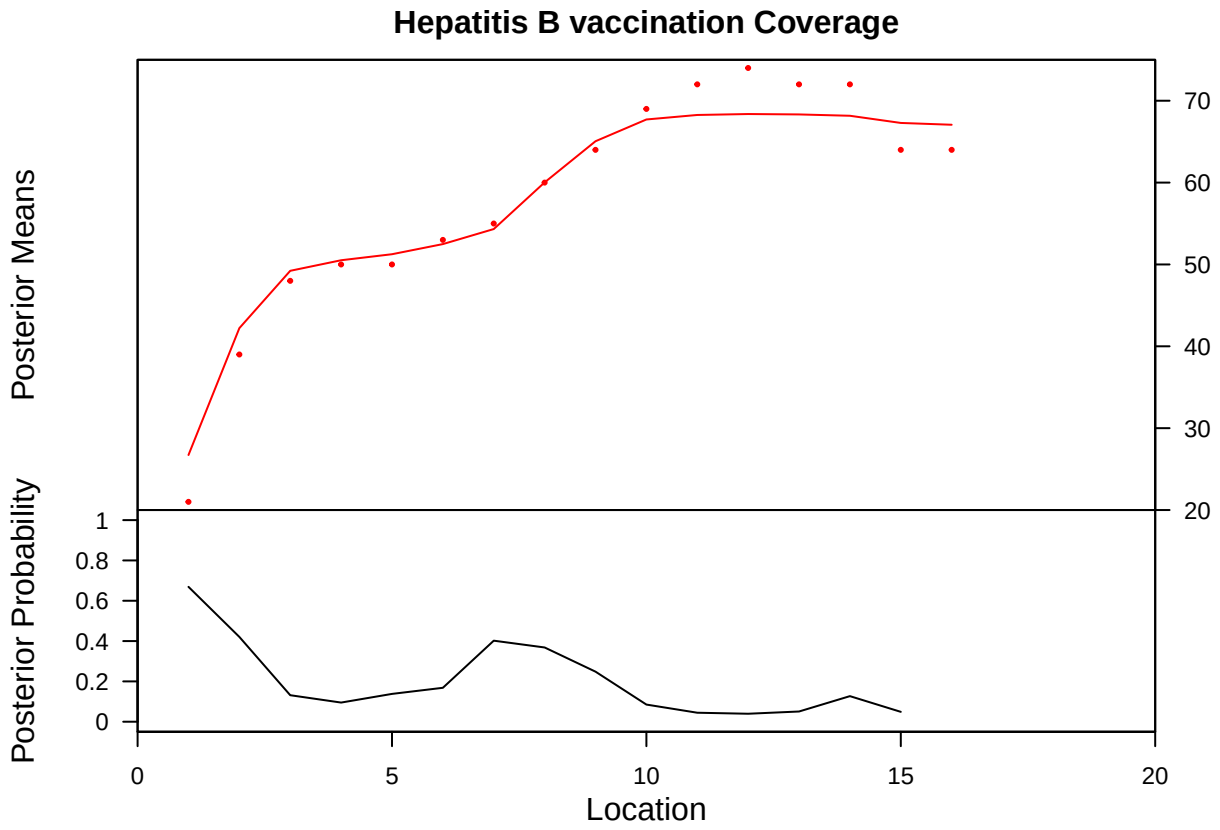
```
library(grid)
library(bcp)

# Bayesian Approach

bcpPol3 <- bcp(as.vector(Pol3),  burnin = 1000, mcmc = 10000)
plot(bcpPol3, main = 'Polio vaccination Coverage')
```



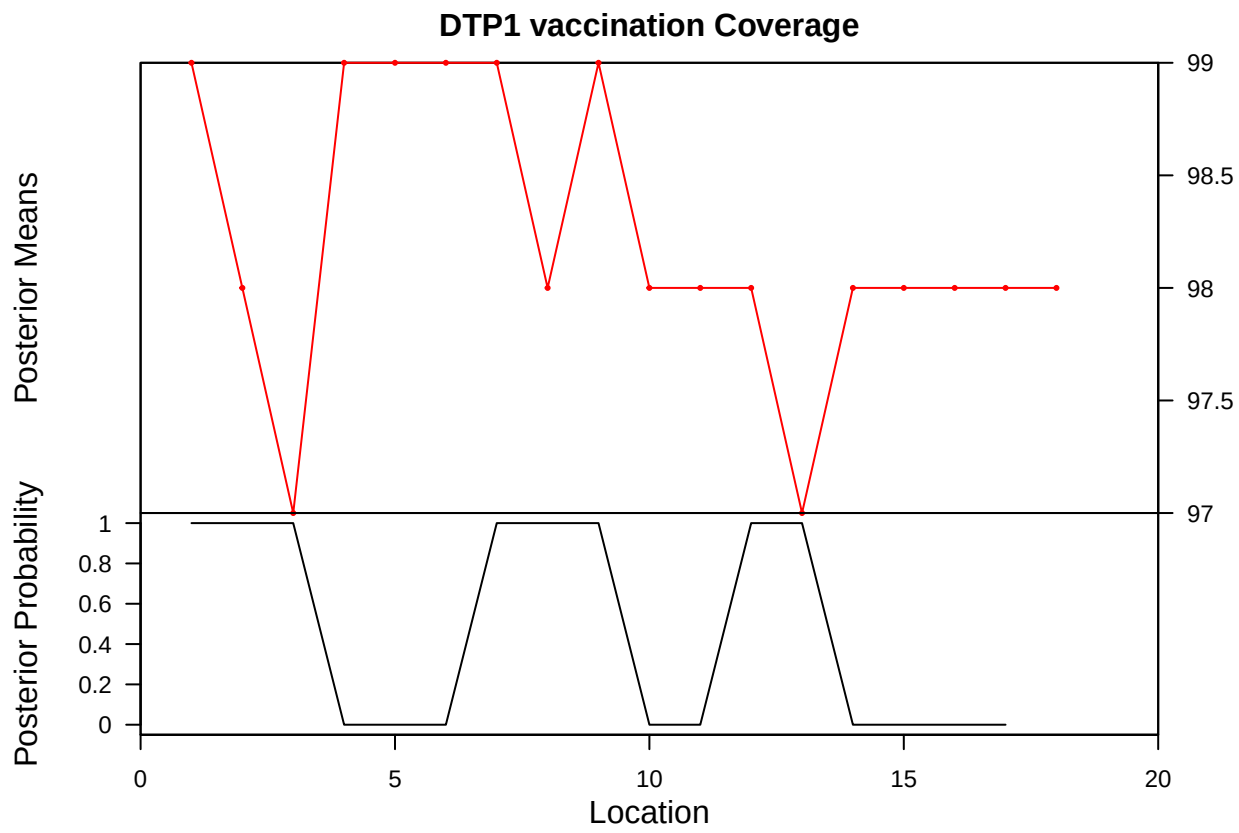

```
bcpMCV <- bcp(as.vector(MCV1),  burnin = 1000, mcmc = 10000)
plot(bcpMCV, main = 'MCV1 vaccination Coverage')
```




```
bcpHepB_BD <- bcp(na.omit(as.vector(HepB_BD)),  burnin = 1000, mcmc = 10000)
plot(bcpHepB_BD, main = 'Hepatitis B vaccination Coverage')
```




```
bcpDTP1<- bcp(na.omit(as.vector(DTP1)),  burnin = 1000, mcmc = 10000)
plot(bcpDTP1, main = 'DTP1 vaccination Coverage')
```

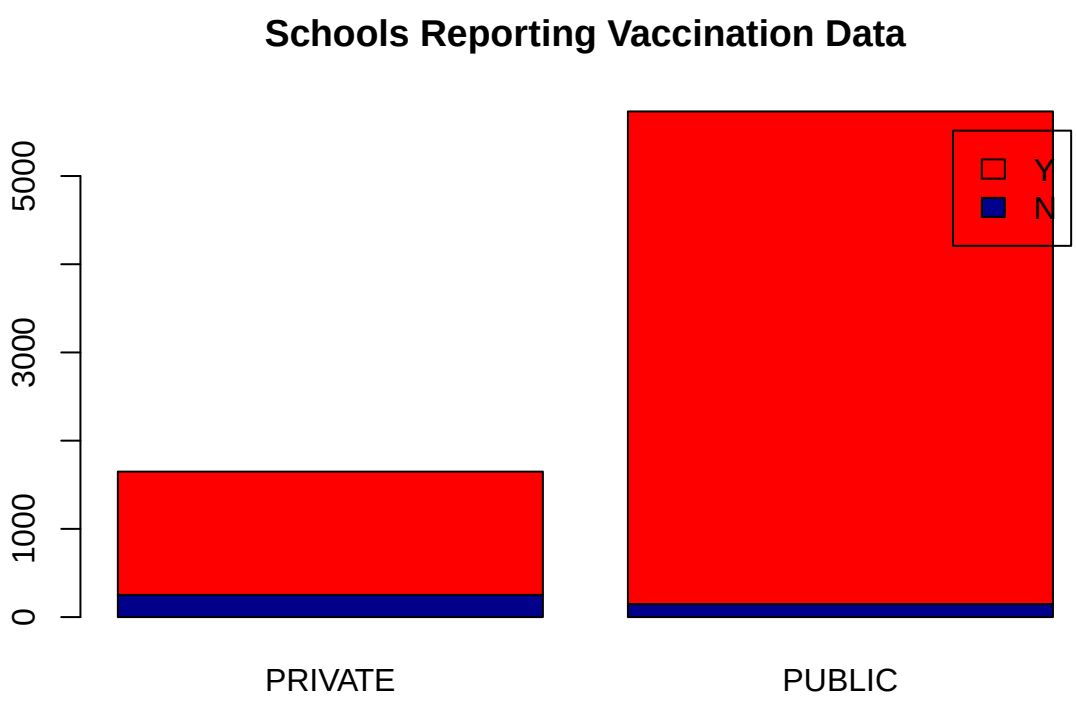


Public vs. Private School Comparisons:

5. Difference in overall reporting proportions between public and private schools

Chi-Squared Test

```
# Stacked Bar Plot with Colors and Legend
counts <- t(as.matrix(table(allSchoolsReportStatus[,2:ncol(allSchoolsReportStatus)])))
barplot(counts, main="Schools Reporting Vaccination Data",
  xlab="School Designation", col=c("darkblue","red"),
  legend = rownames(counts))
```




```
# teST the hypothesis of whether the public private designation is independent from the whether they re

table(All_Schools[,2:3])
```

```
##          reported
## pubpriv      0    1
##   PRIVATE  252 1397
##   PUBLIC   148 5584
```

```
totals <- table(All_Schools[,2:3])
chisq.test(totals)
```

```
##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  totals
## X-squared = 400.49, df = 1, p-value < 2.2e-16
```

Using a Chi squared test we can place the totals of all California kindergarterns in a contingency table. With the p-value less than any significance value, we can reject the null hypothesis that the smoking habit is independent of the exercise level of the students.

Bayes approach

```
library(BayesFactor)
```

```
## Loading required package: coda
```

```
## Loading required package: Matrix
```

```
## ************
## Welcome to BayesFactor 0.9.12-4.2. If you have questions, please contact Richard Morey (richarddmorey
##
## Type BFManual() to open the manual.
## ************
```

```
MCMC_ct <- contingencyTableBF(totals, sampleType = 'poisson', posterior = FALSE, iterations = 10000)
summary(MCMC_ct)
```

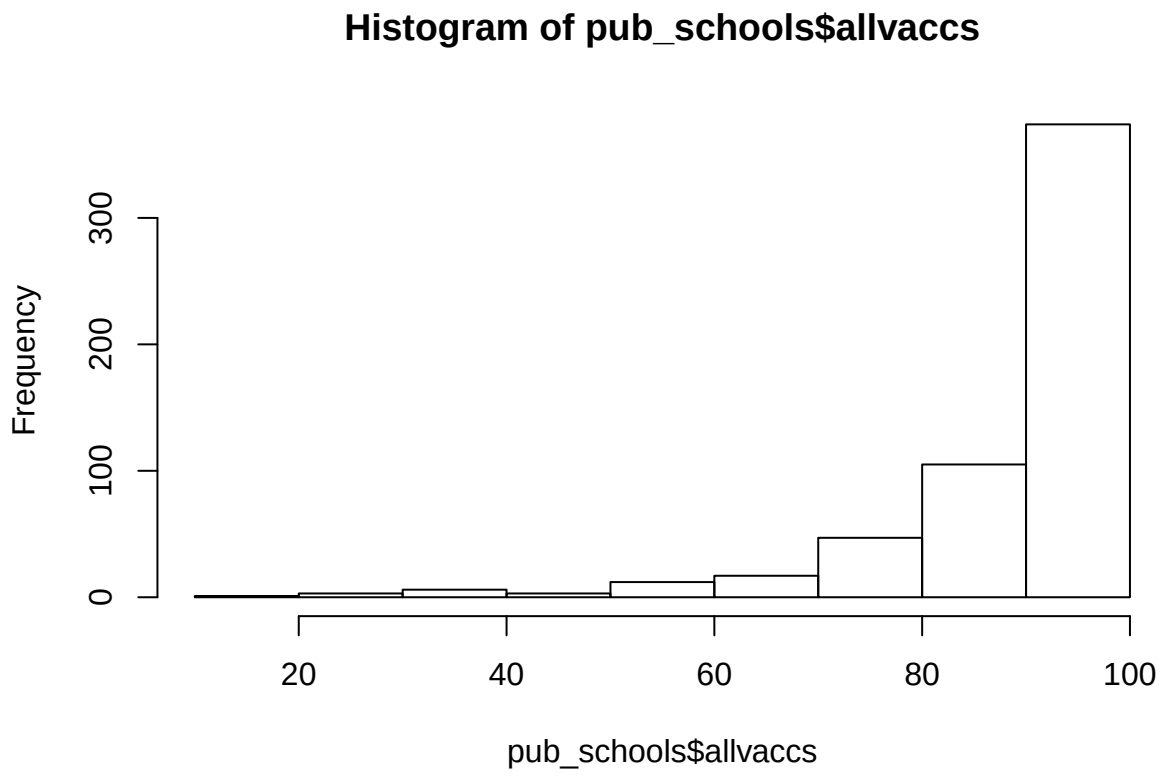
```
## Bayes factor analysis
## --------------
## [1] Non-indep. (a=1) : 1.150548e+69 ±0%
##
## Against denominator:
##   Null, independence, a = 1
## ---
## Bayes factor type: BFcontingencyTable, poisson
```

With an incredibly small bayes factor we can determine that it is very unlikely these two factors are independent. We can now see that the

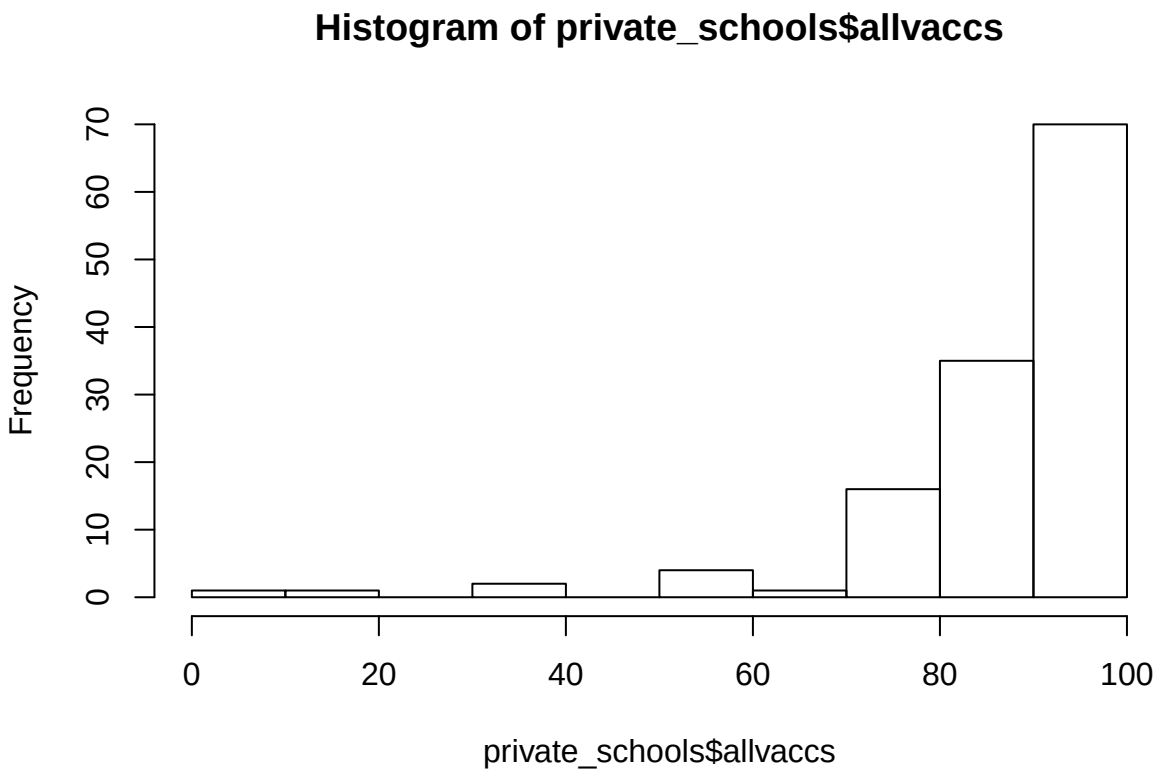
6. Comparasion of overall vaccination rates (allvaccs) between public and private schools.

Data Exploration and Prep

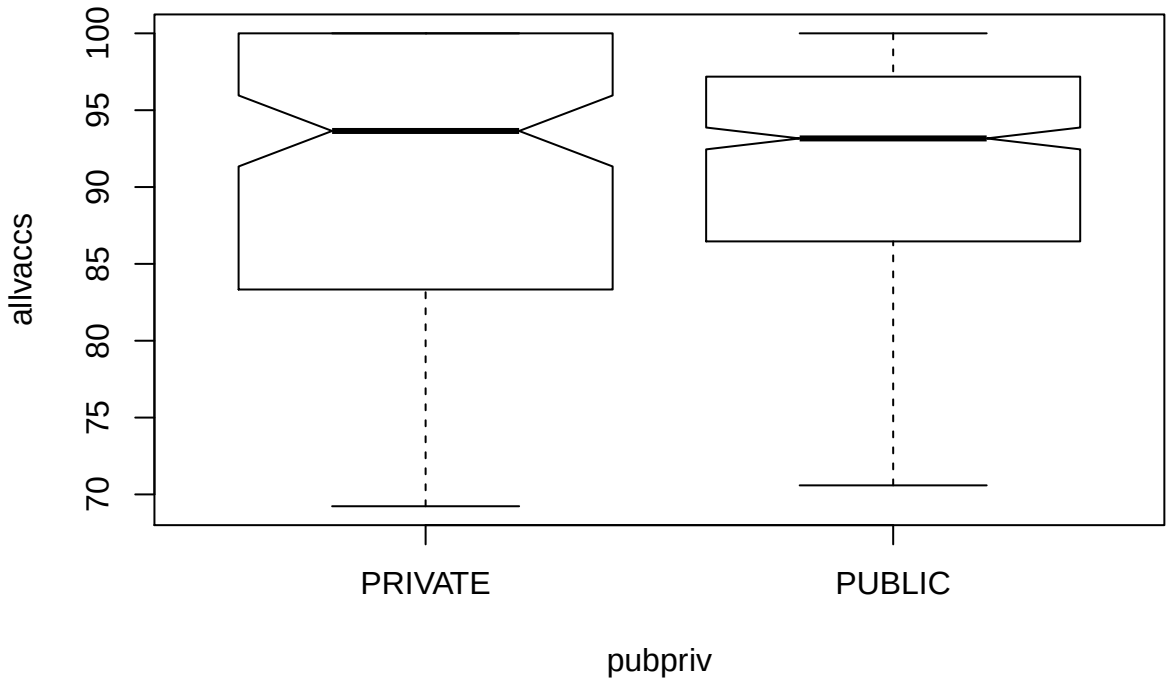
```
# First Looks
sample <- reportSample
sample$vaxed <- sample$enrollment * (sample$allvaccs/100)
sample$medtotal <- sample$enrollment * (sample$medical/100)
sample$reltotal <- sample$enrollment * (sample$religious/100)
pub_schools = sample[sample$pubpriv == 'PUBLIC',]
private_schools = sample[sample$pubpriv == 'PRIVATE',]
hist(pub_schools$allvaccs)
```




```
hist(private_schools$allvaccs)
```




```
boxplot(allvaccs ~ pubpriv, data = sample, outline = FALSE, notch = TRUE)
```




```
#sample <- data.frame(sample$code, sample$name, sample$pubpriv, sample$enrollment, sample$allvaccs, sam
#colnames(sample) <- c('code', 'name', 'pubpriv', 'enrollment', 'vaxxed')
```

```
# Prep Data
myData <- data.frame(sample$pubpriv, sample$allvaccs, sample$vaxed, sample$enrollment)
colnames(myData) <- c('pubpriv' ,'allvaccs', 'vaxed', 'enrollment' )
library(dplyr)
```

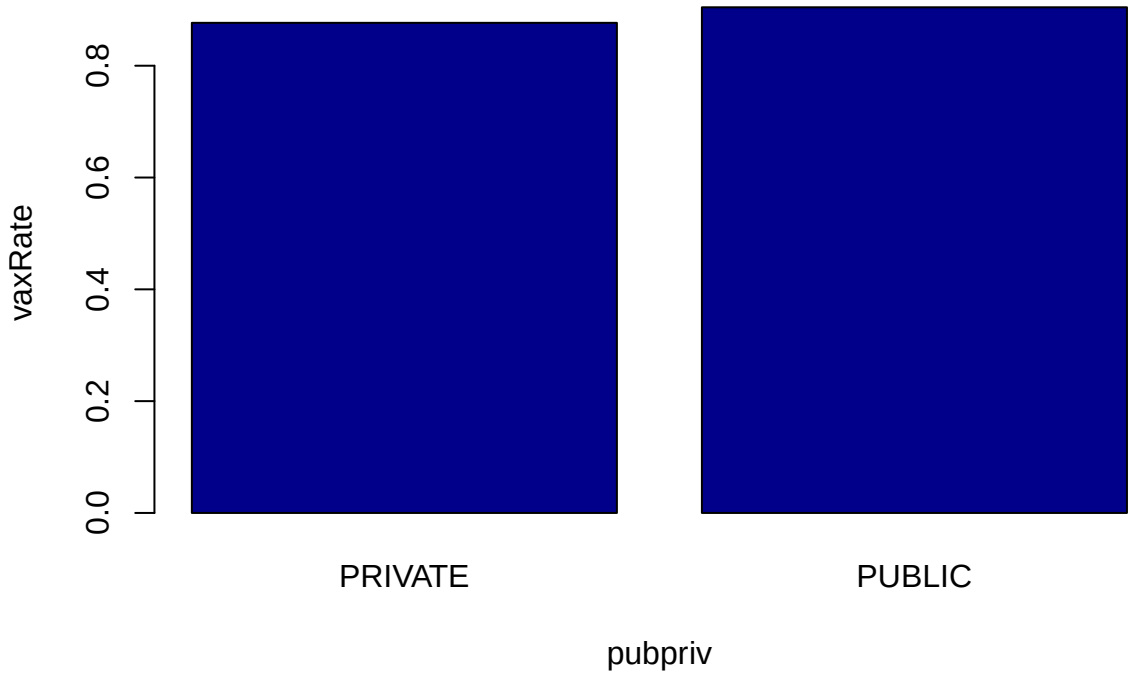
```
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(stats)
p_data <- group_by(myData, pubpriv) %>%
  summarise(
    count = n(),
    mean = mean(allvaccs, na.rm = TRUE),
    median = median(allvaccs, na.rm = TRUE),
    sd = sd(allvaccs, na.rm = TRUE),
    totalv = sum(vaxed),
    totale = sum(enrollment)
```

```
  )
p_data$vaxRate = p_data$totalv/p_data$totale
head(p_data)
```

```
## # A tibble: 2 x 8
##   pubpriv count  mean median    sd totalv totale vaxRate
##   <fct>   <int> <dbl>  <dbl> <dbl>  <dbl>  <int>   <dbl>
## 1 PRIVATE   130  88.3   93.6  16.1   3333   3802   0.877
## 2 PUBLIC    568  89.2   93.2  13.0  45515  50321   0.904
```

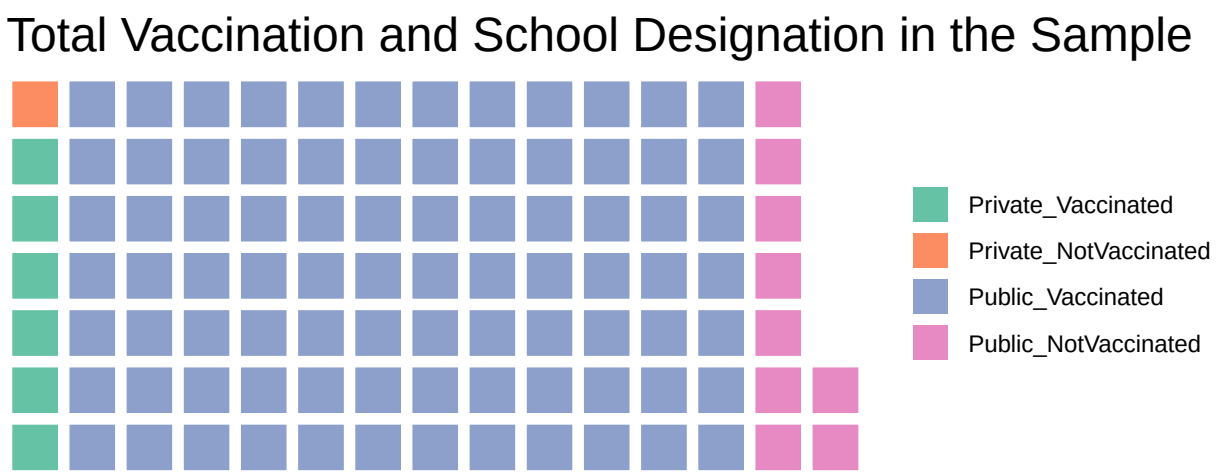
```
barplot(vaxRate ~pubpriv, data=p_data, col= 'Dark Blue' )
```



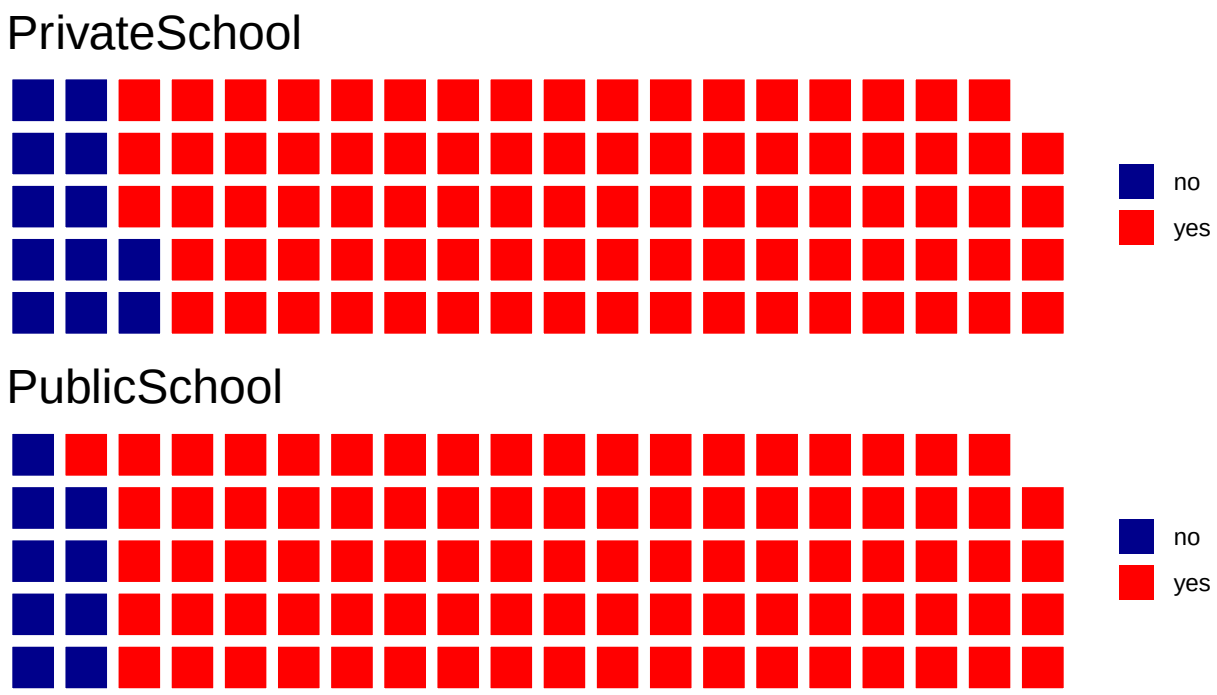

```
#install.packages("waffle")

library(waffle)
```

```
## Loading required package: ggplot2
```

```
pv <- c( Private_Vaccinated = p_data$totalv[1],
         Private_NotVaccinated = (p_data$totale[1] - p_data$totalv[1]),
         Public_Vaccinated = p_data$totalv[2],
         Public_NotVaccinated = (p_data$totale[2] - p_data$totalv[2])
          )
pv <- round((pv/sum(pv))*100)

waffle(pv, rows = 7, title = "Total Vaccination and School Designation in the Sample")
```




```
iron(
  waffle(c(no = 100*(1-p_data$vaxRate[1]), yes = 100*p_data$vaxRate[1]), rows = 5,
         colors = c("darkblue","red"), title = "PrivateSchool"),
  waffle(c(no = 100*(1-p_data$vaxRate[2]), yes = 100*p_data$vaxRate[2]), rows = 5,
         colors = c("darkblue","red"), title = "PublicSchool")
)
```



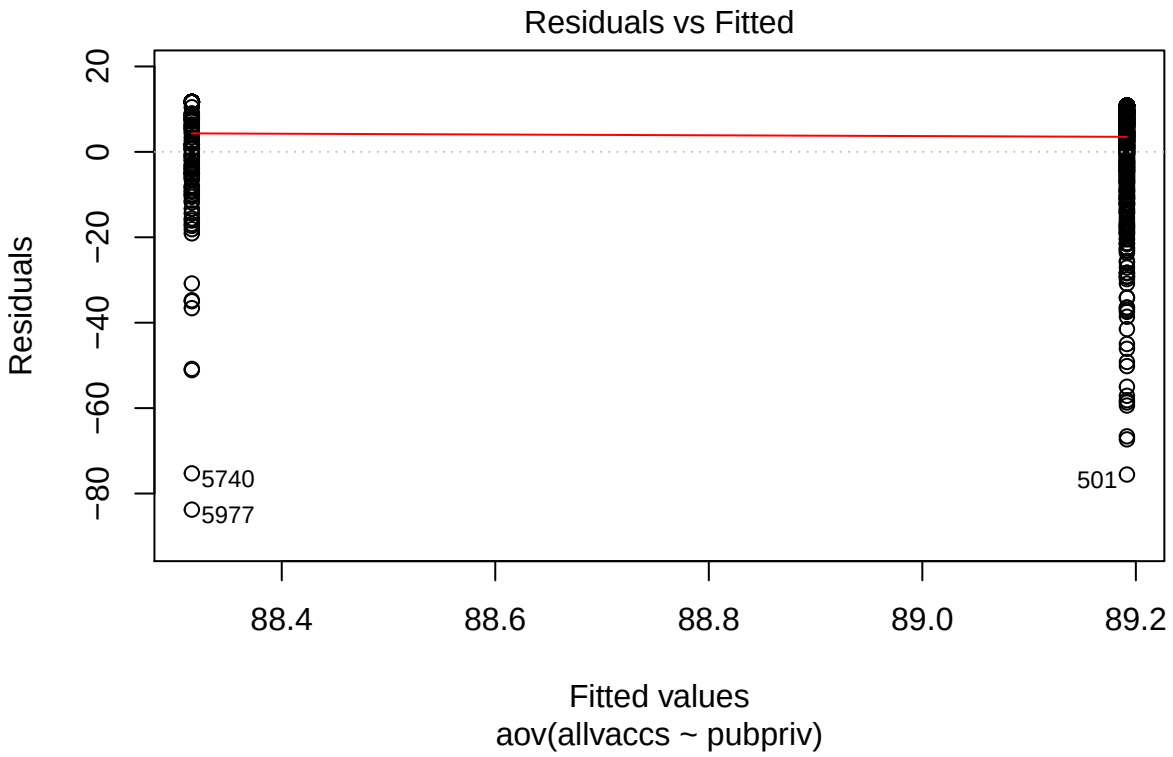
Anova

```
# Compute the analysis of variance
p_dataov <- aov(allvaccs ~ pubpriv, data = sample)
# Summary of the analysis
summary(p_dataov)
```

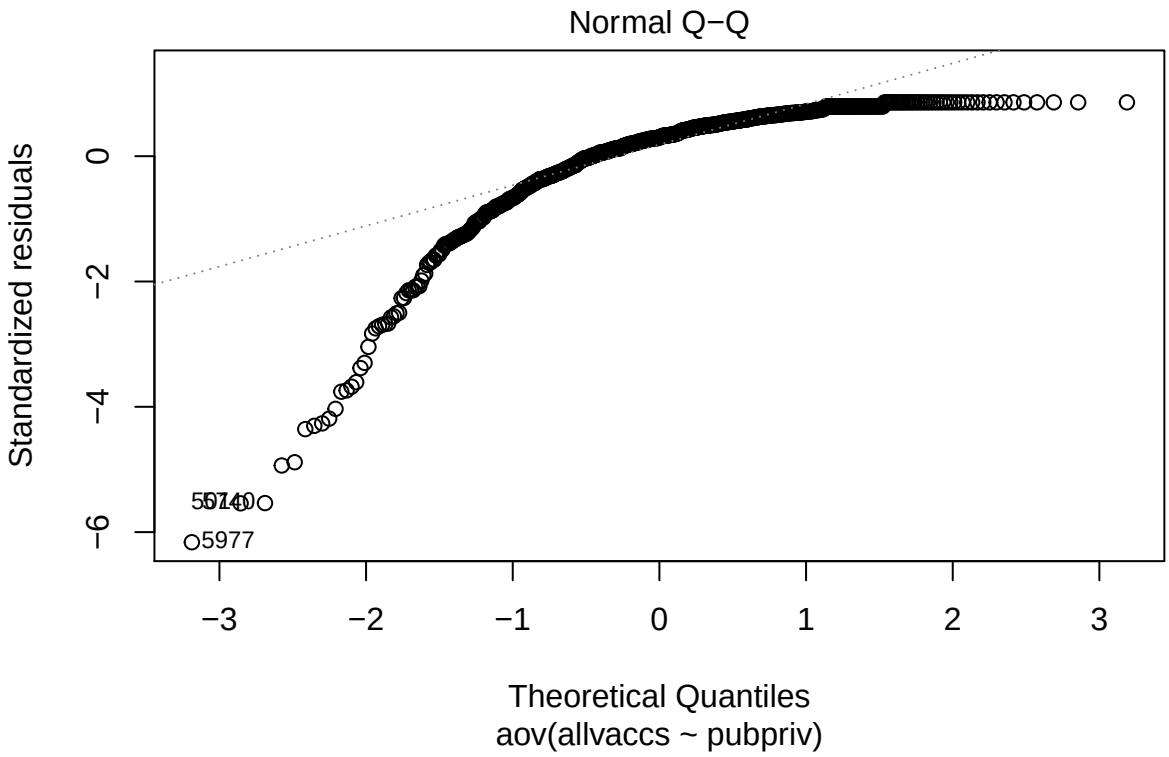
```
##              Df Sum Sq Mean Sq F value Pr(>F)
## pubpriv       1     81   81.15   0.436  0.509
## Residuals   696 129638  186.26
```

As the p-value is not less than the significance level 0.05, we cannot conclude that there are significant differences between public and private school vaccination based soledly on variation.

```
# Diagnostics
# 1. Homogeneity of variances
plot(p_dataov, 1)
```




```
# 2. Normality
plot(p_dataov, 2)
```




```
# Extract the residuals
aov_residuals <- residuals(object = p_dataov)
# Run Shapiro-Wilk test
shapiro.test(x = aov_residuals)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  aov_residuals
## W = 0.72975, p-value < 2.2e-16
```

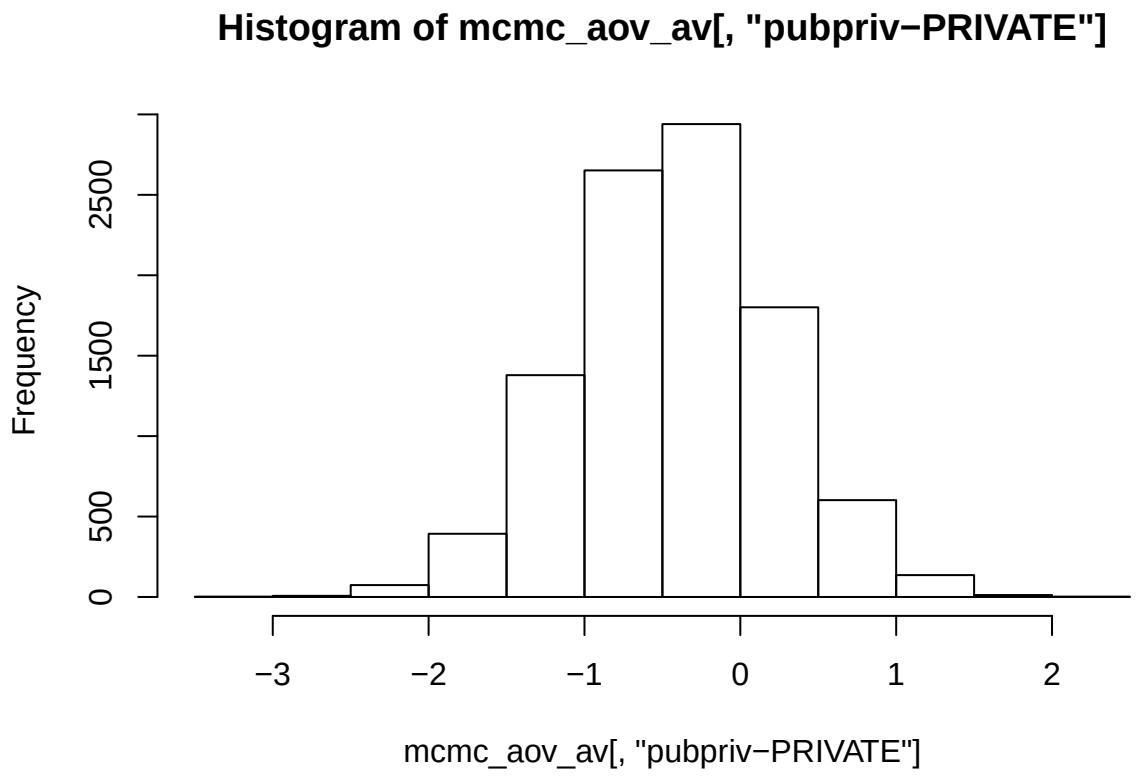
While the Shapiro test can show us that the data is normally ditributed. We can see in the residuals by quantile chart the effect that the skew has. A log transformation or square root may be approriate if this metric is to be used further for analysis.

```
av_aov_bf <- anovaBF(allvaccs ~ pubpriv, data = sample)
mcmc_aov_av<- posterior(av_aov_bf, iteration=10000)
summary(mcmc_aov_av)
```

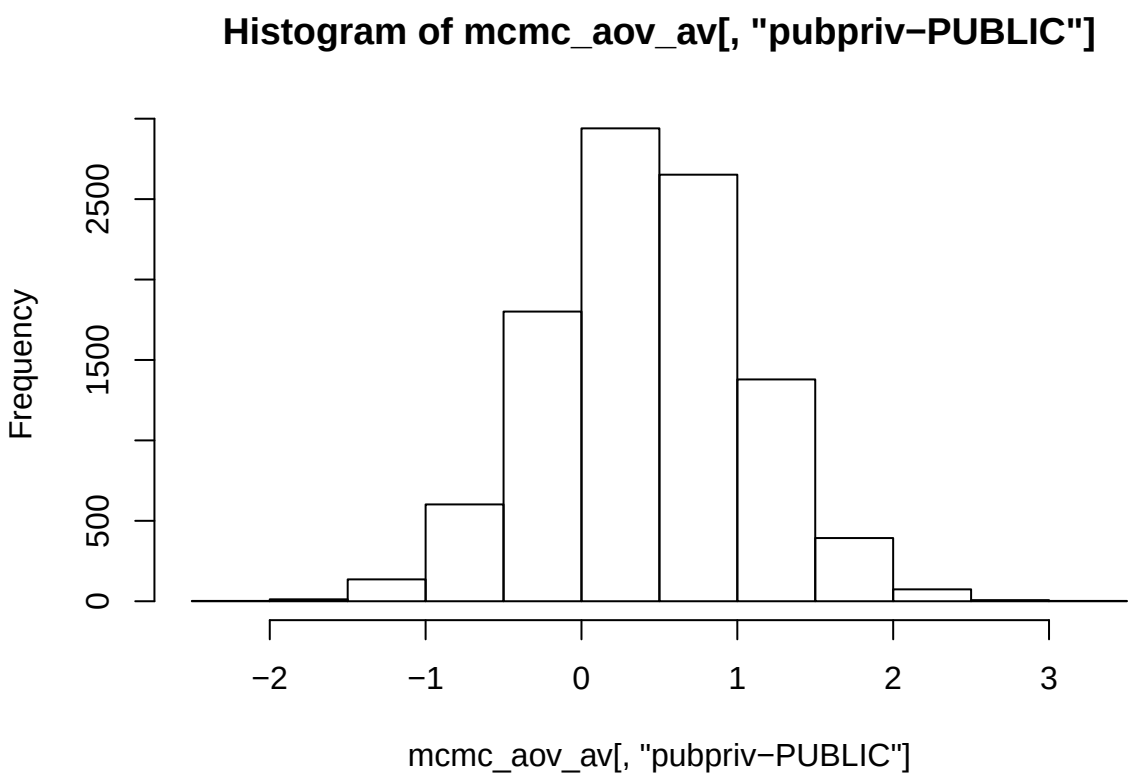
```
##
## Iterations = 1:10000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
```

```
##                      Mean      SD Naive SE Time-series SE
## mu                88.7529  0.6561 0.006561       0.006390
## pubpriv-PRIVATE   -0.4261  0.6494 0.006494       0.006494
## pubpriv-PUBLIC     0.4261  0.6494 0.006494       0.006494
## sig2             186.5524 10.0203 0.100203       0.096587
## g_pubpriv          0.9524  7.7687 0.077687       0.077687
##
## 2. Quantiles for each variable:
##
##                       2.5%       25%      50%       75%    97.5%
## mu                87.43860  88.31921  88.7552  89.19219  90.0215
## pubpriv-PRIVATE   -1.68245  -0.86160  -0.4242   0.01105   0.8419
## pubpriv-PUBLIC    -0.84192  -0.01105   0.4242   0.86160   1.6825
## sig2             167.82880 179.63247 186.2149 193.05650 207.0780
## g_pubpriv          0.03445   0.09112   0.1827   0.44542   4.9738
```

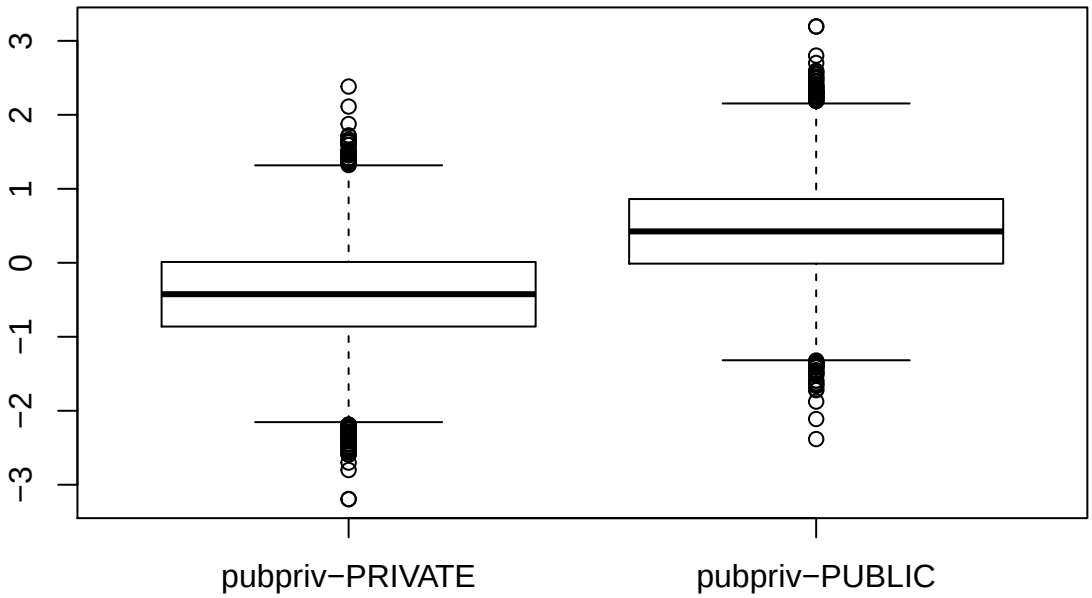
```
hist(mcmc_aov_av[,"pubpriv-PRIVATE"])
```




```
hist(mcmc_aov_av[,"pubpriv-PUBLIC"])
```




```
boxplot(as.matrix(mcmc_aov_av[,2:3]))
```



2 sample T Test

```
t.test( allvaccs ~ pubpriv, data = sample)
```

```
##
##  Welch Two Sample t-test
##
## data:  allvaccs by pubpriv
## t = -0.57838, df = 169.66, p-value = 0.5638
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.865224  2.113493
## sample estimates:
## mean in group PRIVATE  mean in group PUBLIC
##              88.31579              89.19166
```

```
wilcox.test(allvaccs ~ pubpriv, data = sample)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  allvaccs by pubpriv
## W = 39333, p-value = 0.2443
## alternative hypothesis: true location shift is not equal to 0
```

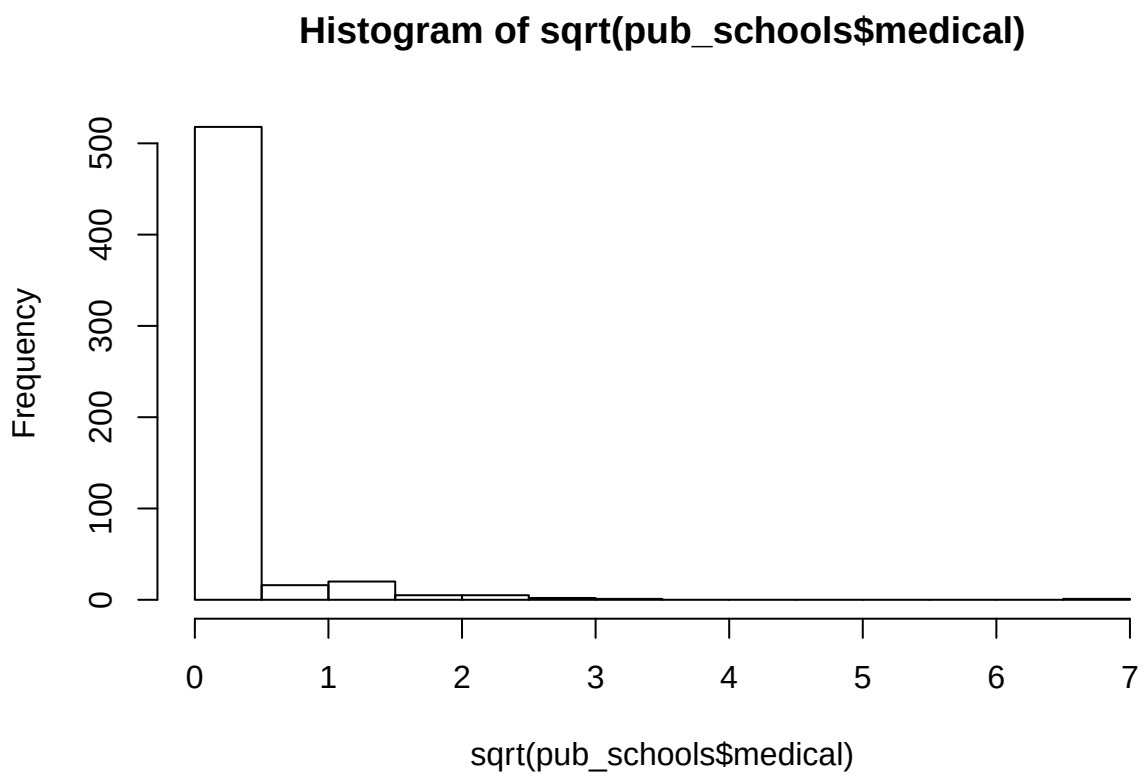
In both the 2 sample t-test we still cannot null out the null hypothesis that the difference in mean and variance for these two popultions are different.

```r
#install.packages('effsize')
library(effsize)
cohen.d(sample$allvaccs[sample$pubpriv == 'PUBLIC'], sample$allvaccs[sample$pubpriv == 'PRIVATE'])
```

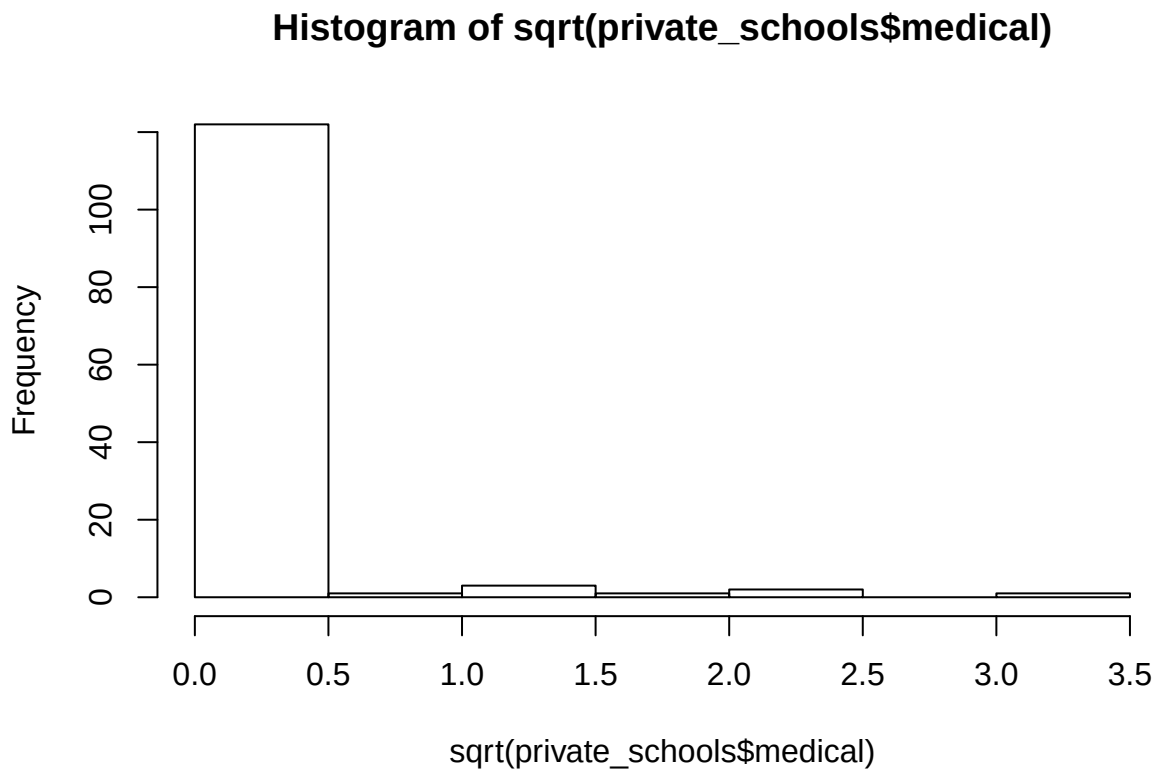
```
##
## Cohen's d
##
## d estimate: 0.0641764 (negligible)
## 95 percent confidence interval:
##      lower      upper
## -0.1267446  0.2550974
```

An incredibly small effect size wich crosses 0 suggests again that we cannot conclude there is a significant difference ### 7. Medical exemptions between public and private schools.

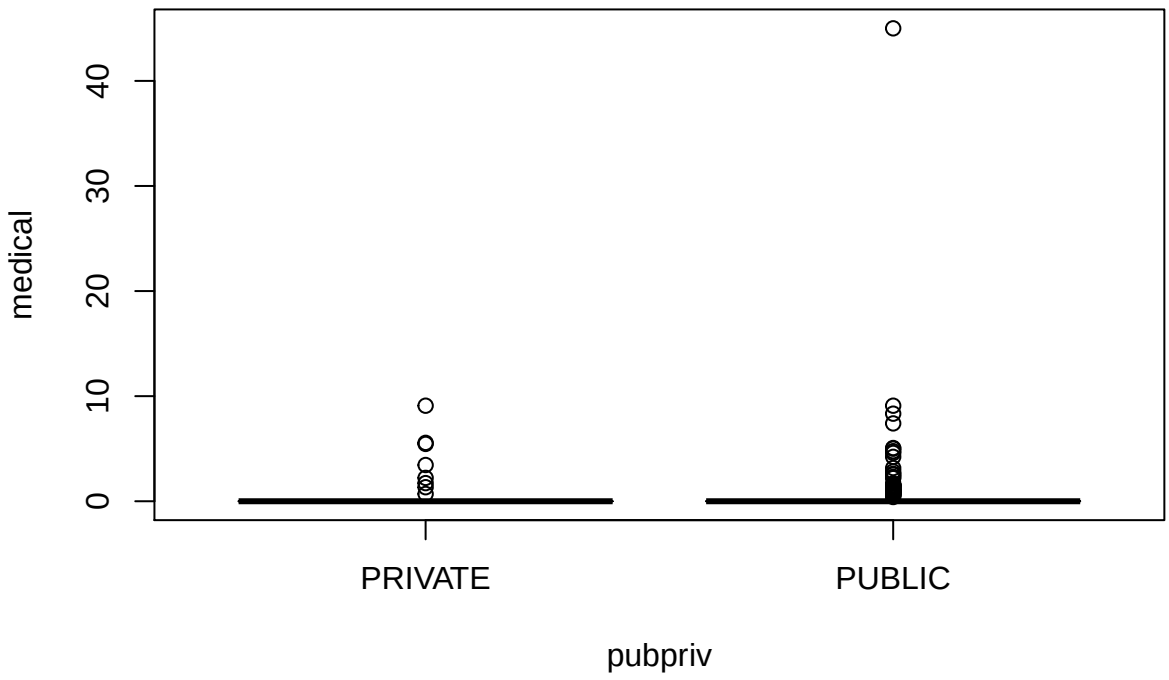
```r
# First Looks

hist(sqrt(pub_schools$medical))
```



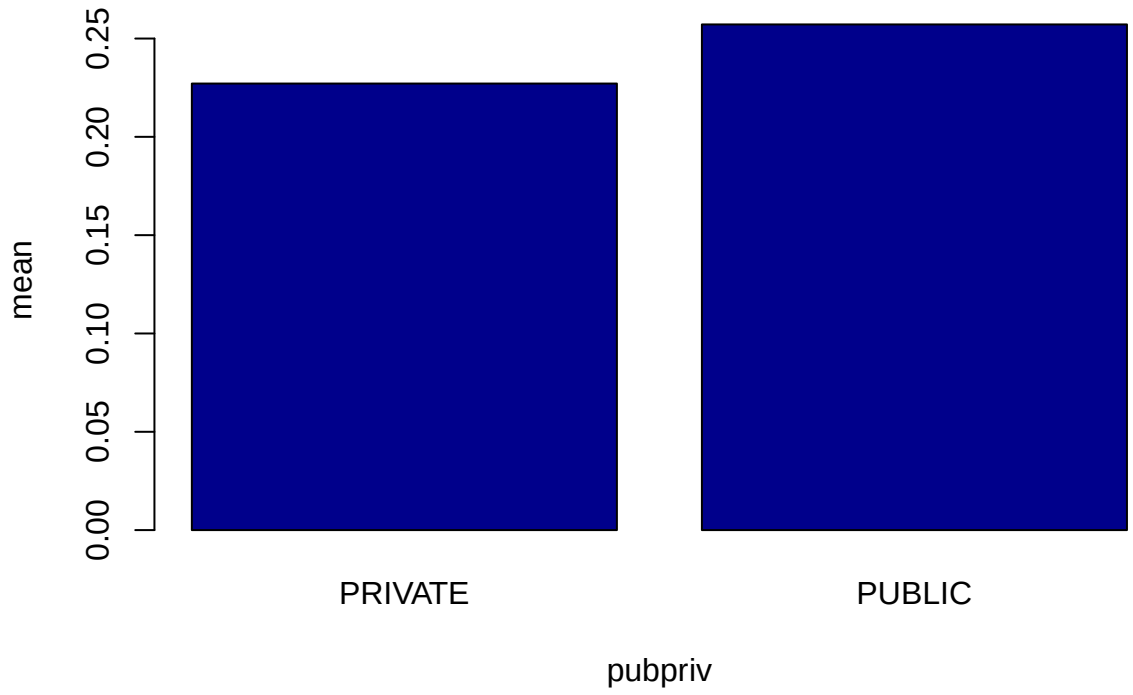

```r
hist(sqrt(private_schools$medical))
```




```
boxplot(medical ~ pubpriv, data = sample)
```




```
mp_data <- group_by(sample, pubpriv) %>%
  summarise(
    count = n(),
    mean = mean(medical, na.rm = TRUE),
    median = median(medical, na.rm = TRUE),
    sd = sd(medical, na.rm = TRUE),
    totale = sum(enrollment),
    totalm = sum(medtotal)
  )

barplot(mean ~ pubpriv, data = mp_data, col= 'Dark Blue')
```



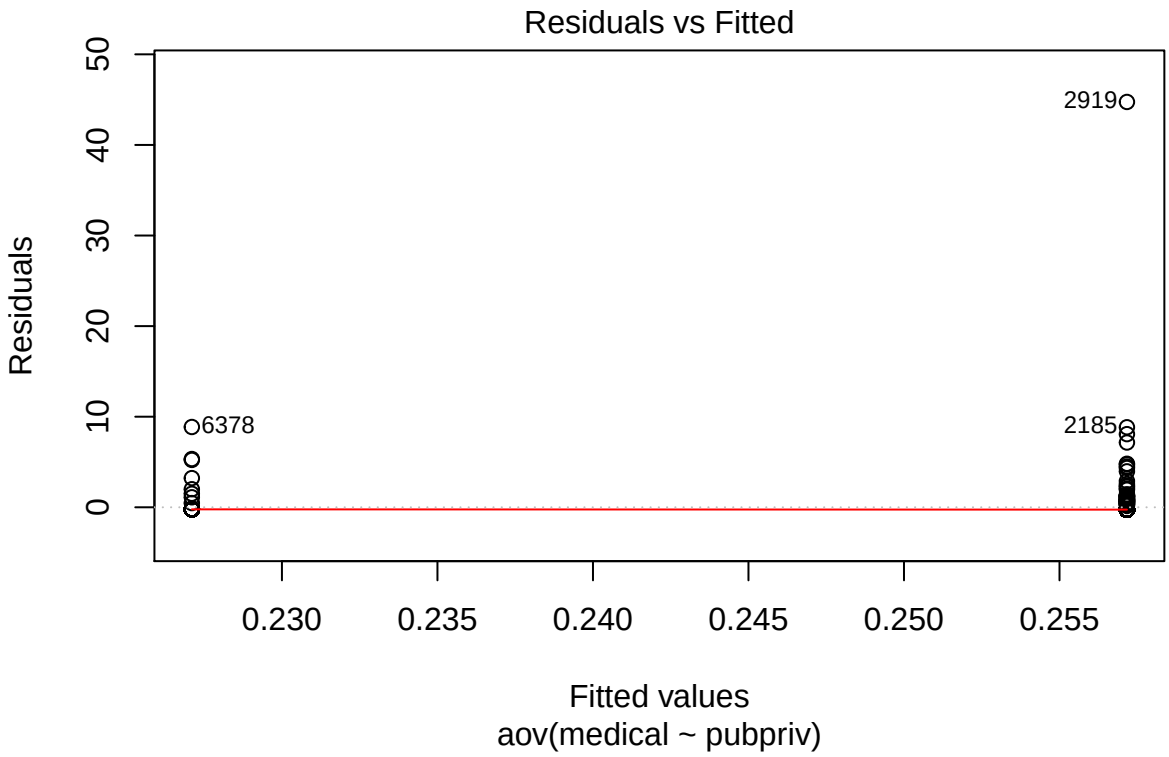
Anova

```
# Compute the analysis of variance
mp_dataov <- aov(medical ~ pubpriv, data = sample)
# Summary of the analysis
summary(mp_dataov)
```

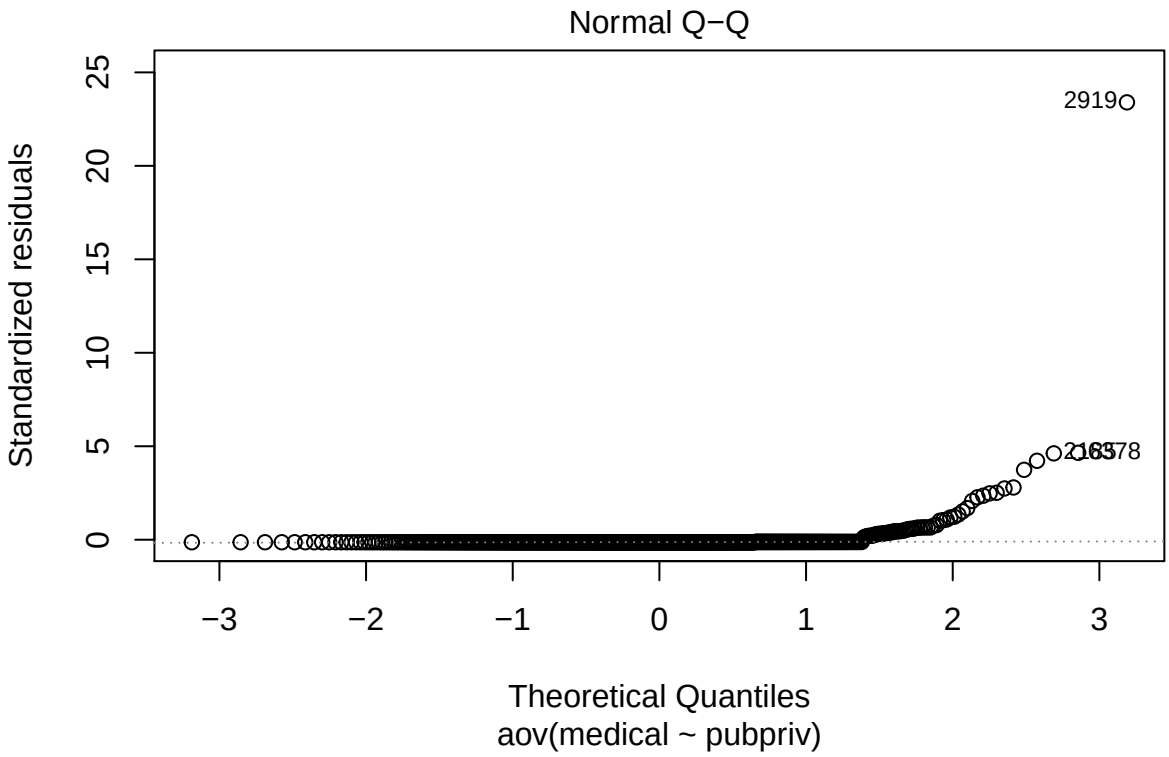
```
##              Df Sum Sq Mean Sq F value Pr(>F)
## pubpriv       1    0.1   0.096   0.026  0.872
## Residuals   696 2549.7   3.663
```

As the p-value is not less than the significance level 0.05, we cannot conclude that there are significant differences between public and private school vaccination based soledly on variation.

```
# Diagnostics
# 1. Homogeneity of variances
plot(mp_dataov, 1)
```




```
# 2. Normality
plot(mp_dataov, 2)
```




```
# Extract the residuals
aov_residuals <- residuals(object = mp_dataov)
# Run Shapiro-Wilk test
shapiro.test(x = aov_residuals)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  aov_residuals
## W = 0.10548, p-value < 2.2e-16
```

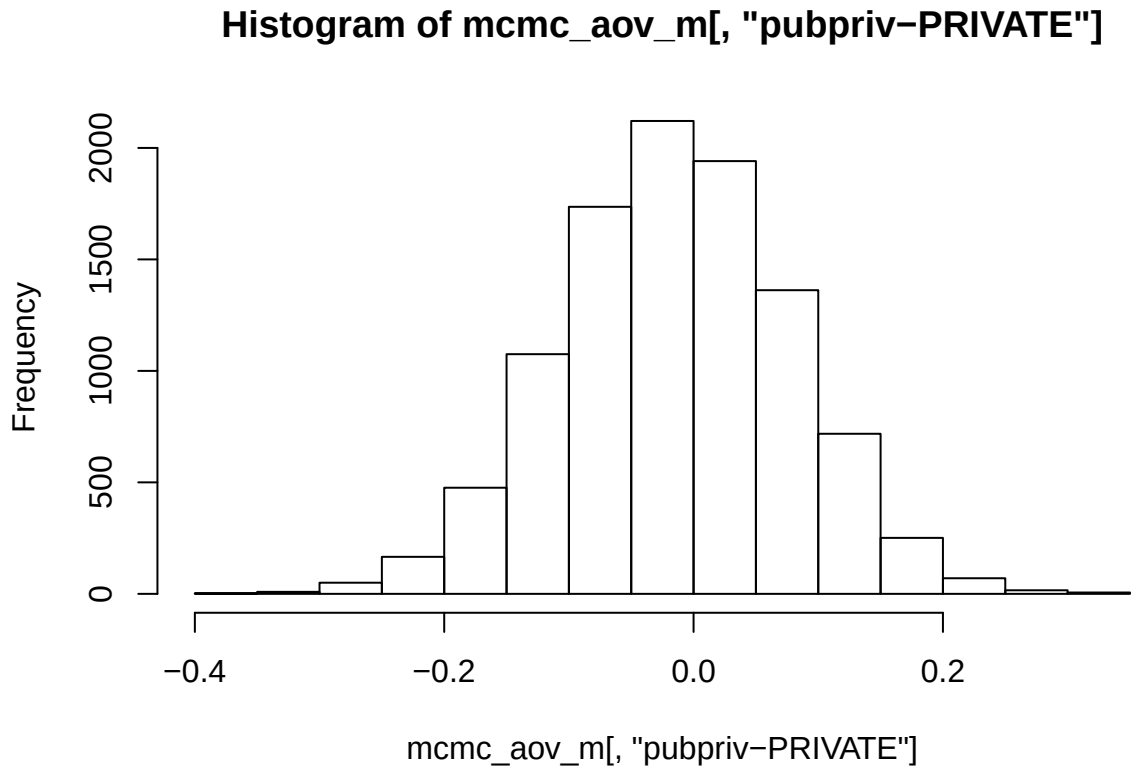
While the Shapiro test can show us that the data is normally ditributed. We can see in the residuals by quantile chart the effect that the skew has. A log transformation or square root may be approriate if this metric is to be used further for analysis.

```
# Bayesian Approach
mp_aov_bf <- anovaBF(medical ~ pubpriv, data = sample)
mcmc_aov_m <- posterior(mp_aov_bf, iteration=10000)
summary(mcmc_aov_m)
```

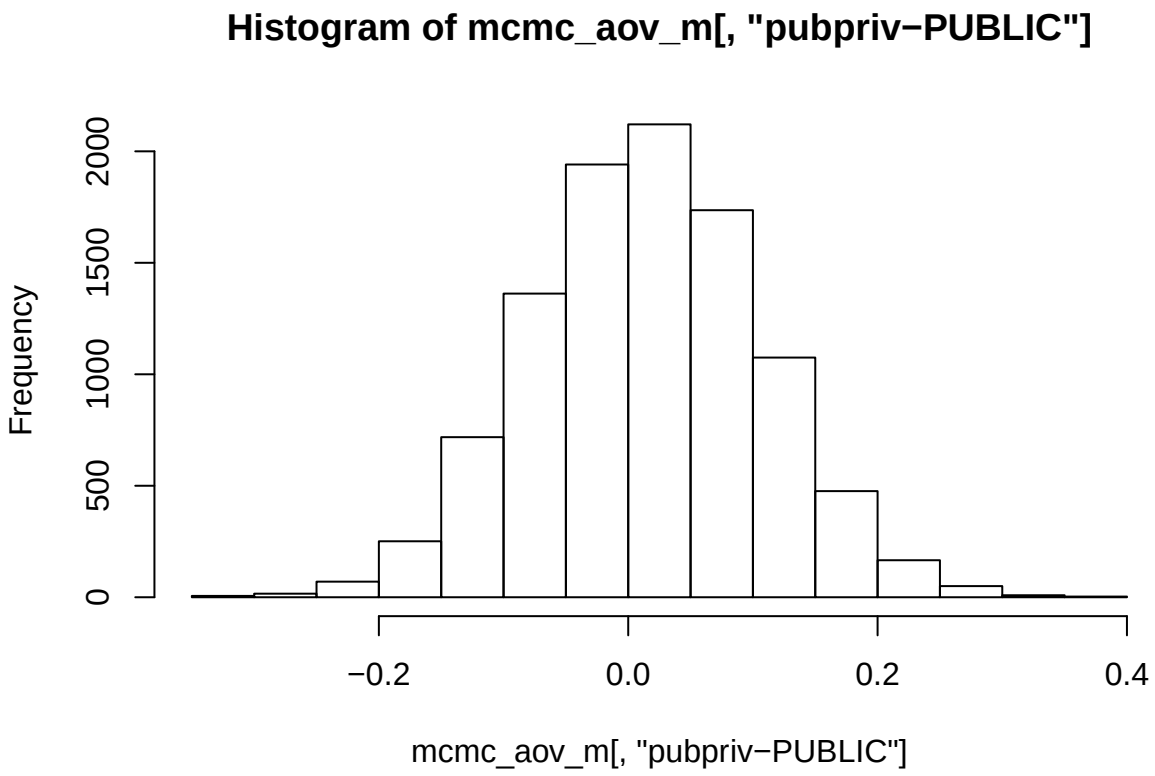
```
##
## Iterations = 1:10000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
```

```
##
##                       Mean       SD  Naive SE Time-series SE
## mu                 0.24257  0.09227 0.0009227      0.0009227
## pubpriv-PRIVATE -0.01522  0.09186 0.0009186      0.0009421
## pubpriv-PUBLIC   0.01522  0.09186 0.0009186      0.0009421
## sig2               3.67216  0.19409 0.0019409      0.0019409
## g_pubpriv          1.19477 24.15084 0.2415084      0.2415084
##
## 2. Quantiles for each variable:
##
##                       2.5%      25%      50%     75%  97.5%
## mu                 0.06215  0.18129  0.24205 0.30457 0.4209
## pubpriv-PRIVATE -0.19636 -0.07653 -0.01428 0.04771 0.1614
## pubpriv-PUBLIC  -0.16135 -0.04771  0.01428 0.07653 0.1964
## sig2               3.30553  3.53859  3.66370 3.79853 4.0703
## g_pubpriv          0.03437  0.09192  0.18478 0.43683 5.0903
```

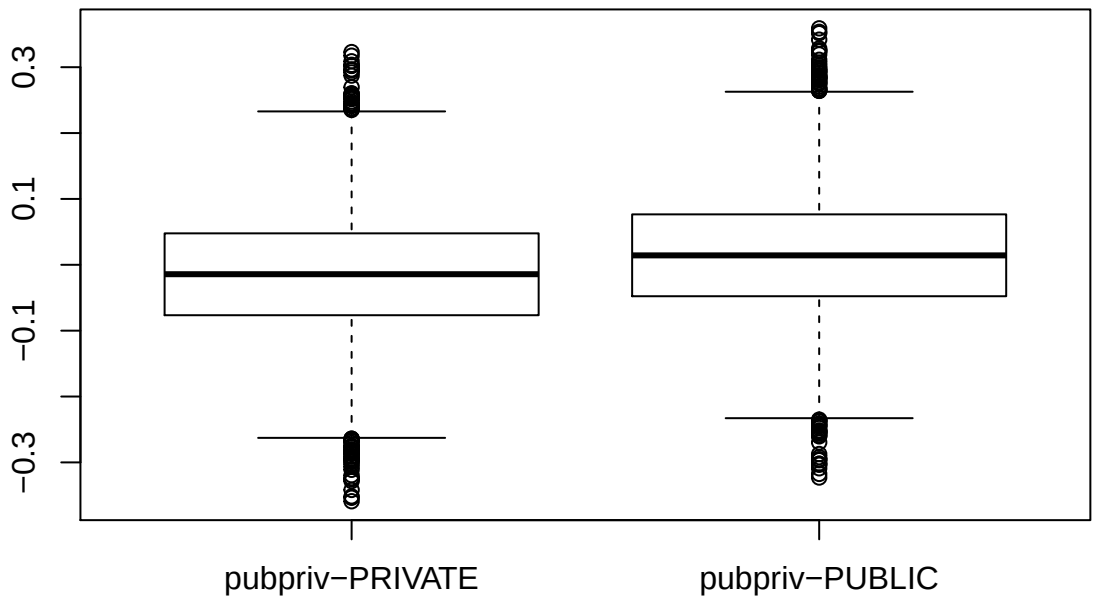
```
hist(mcmc_aov_m[,"pubpriv-PRIVATE"])
```




```
hist(mcmc_aov_m[,"pubpriv-PUBLIC"])
```




```
boxplot(as.matrix(mcmc_aov_m[,2:3]))
```



The Bayesian apporoach to Anova concurs with the frequentist approach in suggesting that there is not a difference in the mean population.

2 sample T Test

```
t.test(medical ~ pubpriv, data = sample)
```

```
##
##  Welch Two Sample t-test
##
## data:  medical by pubpriv
## t = -0.23139, df = 360.47, p-value = 0.8171
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2855895  0.2254581
## sample estimates:
## mean in group PRIVATE  mean in group PUBLIC
##             0.2271033             0.2571690
```

```
wilcox.test(medical**10 ~ pubpriv, data = sample)
```

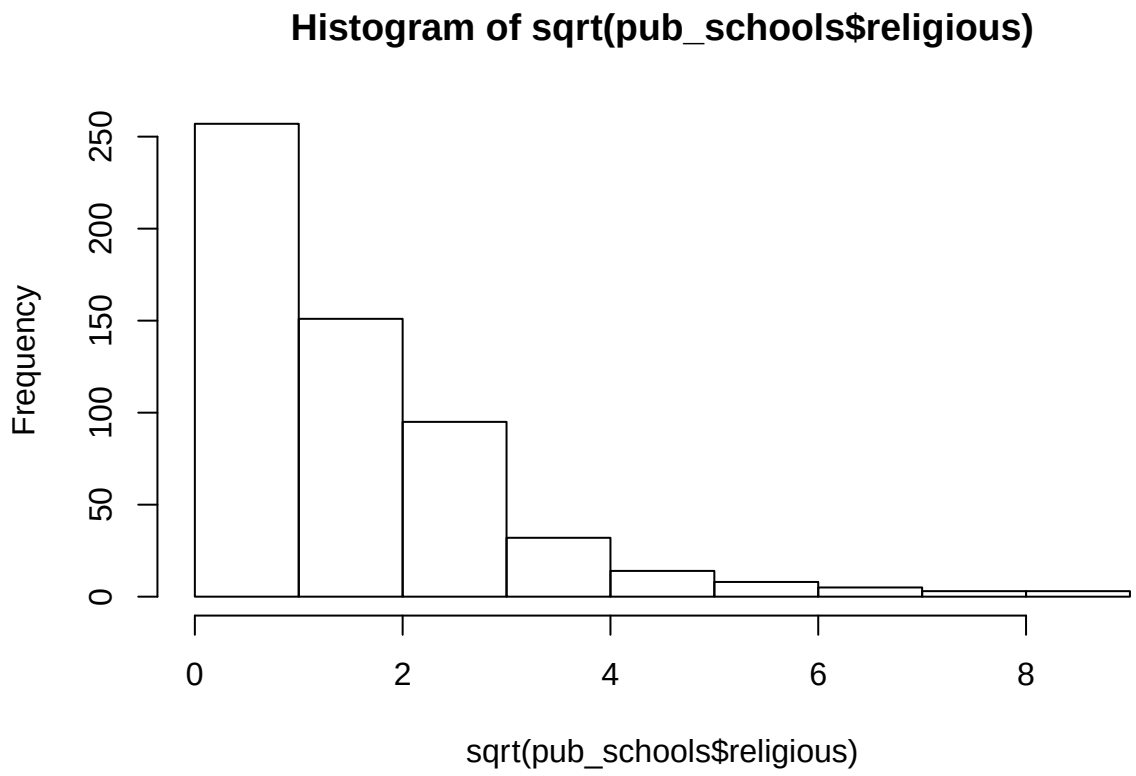
```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  medical^10 by pubpriv
## W = 36027, p-value = 0.3687
## alternative hypothesis: true location shift is not equal to 0
```

```r
#install.packages('effsize')
library(effsize)
cohen.d(sample$medical[sample$pubpriv == 'PUBLIC'], sample$medical[sample$pubpriv == 'PRIVATE'])
```

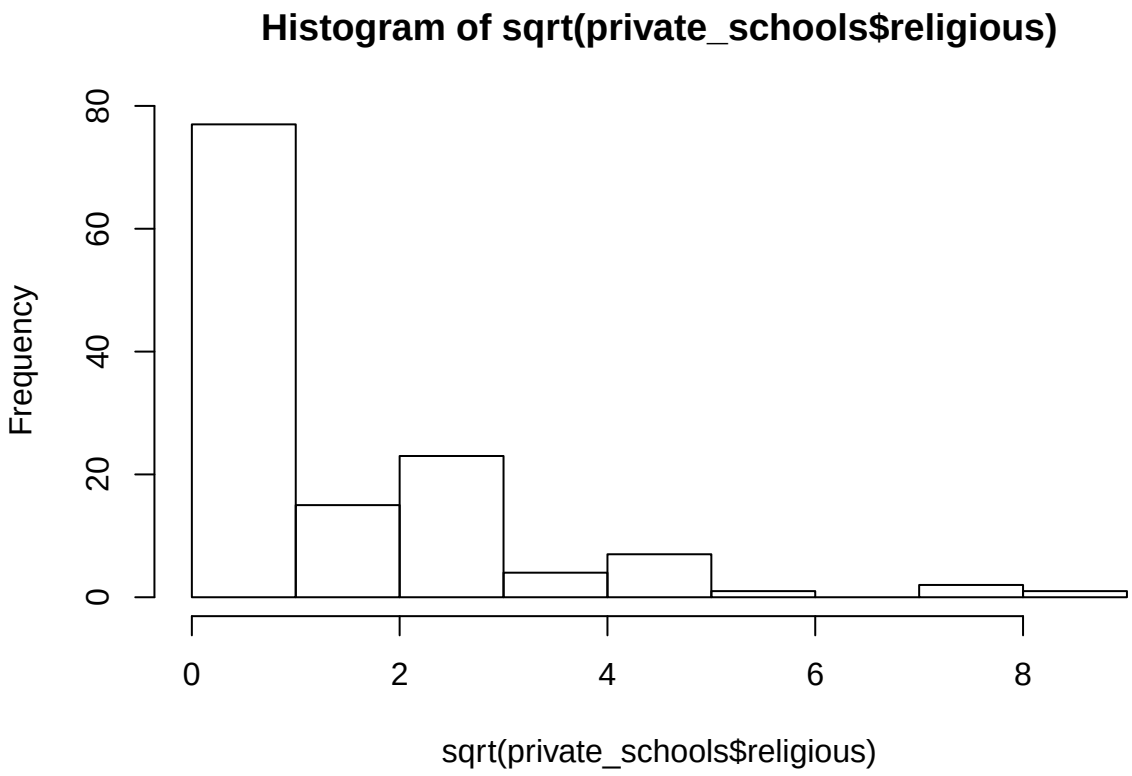
```
##
## Cohen's d
##
## d estimate: 0.01570839 (negligible)
## 95 percent confidence interval:
##      lower      upper
## -0.1751846  0.2066013
```

An incredibly small effect size wich crosses 0 suggests again that we cannot conclude there is a significant difference ### 8. Religious/belief exemptions between public and private schools. Are there any credible differences?

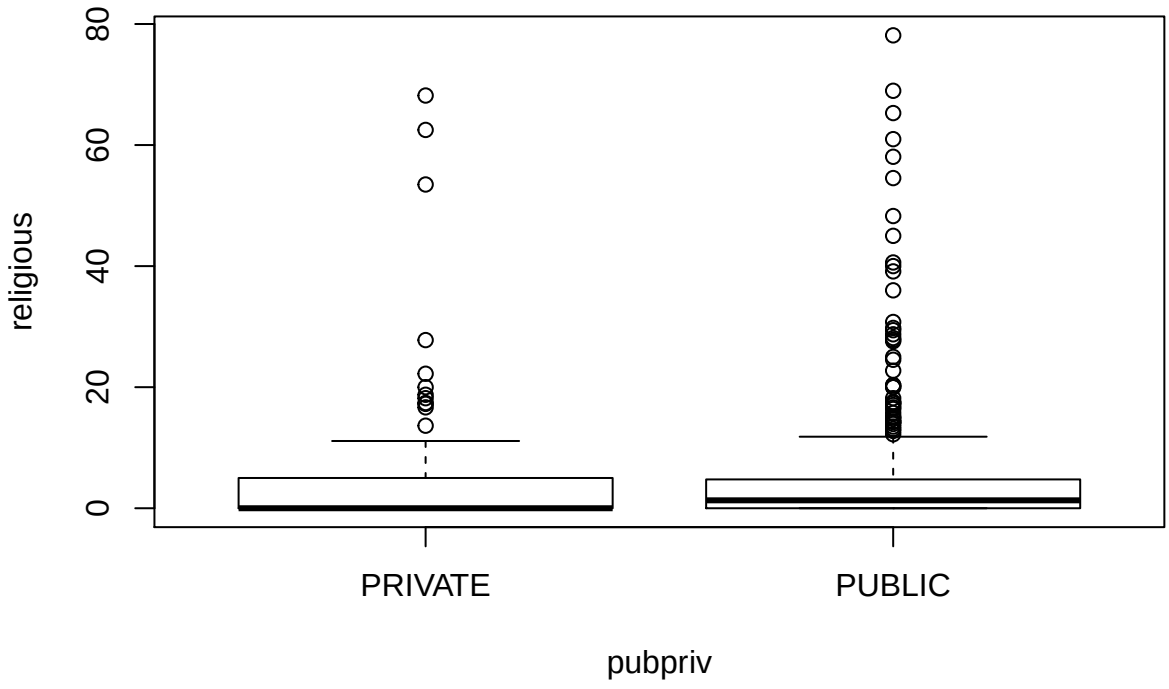
```r
# First Looks

hist(sqrt(pub_schools$religious))
```



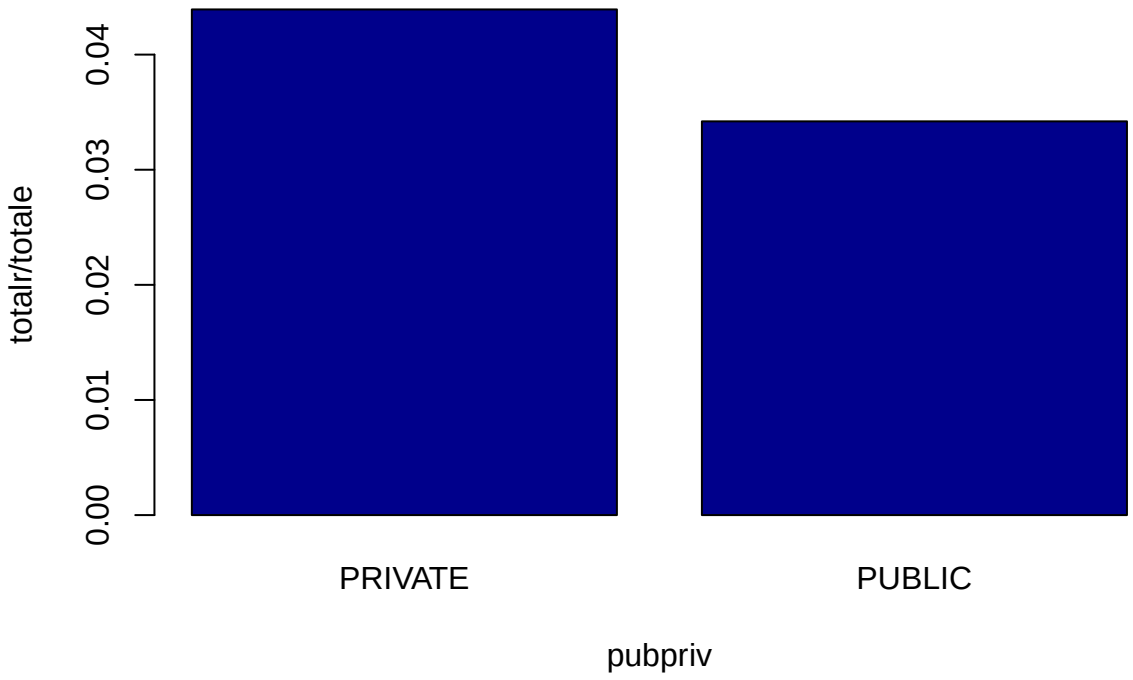

```r
hist(sqrt(private_schools$religious))
```



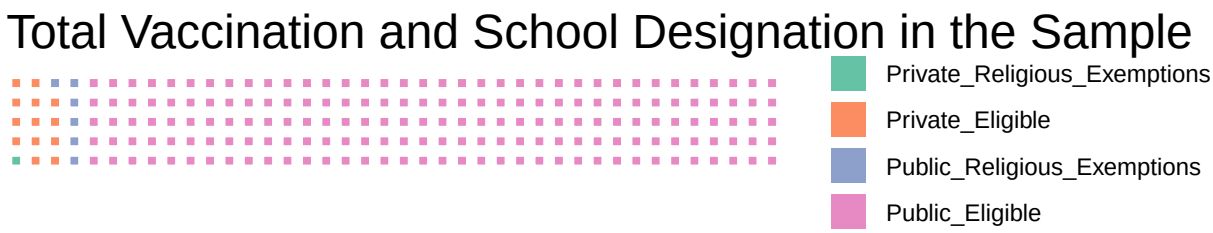

```
boxplot(religious ~ pubpriv, data = sample)
```



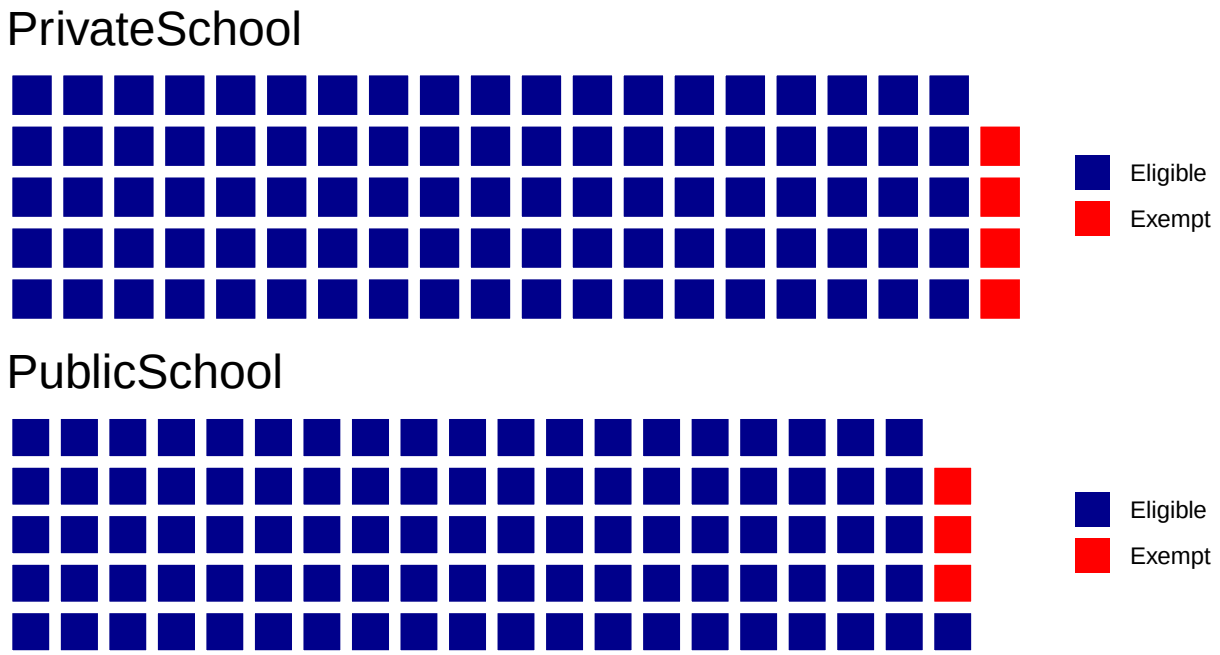

```
rp_data <- group_by(sample, pubpriv) %>%
  summarise(
    count = n(),
    mean = mean(religious, na.rm = TRUE),
    median = median(religious, na.rm = TRUE),
    sd = sd(religious, na.rm = TRUE),
    totale = sum(enrollment),
    totalr = sum(reltotal)
  )

barplot(totalr/totale ~ pubpriv, data = rp_data, col= 'Dark Blue')
```




```
rv <- c( Private_Religious_Exemptions = rp_data$totalr[1],
         Private_Eligible = (rp_data$totale[1] - rp_data$totalr[1]),
         Public_Religious_Exemptions  = rp_data$totalr[2],
         Public_Eligible = (rp_data$totale[2] - rp_data$totalr[2])
          )
rv <- round((rv/sum(rv))*200)

waffle(rv, rows = 5, title = "Total Vaccination and School Designation in the Sample")
```




```
iron(
  waffle(c(Eligible = 100*((rp_data$totale[1]-rp_data$totalr[1])/rp_data$totale[1]),
           Exempt =  100*(rp_data$totalr[1]/rp_data$totale[1])
           ),
  rows = 5, colors = c("darkblue","red"), title = "PrivateSchool"),

  waffle(c(Eligible = 100*((rp_data$totale[2]-rp_data$totalr[2])/rp_data$totale[2]),
           Exempt =  100*(rp_data$totalr[2]/rp_data$totale[2])
           ),
         rows = 5, colors = c("darkblue","red"), title = "PublicSchool")
)
```



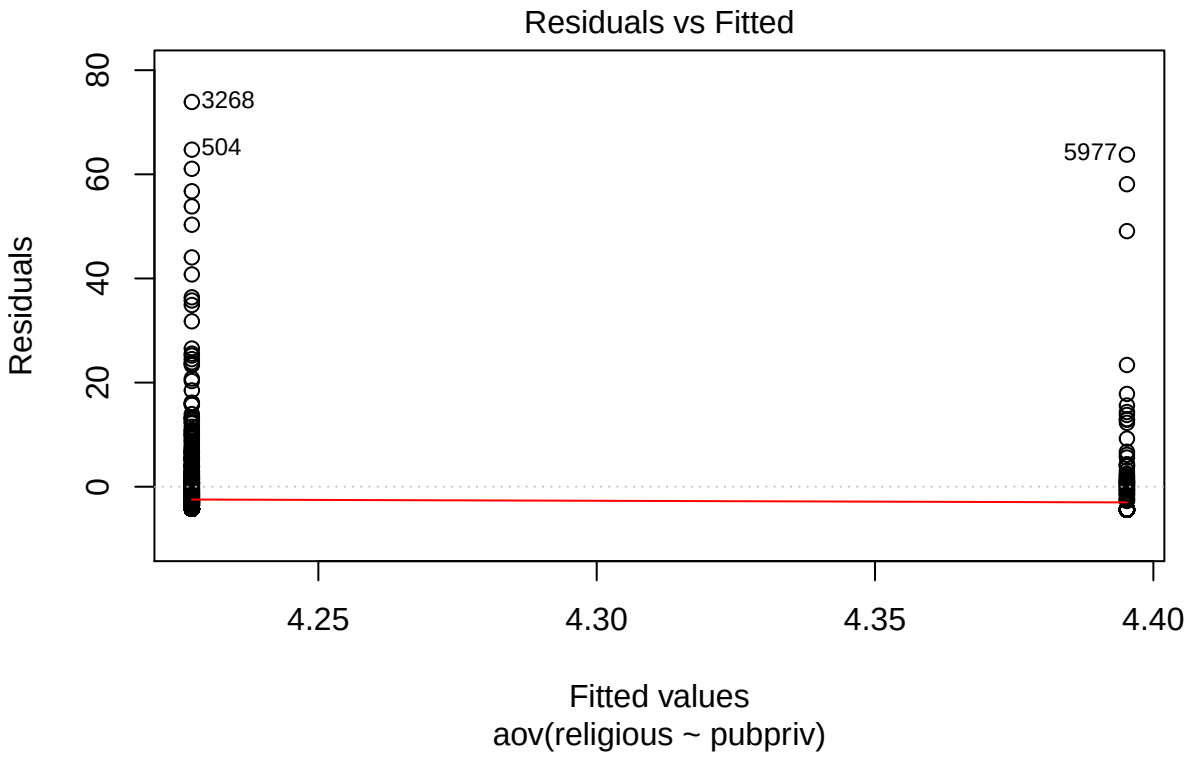
Anova

```
# Compute the analysis of variance
rp_dataov <- aov(religious ~ pubpriv, data = sample)
# Summary of the analysis
summary(rp_dataov)
```

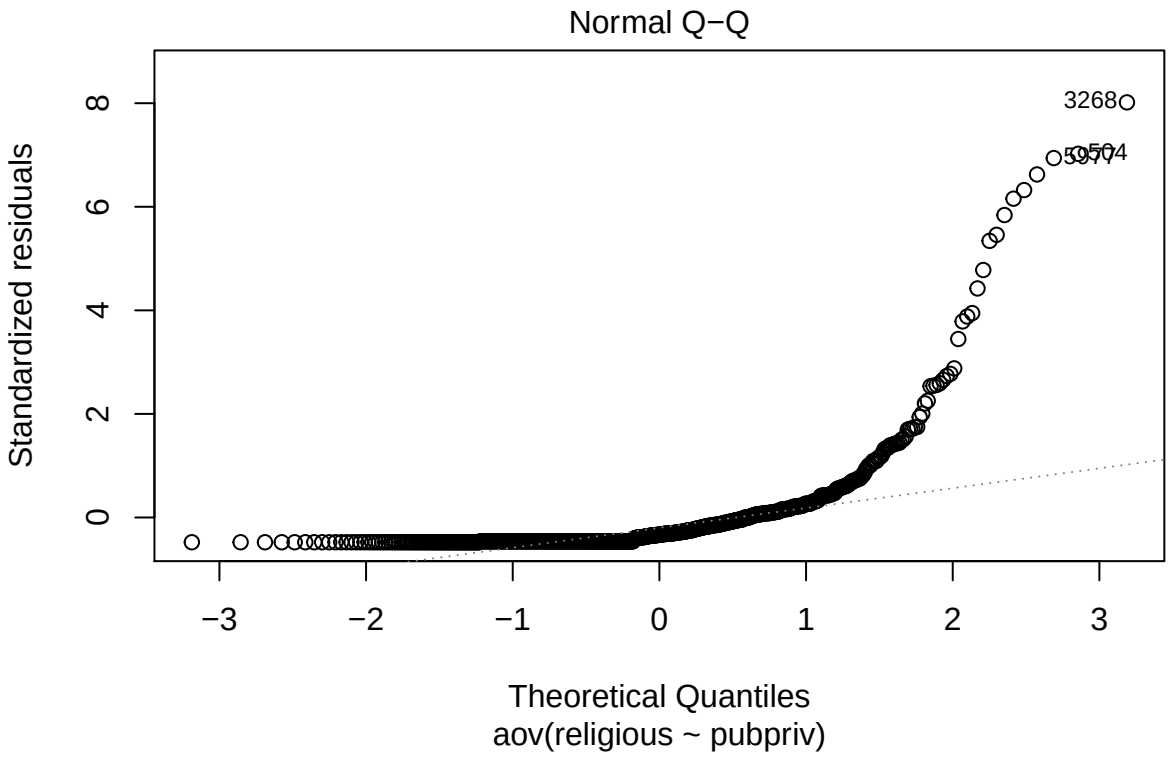
```
##              Df Sum Sq Mean Sq F value Pr(>F)
## pubpriv       1      3    2.98   0.035  0.852
## Residuals   696  59242   85.12
```

As the p-value is not less than the significance level 0.05, we cannot conclude that there are significant differences between public and private school vaccination based soledly on variation.

```
# Diagnostics
# 1. Homogeneity of variances
plot(rp_dataov, 1)
```




```
# 2. Normality
plot(rp_dataov, 2)
```




```
# Extract the residuals
aov_residuals <- residuals(object = rp_dataov)
# Run Shapiro-Wilk test
shapiro.test(x = aov_residuals)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  aov_residuals
## W = 0.4839, p-value < 2.2e-16
```

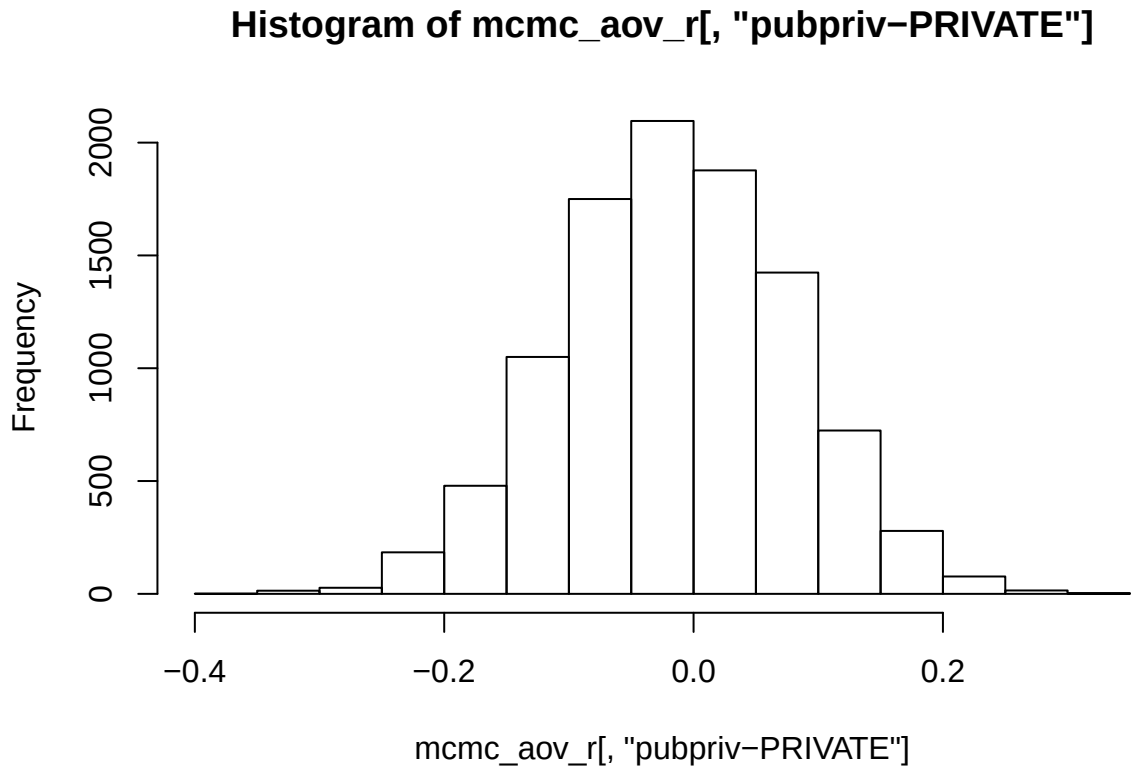
While the Shapiro test can show us that the data is normally ditributed. We can see in the residuals by quantile chart the effect that the skew has. A log transformation or square root may be approriate if this metric is to be used further for analysis.

```
# Bayesian Approach
r_aov_bf <- anovaBF(religious ~ pubpriv, data = sample)
mcmc_aov_r <- posterior(mp_aov_bf, iteration=10000)
summary(mcmc_aov_r)
```

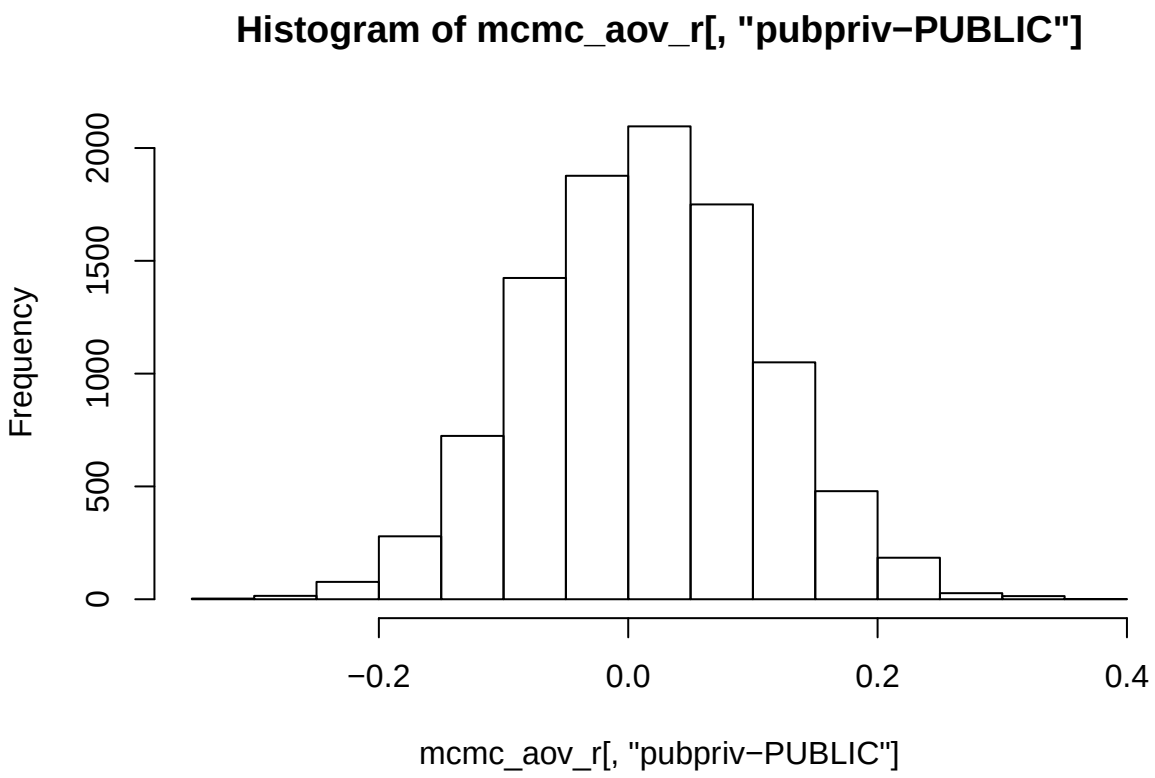
```
##
## Iterations = 1:10000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
```

```
##
##                       Mean       SD  Naive SE Time-series SE
## mu                 0.24276  0.09260 0.0009260      0.0008971
## pubpriv-PRIVATE -0.01337  0.09252 0.0009252      0.0009056
## pubpriv-PUBLIC   0.01337  0.09252 0.0009252      0.0009056
## sig2               3.66617  0.19467 0.0019467      0.0019660
## g_pubpriv          1.15467 15.93368 0.1593368      0.1740758
##
## 2. Quantiles for each variable:
##
##                       2.5%      25%     50%     75%  97.5%
## mu                 0.05646  0.18148  0.2440 0.30528 0.4209
## pubpriv-PRIVATE -0.19458 -0.07511 -0.0136 0.05088 0.1650
## pubpriv-PUBLIC  -0.16500 -0.05088  0.0136 0.07511 0.1946
## sig2               3.30364  3.52986  3.6589 3.79248 4.0703
## g_pubpriv          0.03486  0.09135  0.1817 0.43706 4.4680
```

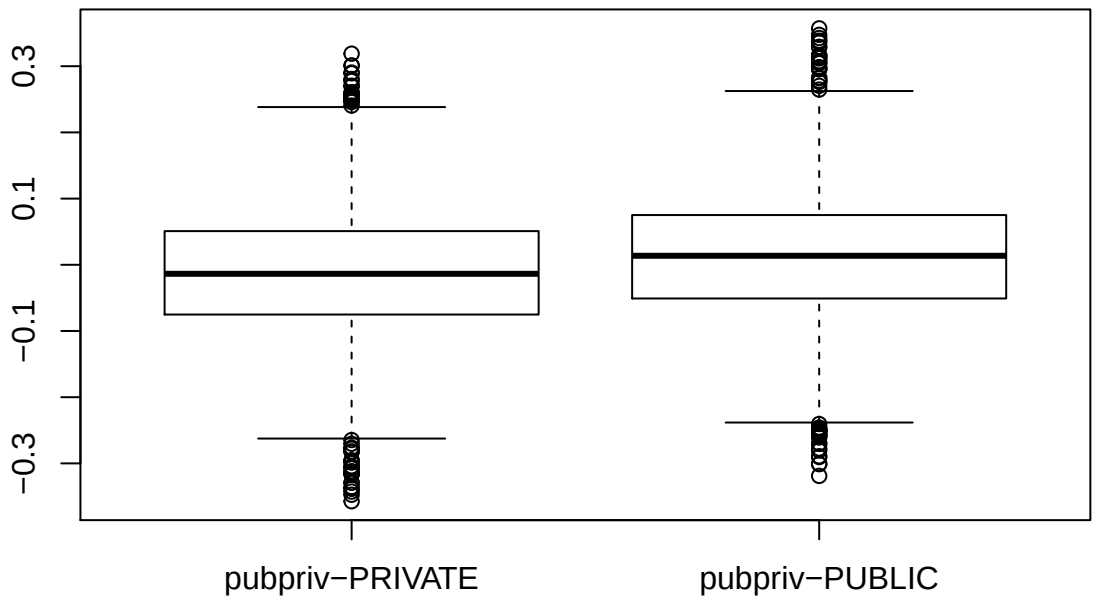
```
hist(mcmc_aov_r[,"pubpriv-PRIVATE"])
```




```
hist(mcmc_aov_r[,"pubpriv-PUBLIC"])
```




```
boxplot(as.matrix(mcmc_aov_r[,2:3]))
```



2 sample T Test

```
rp_t <- t.test(religious ~ pubpriv, data = sample)
rp_t
```

```
##
##  Welch Two Sample t-test
##
## data:  religious by pubpriv
## t = 0.1717, df = 176.42, p-value = 0.8639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.762772  2.098727
## sample estimates:
## mean in group PRIVATE  mean in group PUBLIC
##              4.395253              4.227275
```

```
rp_tw <- wilcox.test(religious ~ pubpriv, data = sample)
rp_tw
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  religious by pubpriv
## W = 32778, p-value = 0.03741
## alternative hypothesis: true location shift is not equal to 0
```

```
#install.packages('effsize')
library(effsize)
cohen.d(sample$medical[sample$pubpriv == 'PUBLIC'], sample$medical[sample$pubpriv == 'PRIVATE'])
```

```
##
## Cohen's d
##
## d estimate: 0.01570839 (negligible)
## 95 percent confidence interval:
##      lower      upper
## -0.1751846  0.2066013
```

Predictive Analyses:

After the following explanation it appears the most important distinction is not just total vaccination rates but the portion of that which is a religious exemption we will test this assumption by trying to make predictions

9. Is it possible to predict whether a school is public or private based on conditional, medical, and religious percentages? If so, what are the specifics?

Data Prep

```
m_sample <- reportSample # Put data in into a new variable for integrity
m_sample$nonvax <- sample$conditional + sample$medical + sample$religious # keep total number of percen
m_sample$conditional_t <- sample$conditional
m_sample$conditional <- sample$conditional /(100 - sample$allvaccs) #Measure the portion of all non cov
m_sample$medical_t <- sample$medical
m_sample$medical <- sample$medical/(100 - sample$allvaccs)
m_sample$not_r <-(100 - sample$allvaccs) - m_sample$religious
m_sample$rel_t <- sample$religious
m_sample$religious <- sample$religious/(100 - sample$allvaccs)
m_sample$uc_religious <-  scale(m_sample$religious - m_sample$conditional)+2


m_sample<- m_sample[complete.cases(m_sample),]
```

I created a variable to represent the portion of all execeptions then the portion of exception which fall into each category. After observing the correlations below I created a variable that is meant to esetimate the unconditional religious exemptions. Then one that is the total percentage of non relious

```
cor(m_sample[,c( 'enrollment', 'allvaccs', 'conditional', 'medical', 'religious')])
```

```
##              enrollment    allvaccs conditional     medical   religious
## enrollment   1.00000000  0.26410163  0.08487386  0.03205594 -0.09626620
## allvaccs     0.26410163  1.00000000  0.01553205  0.04436259 -0.02935245
## conditional  0.08487386  0.01553205  1.00000000 -0.21159875 -0.95458248
## medical      0.03205594  0.04436259 -0.21159875  1.00000000 -0.08921181
## religious   -0.09626620 -0.02935245 -0.95458248 -0.08921181  1.00000000
```

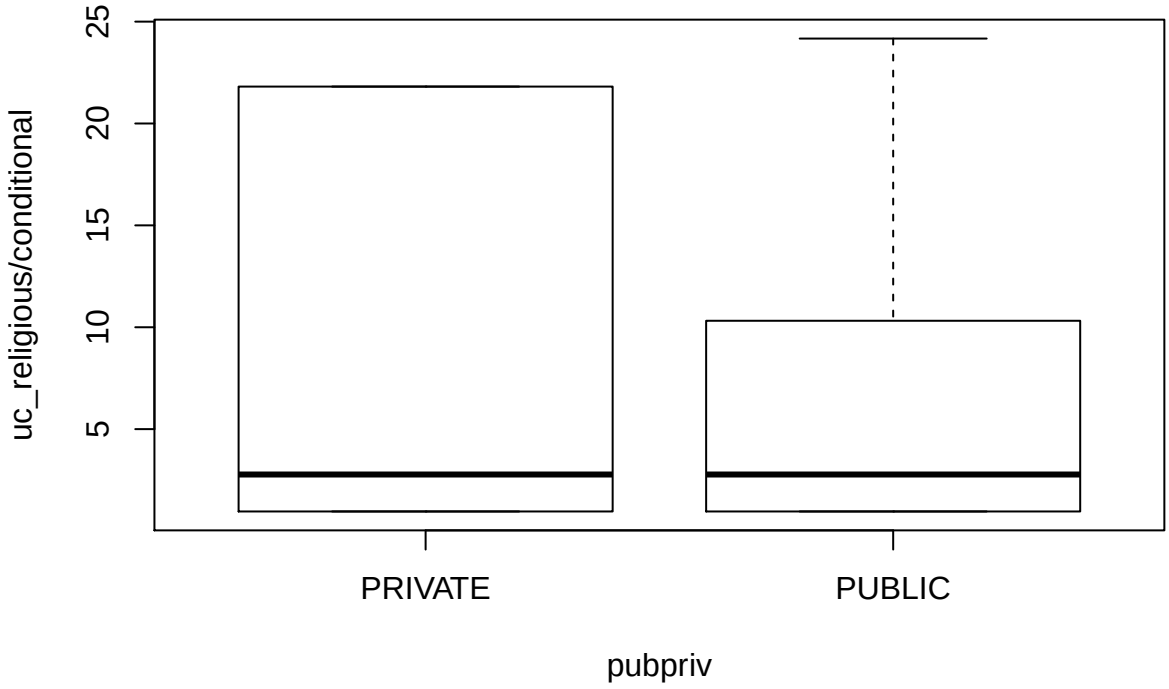
```
cor(sample[,c( 'enrollment', 'allvaccs', 'conditional', 'medical', 'religious')])
```

```
##              enrollment   allvaccs conditional     medical   religious
## enrollment   1.00000000  0.1603069 -0.07461074 -0.04855299 -0.14912471
## allvaccs     0.16030689  1.0000000 -0.72211949 -0.14039433 -0.69555970
## conditional -0.07461074 -0.7221195  1.00000000 -0.01190686  0.02542797
## medical     -0.04855299 -0.1403943 -0.01190686  1.00000000  0.01273631
```

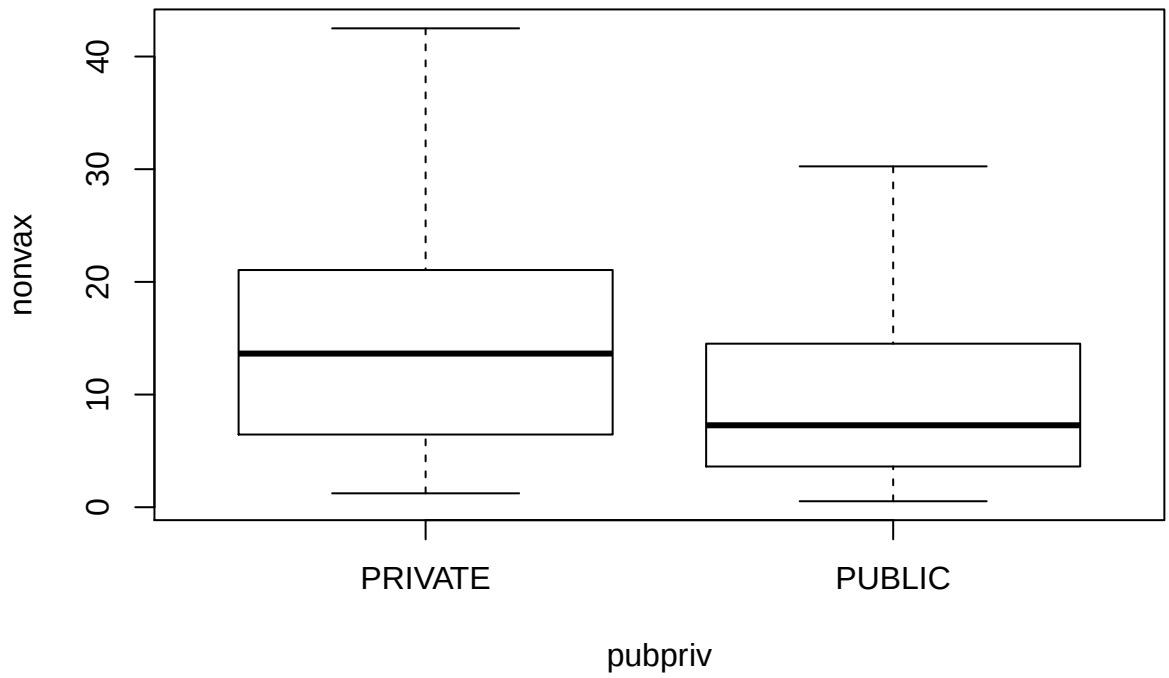
```
## religious   -0.14912471 -0.6955597  0.02542797  0.01273631  1.00000000
```

In the correlations we can see potential interactions we'll try to account for these

```
boxplot(uc_religious/conditional ~ pubpriv, data=m_sample, outline = FALSE)
```




```
boxplot(nonvax ~ pubpriv, data=m_sample, outline = FALSE)
```



These variables give us a better view of the difference between public and private vaccination practices

Modeling with Multivariate Logistic Regression

```
# Base Model
summary(glm(formula = pubpriv ~ medical + religious + conditional, data=sample, family=binomial()))
```

```
##
## Call:
## glm(formula = pubpriv ~ medical + religious + conditional, family = binomial(),
##     data = sample)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8920   0.6262   0.6317   0.6414   0.7885
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.529516   0.125750  12.163   <2e-16 ***
## medical      0.008533   0.056112   0.152    0.879
## religious   -0.001733   0.010314  -0.168    0.867
## conditional -0.007414   0.009525  -0.778    0.436
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
```

```
##     Null deviance: 671.10  on 697  degrees of freedom
## Residual deviance: 670.46  on 694  degrees of freedom
## AIC: 678.46
##
## Number of Fisher Scoring iterations: 4
```

```
# Modified
priv_glm <- glm(formula = pubpriv ~ uc_religious/conditional + nonvax, data=m_sample, family=binomial())

summary(priv_glm)
```

```
##
## Call:
## glm(formula = pubpriv ~ uc_religious/conditional + nonvax, family = binomial(),
##     data = m_sample)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.2550   0.4319   0.5144   0.5584   1.1794
##
## Coefficients:
##                            Estimate Std. Error z value Pr(>|z|)
## (Intercept)                0.914075   0.706375   1.294 0.195653
## uc_religious               0.280612   0.191385   1.466 0.142589
## nonvax                    -0.024786   0.006869  -3.608 0.000308 ***
## uc_religious:conditional   0.859802   0.456588   1.883 0.059687 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 495.62  on 607  degrees of freedom
## Residual deviance: 480.87  on 604  degrees of freedom
## AIC: 488.87
##
## Number of Fisher Scoring iterations: 4
```

Our transformations were able to lower the AIC, and increase Null deviance as well as residual diviance #### Model Evaluation

```
exp(coef(priv_glm))
```

```
##              (Intercept)             uc_religious                   nonvax
##                2.4944673                1.3239396              0.9755189
## uc_religious:conditional
##                2.3626926
```

```
exp(confint(priv_glm))
```

```
## Waiting for profiling to be done...
```

```
##                               2.5 %    97.5 %
## (Intercept)                0.6205409 9.9754928
## uc_religious               0.9121479 1.9361487
## nonvax                     0.9625198 0.9890036
## uc_religious:conditional 0.9805836 5.9056087
```

Here we see that the coeffecitient log odds are all right are still hovering close to 1. This would indicate that

they have very little effect on the models ability to make a prediction. However, the uncoditional religious variable does reach into the high 5s.

```
anova(priv_glm, test = 'Chisq')
```

```
## Analysis of Deviance Table
##
## Model: binomial, link: logit
##
## Response: pubpriv
##
## Terms added sequentially (first to last)
##
##
##                           Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
## NULL                                        607     495.62
## uc_religious               1   0.0372       606     495.58 0.8471206
## nonvax                     1  11.0457       605     484.54 0.0008889 ***
## uc_religious:conditional   1   3.6695       604     480.87 0.0554168 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#install.packages("BaylorEdPsych")
library(BaylorEdPsych)
PseudoR2(priv_glm)
```

```
##         McFadden     Adj.McFadden        Cox.Snell       Nagelkerke
##      0.029765493      0.009588743      0.023971771      0.043003827
## McKelvey.Zavoina           Effron            Count        Adj.Count
##      0.047048353      0.021607735      0.856907895     -0.011627907
##              AIC    Corrected.AIC
##    488.867587496    488.933922487
```

```
library(caret)
```

```
## Loading required package: lattice
```

```
cm <- table(round(predict(priv_glm, type = "response")), as.integer(m_sample$pubpriv)-1)
confusionMatrix(cm)
```

```
## Confusion Matrix and Statistics
##
##
##       0   1
##   0   0   1
##   1  86 521
##
##                Accuracy : 0.8569
##                  95% CI : (0.8265, 0.8838)
##     No Information Rate : 0.8586
##     P-Value [Acc > NIR] : 0.5746
##
##                   Kappa : -0.0033
##
##  Mcnemar's Test P-Value : <2e-16
##
##             Sensitivity : 0.000000
```

```
##             Specificity : 0.998084
##          Pos Pred Value : 0.000000
##          Neg Pred Value : 0.858320
##              Prevalence : 0.141447
##          Detection Rate : 0.000000
##    Detection Prevalence : 0.001645
##       Balanced Accuracy : 0.499042
##
##        'Positive' Class : 0
##
```

With the results it is clear that it is not reasonable to try to predict whether a school is private or public

Bayesian Approach

```
#install.packages("MCMCpack")

library(MCMCpack)
```

```
## Loading required package: MASS
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select
```

```
## ##
## ## Markov Chain Monte Carlo Package (MCMCpack)
```

```
## ## Copyright (C) 2003-2020 Andrew D. Martin, Kevin M. Quinn, and Jong Hee Park
```

```
## ##
## ## Support provided by the U.S. National Science Foundation
```

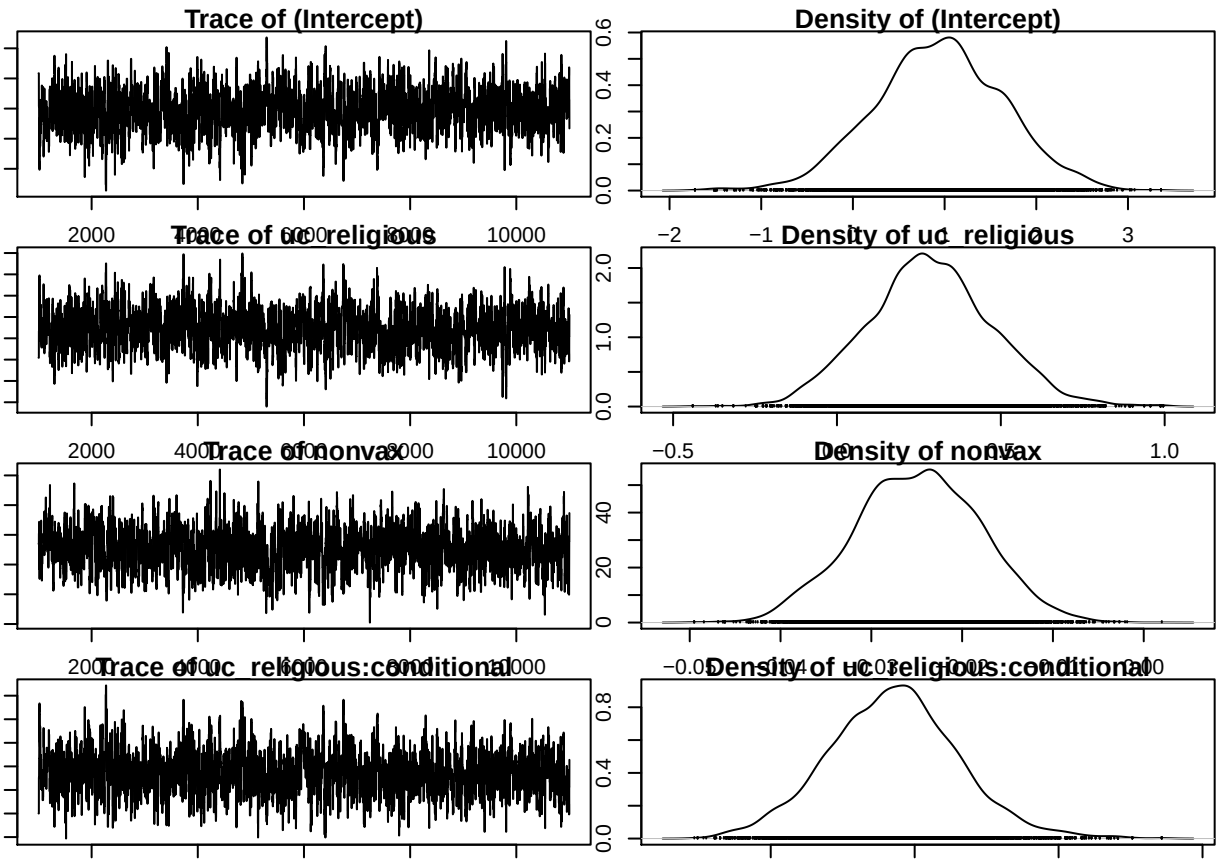
```
## ## (Grants SES-0350646 and SES-0350613)
## ##
```

```
m_sample$pubpriv_n <- as.integer(m_sample$pubpriv)-1
bayesLogit <- MCMClogit(formula = pubpriv_n ~ uc_religious/conditional + nonvax, data=m_sample)
summary(bayesLogit)
```

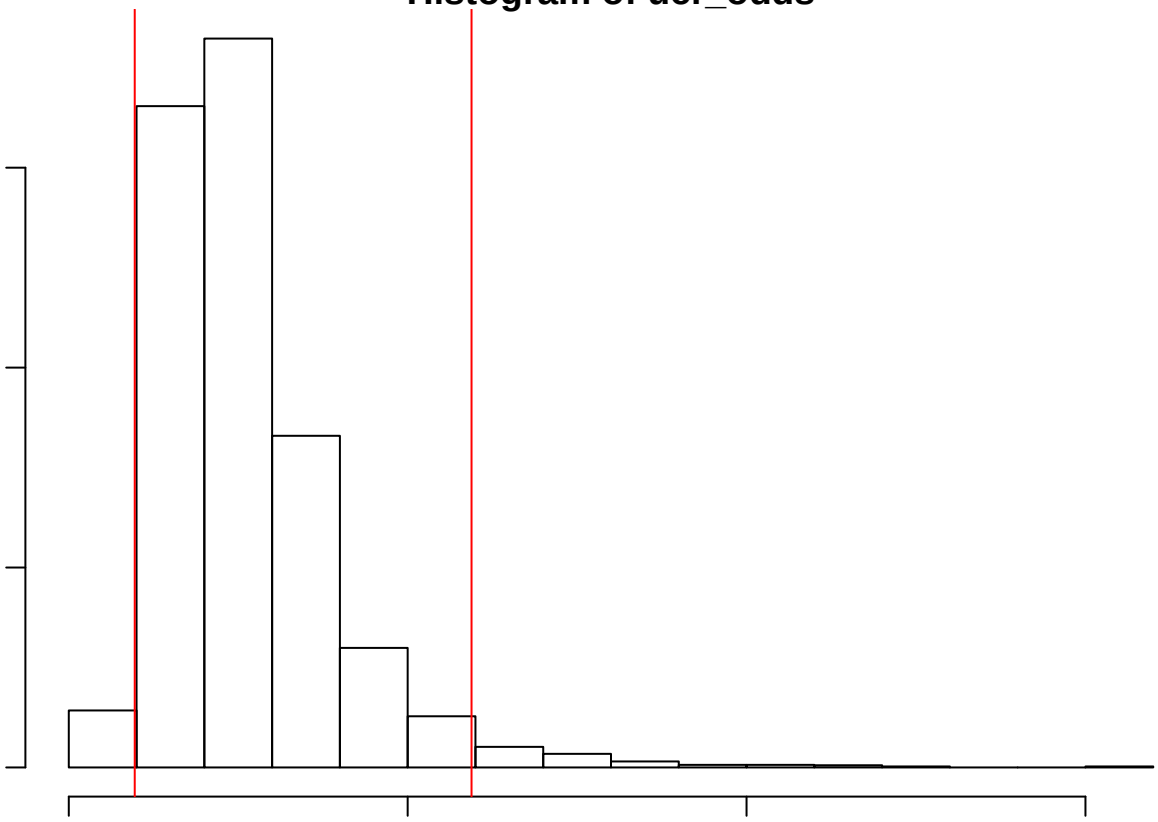
```
##
## Iterations = 1001:11000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 10000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##                              Mean       SD  Naive SE Time-series SE
## (Intercept)               0.93740 0.709609 7.096e-03      0.0261153
## uc_religious              0.28465 0.192157 1.922e-03      0.0071099
## nonvax                   -0.02493 0.006906 6.906e-05      0.0002509
## uc_religious:conditional  0.85324 0.452731 4.527e-03      0.0166822
##
## 2. Quantiles for each variable:
```

```
##
##                                2.5%      25%      50%      75%    97.5%
## (Intercept)                -0.44238  0.47988  0.94741  1.41871  2.34435
## uc_religious               -0.08724  0.16160  0.27757  0.40609  0.66303
## nonvax                     -0.03853 -0.02962 -0.02481 -0.02011 -0.01159
## uc_religious:conditional -0.02742  0.55584  0.85367  1.14173  1.78208
```

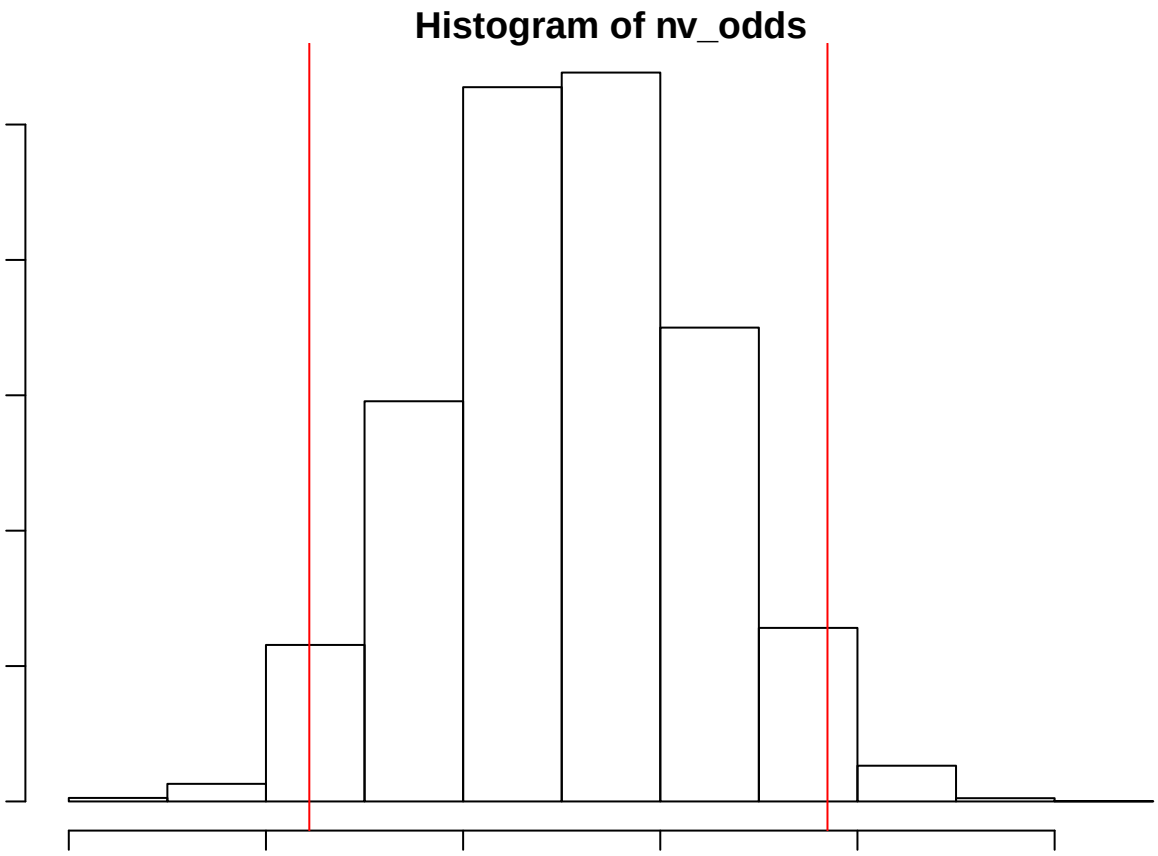
```
# Plot the densities
par(mar=c(1,1,1,1))
plot(bayesLogit)
```




```
# Plot odds for uc_religious rate
ucr_logOdds <- as.matrix(bayesLogit[,'uc_religious:conditional'])
ucr_odds <- apply(ucr_logOdds, 1, exp)
hist(ucr_odds)
abline(v=quantile(ucr_odds, c(0.025)),col='red')
abline(v=quantile(ucr_odds, c(0.975)),col='red')
```



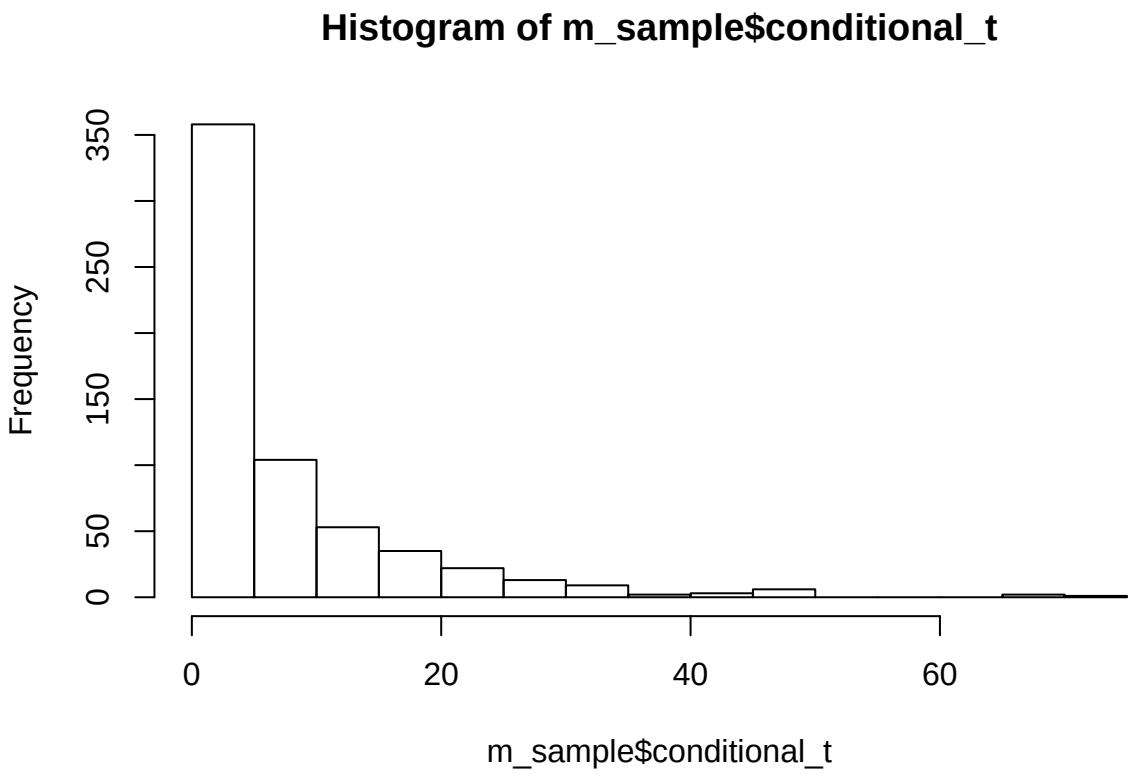

```
# Plot odds for nonvax
nv_logOdds <- as.matrix(bayesLogit[,'nonvax'])
nv_odds <- apply(nv_logOdds, 1, exp)
hist(nv_odds)
abline(v=quantile(nv_odds, c(0.025)),col='red')
abline(v=quantile(nv_odds, c(0.975)),col='red')
```



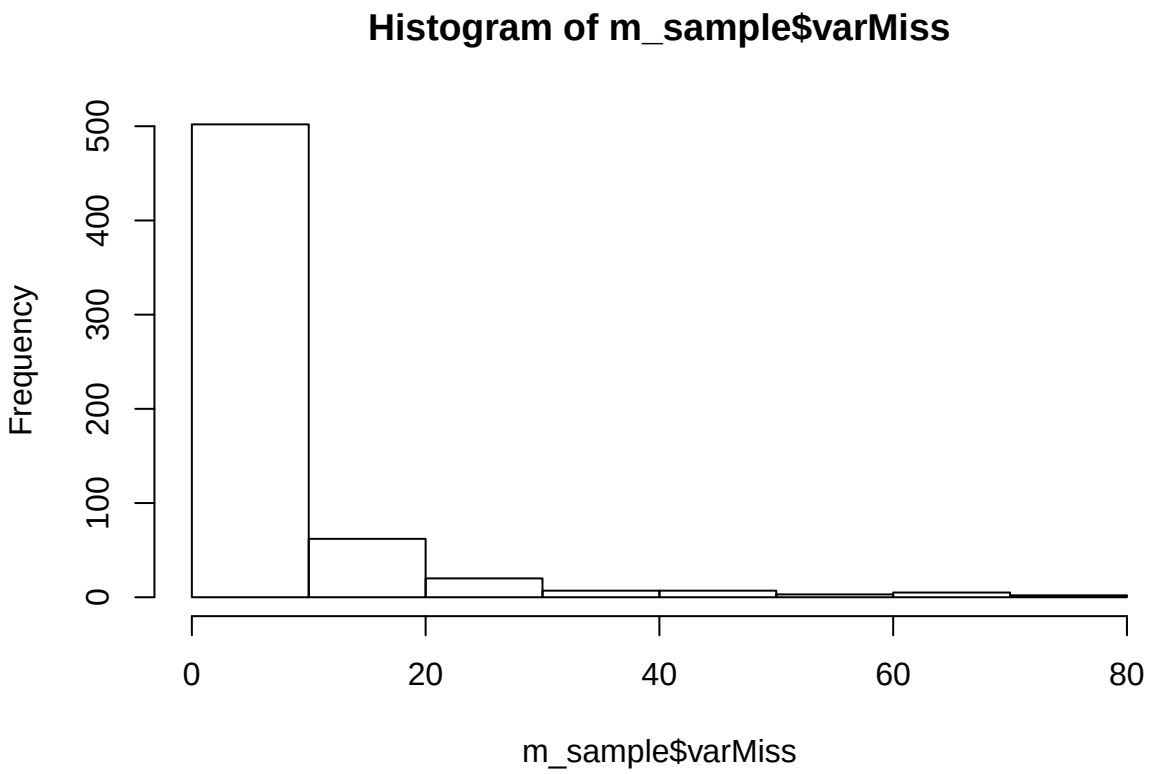
The Bayesian approach allows us to simulate the regression 10000 times and see the ditributions of each coefficent We can see that each has a non zero mean and the HDI does not intersect zero. When examine the posterior odds we can see that they do not interect with one but it does get incredibly close, illustrating that that these metrics are not independent but probably not sensitive enough to use in order to predict a schools private or public status

10. Is it possible to predict conditional percentage, based on the percentages of specific vaccines that are missing? If so, what are the specifics?

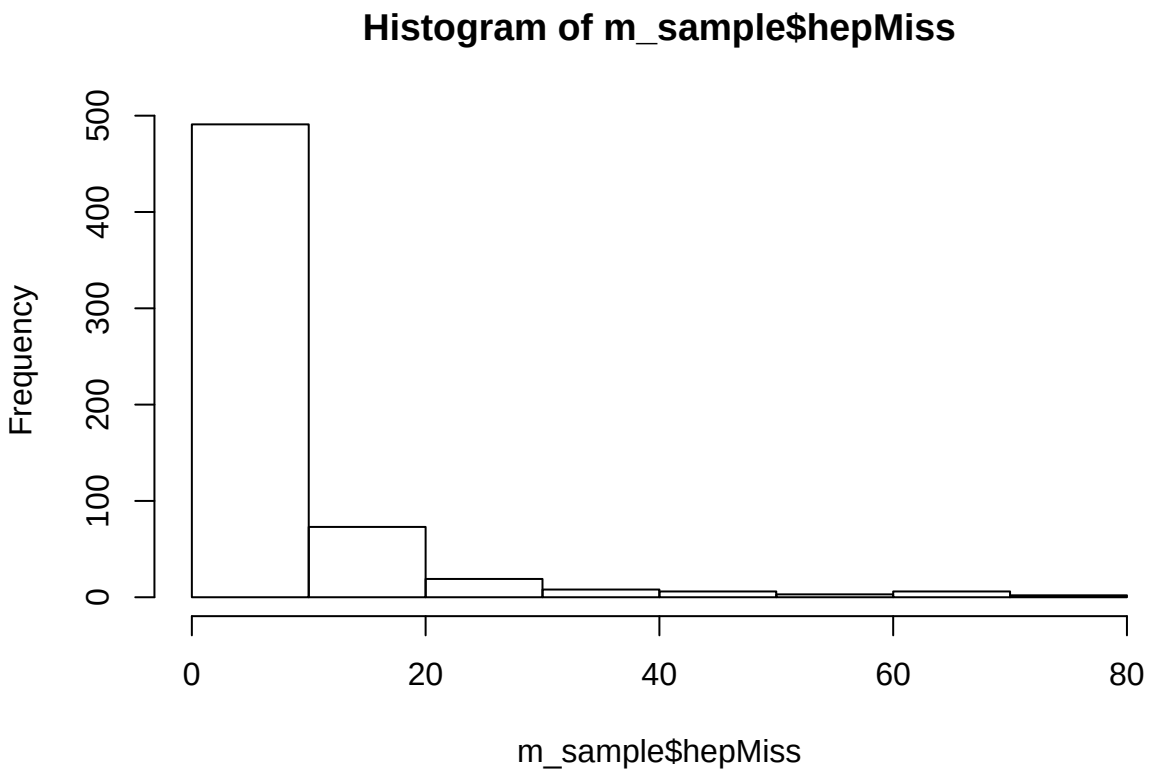
```
hist(m_sample$conditional_t)
```



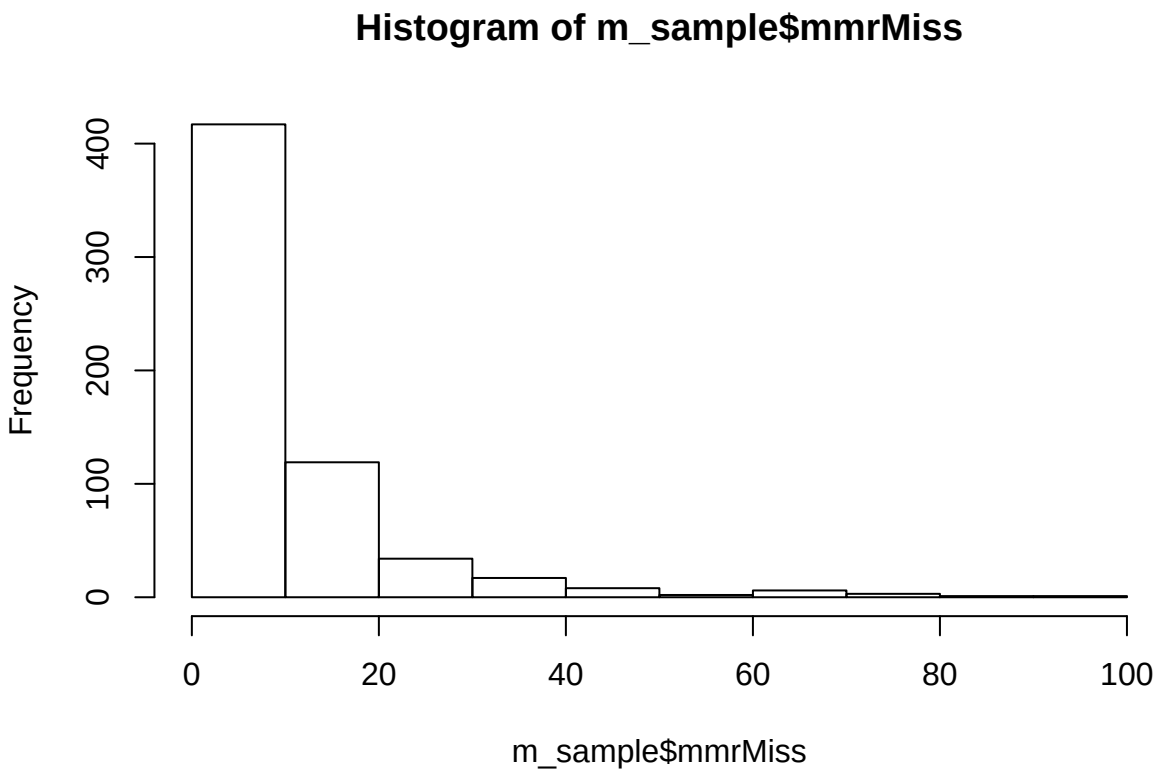

```
hist(m_sample$varMiss)
```



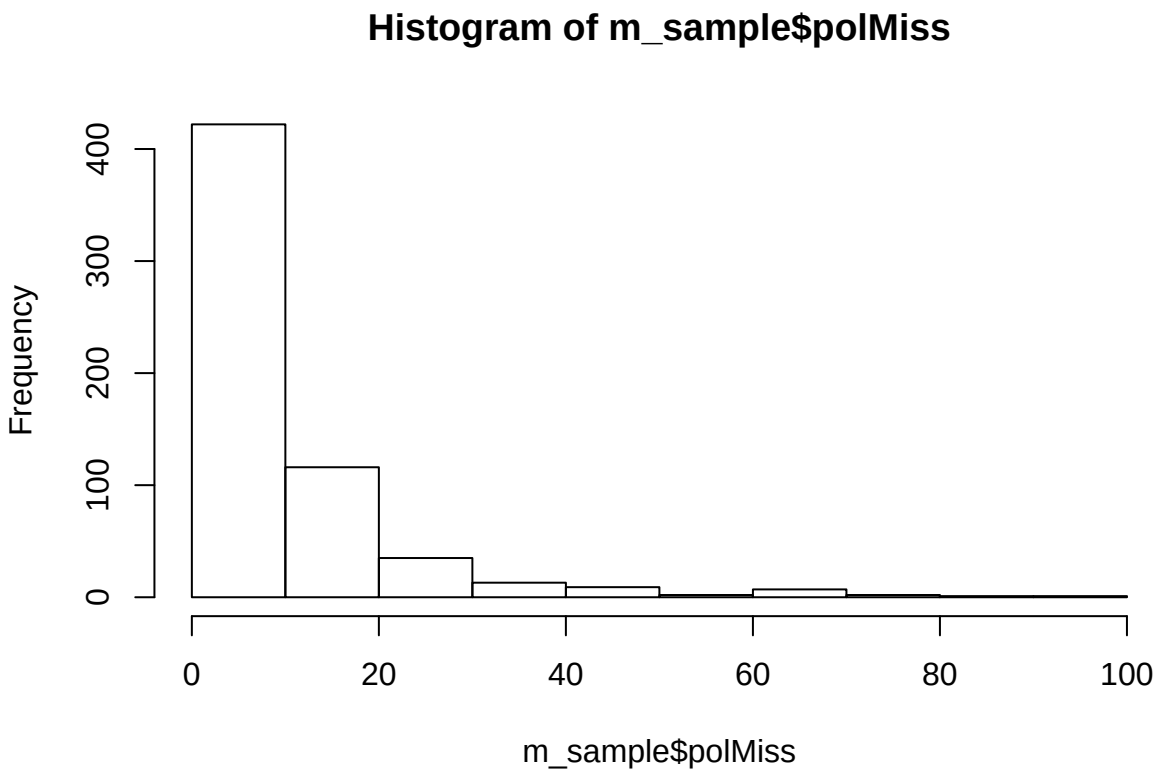

```
hist(m_sample$hepMiss)
```



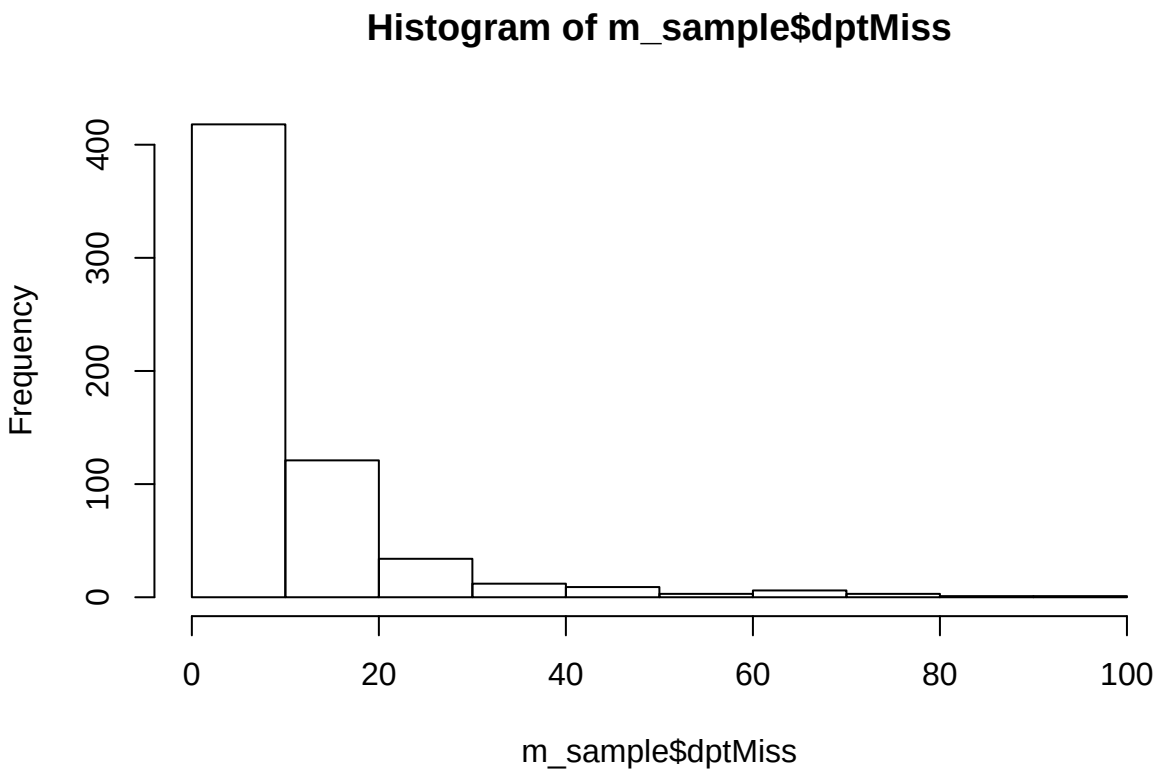

```r
hist(m_sample$mmrMiss)
```




```
hist(m_sample$polMiss)
```




```
hist(m_sample$dptMiss)
```




```
m_sample[complete.cases(m_sample), ]
```

```
##         code                                                name pubpriv
## 1872 6013882                                LA FETRA ELEMENTARY  PUBLIC
## 3056 6003388                              COPPEROPOLIS ELEMENTARY  PUBLIC
## 1733 6006548                                   VINLAND ELEMENTARY  PUBLIC
## 4610 6048680                         SCHALLENBERGER ELEMENTARY  PUBLIC
## 5593 6132419                           PATTI'S PRESCHOOL, INC. PRIVATE
## 4485 6089056                            TIERRASANTA ELEMENTARY  PUBLIC
## 3418 6118236                          NEWPORT COAST ELEMENTARY  PUBLIC
## 2802 6018915                                RITTER ELEMENTARY  PUBLIC
## 4096  120980 REDWOOD CONSORTIUM FOR STUDENT SERVICES  PUBLIC
## 1609 6035844                             OLEANDER ELEMENTARY  PUBLIC
## 2350 6015283          EMERSON PARKSIDE ACADEMY CHARTER  PUBLIC
## 4021 6102941                              ORION ALTERNATIVE  PUBLIC
## 1753 6117477                DAVID L. GREENBERG ELEMENTARY  PUBLIC
## 3349  101360                              INTEGRITY CHARTER  PUBLIC
## 2706 6017834                           LELAND STREET ELEMENTARY  PUBLIC
## 121  6116438                HELEN HUNT JACKSON ELEMENTARY  PUBLIC
## 1836  115345                REDDING SCHOOL OF THE ARTS II  PUBLIC
## 4087 6057210                  EDWARD M. DOWNER ELEMENTARY  PUBLIC
## 3140 6050405                         MILLVILLE ELEMENTARY  PUBLIC
## 6179 6964779                    SANTA TERESITA ELEMENTARY PRIVATE
## 6879 7085707                           BRADSHAW CHRISTIAN PRIVATE
## 4880 6049068                          ARGONAUT ELEMENTARY  PUBLIC
## 6458 6977961                     TABERNACLE CHRISTIAN, INC. PRIVATE
```

```
## 4344 6037113                                ROOSEVELT ELEMENTARY  PUBLIC
## 3446 6024491                                HAMILTON MEADOW PARK  PUBLIC
## 176  6042865                                   NORTH ELEMENTARY  PUBLIC
## 2272  123661                                  REAGAN ELEMENTARY  PUBLIC
## 1661 6000566                                CABRILLO ELEMENTARY  PUBLIC
## 1977 6062160                              STROBRIDGE ELEMENTARY  PUBLIC
## 504  6120562                              COASTAL GROVE CHARTER  PUBLIC
## 5796 6907877                           SAN DIEGO JEWISH ACADEMY PRIVATE
## 543  6008874                               EVERGREEN ELEMENTARY  PUBLIC
## 5090 6107205                      PINETREE COMMUNITY ELEMENTARY  PUBLIC
## 2749 6018295                           NEVADA AVENUE ELEMENTARY  PUBLIC
## 6212 6965362                               ST. PAUL'S LUTHERAN PRIVATE
## 2675 6017495                             HART STREET ELEMENTARY  PUBLIC
## 3619  127175               CALIFORNIA VIRTUAL ACADEMY @ FRESNO  PUBLIC
## 5517 6069553                   ORANGE COUNTY SPECIAL EDUCATION  PUBLIC
## 2542 6015986             BECKFORD CHARTER FOR ENRICHED STUDIES  PUBLIC
## 1897 6009559                               FAIRVIEW ELEMENTARY  PUBLIC
## 1973 6001127                                  RUUS ELEMENTARY  PUBLIC
## 4982  126920                                      OPAL CLIFFS  PUBLIC
## 4569 6062046                    BUENA VISTA/ HORACE MANN K-8  PUBLIC
## 3809 6021711                                        ROOSEVELT  PUBLIC
## 1398 6008437                               HARDING ELEMENTARY  PUBLIC
## 4028  108258                               LAKEVIEW ELEMENTARY  PUBLIC
## 4425 6039648                                  GAGE ELEMENTARY  PUBLIC
## 5413 6023717                            ORANGE GROVE ELEMENTARY  PUBLIC
## 3069 6056667                                 CORDUA ELEMENTARY  PUBLIC
## 3441 6021026                       JULIA B. MORRISON ELEMENTARY  PUBLIC
## 1610 6035851                               PALMETTO ELEMENTARY  PUBLIC
## 5770 6904973  MONTESSORI CHILD DEVELOPMENT CENTERS OF CA, INC. PRIVATE
## 1083 6005870                             JEFFERSON ELEMENTARY  PUBLIC
## 4761 6114326                       TASSAJARA HILLS ELEMENTARY  PUBLIC
## 46   6037212                               CABRILLO ELEMENTARY  PUBLIC
## 3433 6020911                       LORETTA LAMPTON ELEMENTARY  PUBLIC
## 4968  111088                       JACK FRANSCIONI ELEMENTARY  PUBLIC
## 3147 6052674                       CATHERINE EVERETT ELEMENTARY  PUBLIC
## 2524 6015762                               AMESTOY ELEMENTARY  PUBLIC
## 698  6119812                 TAYLOR (IDA REDMOND) ELEMENTARY  PUBLIC
## 1876 6005508                               GOLD OAK ELEMENTARY  PUBLIC
## 5806 6909378                 VALLEY BETH SHALOM DAY SCHOOL PRIVATE
## 2738 6018170                           MILES AVENUE ELEMENTARY  PUBLIC
## 6842 7079452              ST. MARY'S ARMENIAN CHURCH TUFENKIAN PRIVATE
## 3371  127191           CALIFORNIA VIRTUAL ACADEMY @ SAN JOAQUIN  PUBLIC
## 5425 6056410                               WINTERS ELEMENTARY  PUBLIC
## 3982 6053623                               BIDWELL ELEMENTARY  PUBLIC
## 1450 6077291                         HERMAN LEIMBACH ELEMENTARY  PUBLIC
## 5561  124925                            CELERITY SIRIUS CHARTER  PUBLIC
## 2188 6047351                               LAKESIDE ELEMENTARY  PUBLIC
## 6535 6980528                          ST. LUCY PARISH SCHOOL PRIVATE
## 6615 6983522                               HARKER SCHOOL, THE PRIVATE
## 4092 6036727                         LAKE ARROWHEAD ELEMENTARY  PUBLIC
## 545  6008890                 COLONEL HOWARD NICHOLS ELEMENTARY  PUBLIC
## 3939  116475                               DEL SUR ELEMENTARY  PUBLIC
## 3713 6032387                         AGUA CALIENTE ELEMENTARY  PUBLIC
## 4201 6022297                               JELLICK ELEMENTARY  PUBLIC
```

```
## 6895 7089469                                COMMUNITY CHRISTIAN SCHOOLS PRIVATE
## 2123 6006837                                      RIVERVIEW ELEMENTARY  PUBLIC
## 4402 6039309                                         CADMAN ELEMENTARY  PUBLIC
## 586  6002919                                         BANGOR ELEMENTARY  PUBLIC
## 1647  128108                                    ROCKETSHIP SPARK ACADEMY  PUBLIC
## 2390 6117824                                H. CLARKE POWERS ELEMENTARY  PUBLIC
## 6943 7098288                                     CHALLENGER - BERRYESSA PRIVATE
## 6861 7083066                                     CALVARY CHAPEL ANAHEIM PRIVATE
## 293   118760                                       BARACK OBAMA CHARTER  PUBLIC
## 3141 6026157                                         MISSION ELEMENTARY  PUBLIC
## 2862 6019541                                TOWNE AVENUE ELEMENTARY  PUBLIC
## 2834 6019244                             SIXTY-EIGHTH STREET ELEMENTARY  PUBLIC
## 2099 6051825                                      KENWOOD ELEMENTARY  PUBLIC
## 3930 6108914                                        VEJAR ELEMENTARY  PUBLIC
## 5450  113134                                     RIVERBEND ELEMENTARY  PUBLIC
## 5320 6040620                                     GRAPEVINE ELEMENTARY  PUBLIC
## 1179 6055909                                         MAPLE ELEMENTARY  PUBLIC
## 5252 6056089                                      ELMHURST ELEMENTARY  PUBLIC
## 2501  126375                              CENTRAL REGION ELEMENTARY #21  PUBLIC
## 2521 6015739                                     ALLESANDRO ELEMENTARY  PUBLIC
## 3597 6036149                                       BON VIEW ELEMENTARY  PUBLIC
## 5762 6904080                                     VILLAGE SCHOOL, INC. PRIVATE
## 5183 6030563                                  C. C. LAMBERT ELEMENTARY  PUBLIC
## 4077 6004931                                      RIVERSIDE ELEMENTARY  PUBLIC
## 334  6055578                                      GLEN CITY ELEMENTARY  PUBLIC
## 4614 6048722                       HACIENDA SCIENCE/ENVIRONMENTAL MAGNET  PUBLIC
## 2828 6019186                            SHERMAN OAKS ELEMENTARY CHARTER  PUBLIC
## 397  6119663                                     OASIS CHARTER PUBLIC  PUBLIC
## 5032 6098297                                GEORGE EISENHUT ELEMENTARY  PUBLIC
## 755  6066674                                WAYNE VAN HORN ELEMENTARY  PUBLIC
## 6544 6980668                              ST. THOMAS THE APOSTLE SCHOOL PRIVATE
## 2008 6035026                                      LADD LANE ELEMENTARY  PUBLIC
## 1247 6012660                                LINWOOD E. HOWE ELEMENTARY  PUBLIC
## 6138 6964241                                         ST. MARIA GORETTI PRIVATE
## 903  6045322                                    SUMMERLAND ELEMENTARY  PUBLIC
## 2433  109371                                ROSA PARKS LEARNING CENTER  PUBLIC
## 3131 6024418                                   EDNA MAGUIRE ELEMENTARY  PUBLIC
## 3268  127035 ACADEMY OF ARTS AND SCIENCES: EL CAJON ELEMENTARY (K-5)  PUBLIC
## 4734  121517                                         SHORT ELEMENTARY  PUBLIC
## 5312  100933                                      HANNALEI ELEMENTARY  PUBLIC
## 2938 6116842                              PRIMARY ACADEMY FOR SUCCESS  PUBLIC
## 3111 6044176                                     OAK KNOLL ELEMENTARY  PUBLIC
## 1648 6047195                                      FRANKLIN ELEMENTARY  PUBLIC
## 1937 6010391                                     JEFFERSON ELEMENTARY  PUBLIC
## 4964 6106140                                SOLANA HIGHLANDS ELEMENTARY  PUBLIC
## 2538 6015945                                  BANDINI STREET ELEMENTARY  PUBLIC
## 3353 6038764                                                 IRA HARBISON  PUBLIC
## 5544 6069454                            SUTTER COUNTY SPECIAL EDUCATION  PUBLIC
## 5275 6105860                                      LIBERTY ELEMENTARY  PUBLIC
## 1829 6013544                               WILLARD (FRANCES E.) ELEMENTARY  PUBLIC
## 2256  107284                         CALIFORNIA VIRTUAL ACADEMY @ SONOMA  PUBLIC
## 6502 6979009                                CRANE COUNTRY DAY SCHOOL PRIVATE
## 4928 6009633                                       FALLER ELEMENTARY  PUBLIC
## 846  6115935                                    CAMPTONVILLE ACADEMY  PUBLIC
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## 5584 6014468                    FREEMAN (DANIEL) ELEMENTARY  PUBLIC
## 1190 6118582                              SYCAMORE CANYON  PUBLIC
## 1090 6100408                           LINCOLN ELEMENTARY  PUBLIC
## 5996 6960736                  AMERICAN MARTYRS SCHOOL PRIVATE
## 411  6053854                     ALTA VISTA ELEMENTARY  PUBLIC
## 408  6104475                        HERMOSA ELEMENTARY  PUBLIC
## 6655 6988190          THE CENTER FOR EARLY EDUCATION PRIVATE
## 3602 6036214                    DEL NORTE ELEMENTARY  PUBLIC
## 3944 6039010                        VALLEY ELEMENTARY  PUBLIC
## 1994 6106728                   VALLE VISTA ELEMENTARY  PUBLIC
## 5251 6056063                  E. P. FOSTER ELEMENTARY  PUBLIC
## 3217 6047799                GEORGE C. PAYNE ELEMENTARY  PUBLIC
## 5335 6005243                WALNUT HEIGHTS ELEMENTARY  PUBLIC
## 2149 6044077                      LA HONDA ELEMENTARY  PUBLIC
## 1723 6006415                          MUIR ELEMENTARY  PUBLIC
## 5777 6905582           BLOOMINGTON CHRISTIAN SCHOOL PRIVATE
## 1682 6090559               STEVEN MILLARD ELEMENTARY  PUBLIC
## 5182 6030555          BENJAMIN F. BESWICK ELEMENTARY  PUBLIC
## 5395 6030837                      WEBBER ELEMENTARY  PUBLIC
## 606  6035471                   FALLSVALE ELEMENTARY  PUBLIC
## 904  6050140                  MEADOW LANE ELEMENTARY  PUBLIC
## 2502  126383                  PLAYA VISTA ELEMENTARY  PUBLIC
## 742  6119804                   OAK VALLEY ELEMENTARY  PUBLIC
## 4689 6049837                BOULDER CREEK ELEMENTARY  PUBLIC
## 961  6052443                   DON PEDRO ELEMENTARY  PUBLIC
## 6471 6978431                    OLD MISSION SCHOOL PRIVATE
## 3360 6036115               VISTA COLORADO ELEMENTARY  PUBLIC
## 1050 6095020          TIFFANY (BURTON C.) ELEMENTARY  PUBLIC
## 3342 6026926                    SALVADOR ELEMENTARY  PUBLIC
## 3454 6113229                         NOVATO CHARTER  PUBLIC
## 2356 6015358                       HARTE ELEMENTARY  PUBLIC
## 4787 6030217               ANDREW JACKSON ELEMENTARY  PUBLIC
## 393  6109466             JOHN E. STEINBECK ELEMENTARY  PUBLIC
## 2989 6020259                    LINDBERGH ELEMENTARY  PUBLIC
## 6801 7057433                        KIDS' CONNECTION PRIVATE
## 2029 6055107                 RICHARD BARD ELEMENTARY  PUBLIC
## 816  6112148               BLOSSOM VALLEY ELEMENTARY  PUBLIC
## 2012 6107338                  CERRA VISTA ELEMENTARY  PUBLIC
## 247  6053169                  CUNNINGHAM ELEMENTARY  PUBLIC
## 1817 6028732                      ROSITA ELEMENTARY  PUBLIC
## 4023 6024657                        REED ELEMENTARY  PUBLIC
## 929  6005789               BIOLA-PERSHING ELEMENTARY  PUBLIC
## 3830 6051957                     MCDOWELL ELEMENTARY  PUBLIC
## 3861 6030027                    GLENKNOLL ELEMENTARY  PUBLIC
## 5203  101147                  GRACE HUDSON ELEMENTARY  PUBLIC
## 5    6024277                       MANOR ELEMENTARY  PUBLIC
## 6070 6963367                   ST. ANDREW ELEMENTARY PRIVATE
## 821  6108518                    JENNY LIND ELEMENTARY  PUBLIC
## 177  6042881              SOUTH/WEST PARK ELEMENTARY  PUBLIC
## 2293  108209             ELLERTH E. LARSON ELEMENTARY  PUBLIC
## 3789 6021471                  THEODORE ROOSEVELT  PUBLIC
## 906  6012033                    CASTAIC ELEMENTARY  PUBLIC
## 4811 6108484                   GARFIELD ELEMENTARY  PUBLIC
## 3806 6021638                   JEFFERSON ELEMENTARY  PUBLIC
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## 1880 6045421                                    ELLWOOD ELEMENTARY  PUBLIC
## 5667 6142145                                       VENTANA SCHOOL PRIVATE
## 6231 6965693                     ST. LOUIS DE MONTFORT ELEMENTARY PRIVATE
## 4378  118083                                  INNOVATIONS ACADEMY  PUBLIC
## 2592 6016521                               CLOVER AVENUE ELEMENTARY  PUBLIC
## 3161 6097752                                   LAKEWOOD ELEMENTARY  PUBLIC
## 3507 6001689                                BURCKHALTER ELEMENTARY  PUBLIC
## 4624  114983            GOLDEN VALLEY CHARTER SCHOOL OF SACRAMENTO  PUBLIC
## 5429 6023808                                JUAN DE ANZA ELEMENTARY  PUBLIC
## 2227 6053557                                LASSEN VIEW ELEMENTARY  PUBLIC
## 5528 6069223              SANTA BARBARA COUNTY SPECIAL EDUCATION  PUBLIC
## 6034 6962625                                   MAYFIELD JUNIOR PRIVATE
## 2042  101667                 WILDER'S PREPARATORY ACADEMY CHARTER  PUBLIC
## 5861 6918072               CHILDREN'S CREATIVE AND PERFORMING ARTS PRIVATE
## 6737 7007776                          ST. PETER AND ST. PAUL SCHOOL PRIVATE
## 3512 6001812                                EMERSON ELEMENTARY  PUBLIC
## 2941 6119044                      MULTICULTURAL LEARNING CENTER  PUBLIC
## 6894 7089196                            GOOD SHEPHERD LUTHERAN PRIVATE
## 1068 6012199                                OAKMONT ELEMENTARY  PUBLIC
## 1805 6028583                           LOUIS G. ZEYEN ELEMENTARY  PUBLIC
## 4100 6052054                                SEQUOIA ELEMENTARY  PUBLIC
## 5181 6030548                                 ARROYO ELEMENTARY  PUBLIC
## 235  6011043                                GRANADA ELEMENTARY  PUBLIC
## 3876 6106009                                      TRAVIS RANCH  PUBLIC
## 4584 6022453                              MCKINLEY ELEMENTARY  PUBLIC
## 60   6035257                            RANCHO VERDE ELEMENTARY  PUBLIC
## 5135 6043350                              TEMPLETON ELEMENTARY  PUBLIC
## 2613 6016786                           DOLORES STREET ELEMENTARY  PUBLIC
## 1489 6050231                              MISTLETOE ELEMENTARY  PUBLIC
## 3579 6106546                              REYNOLDS ELEMENTARY  PUBLIC
## 5357  112706           CALIFORNIA VIRTUAL ACADEMY @ LOS ANGELES  PUBLIC
## 4668 6105928                            OTTOMON WAY ELEMENTARY  PUBLIC
## 788  6105506                              OAK GROVE ELEMENTARY  PUBLIC
## 1857 6013684                         JOHN C. FREMONT ELEMENTARY  PUBLIC
## 1929 6014385                                SUNSET ELEMENTARY  PUBLIC
## 5512  114330                      NEVADA CITY SCHOOL OF THE ARTS  PUBLIC
## 3493  115204                         COMMUNITY UNITED ELEMENTARY  PUBLIC
## 375  6090013                                EDISON ELEMENTARY  PUBLIC
## 1909 6109185                              THE ONTARIO CENTER  PUBLIC
## 2215 6108419                           JACK NORTHROP ELEMENTARY  PUBLIC
## 4592 6032817                            SAN JACINTO ELEMENTARY  PUBLIC
## 4750 6005128                              MONTAIR ELEMENTARY  PUBLIC
## 132  6113625                              TOVASHAL ELEMENTARY  PUBLIC
## 740  6107361                              BLUE OAK ELEMENTARY  PUBLIC
## 2820 6019103                            SELMA AVENUE ELEMENTARY  PUBLIC
## 2507  126433 DR. LAWRENCE H. MOORE MATH, SCIENCE, TECHNOLOGY ACADEMY  PUBLIC
## 6181 6964936                             VISITATION ELEMENTARY PRIVATE
## 5993 6960322                       DUARTE MONTESSORI SCHOOL INC. PRIVATE
## 535  6011308                           MOUNTAIN VIEW ELEMENTARY  PUBLIC
## 2044 6014443                            WORTHINGTON ELEMENTARY  PUBLIC
## 2329 6045587                           CLARENCE RUTH ELEMENTARY  PUBLIC
## 3195 6026181                           DEL REY WOODS ELEMENTARY  PUBLIC
## 715  6008304                           PHIL D. SWING ELEMENTARY  PUBLIC
## 3633 6029896                                PANORAMA ELEMENTARY  PUBLIC
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## 2300 6042097                          GEORGE WASHINGTON ELEMENTARY  PUBLIC
## 3854 6098578                                  FOOTHILL ELEMENTARY  PUBLIC
## 1713 6006290                                     HOMAN ELEMENTARY  PUBLIC
## 2617 6016836                               EAGLE ROCK ELEMENTARY  PUBLIC
## 444  6108104                              VALLEY VIEW ELEMENTARY  PUBLIC
## 6638 6984504                                  OUR LADY OF GRACE PRIVATE
## 2664 6017388                            GRIDLEY STREET ELEMENTARY  PUBLIC
## 3900 3230083                                    PLUMAS CHARTER  PUBLIC
## 609   108589                               SAN LAUREN ELEMENTARY  PUBLIC
## 394  6113542                            CESAR E. CHAVEZ ELEMENTARY  PUBLIC
## 3081 6008593                                   MCCABE ELEMENTARY  PUBLIC
## 2817 6019079              SANTA MONICA BOULEVARD COMMUNITY CHARTER  PUBLIC
## 4489 6096879                                DAILARD ELEMENTARY  PUBLIC
## 1972 6001101                                  PARK ELEMENTARY  PUBLIC
## 3904  107375                             RIO DEL ORO ELEMENTARY  PUBLIC
## 5705 6203772                           MISSION LUTHERAN SCHOOL PRIVATE
## 1941 6010433                              ROOSEVELT ELEMENTARY  PUBLIC
## 2847 6019384                         SUNNY BRAE AVENUE ELEMENTARY  PUBLIC
## 3553 6029540                               CIRCLE VIEW ELEMENTARY  PUBLIC
## 4351 6067086                               NORTH PARK ELEMENTARY  PUBLIC
## 354  6071369                                    BRAGG ELEMENTARY  PUBLIC
## 5521  115808          NORTON SPACE AND AERONAUTICS ACADEMY  PUBLIC
## 2707 6017842                            LEMAY STREET ELEMENTARY  PUBLIC
## 2865 6019582                          TWENTIETH STREET ELEMENTARY  PUBLIC
## 2624 6016901                            EMELITA STREET ELEMENTARY  PUBLIC
## 990  6119523                                  BLUE OAK CHARTER  PUBLIC
## 537  6011332                               VALLEYDALE ELEMENTARY  PUBLIC
## 65   6112825                            SYCAMORE ROCKS ELEMENTARY  PUBLIC
## 1206 6031785                                 GARRETSON ELEMENTARY  PUBLIC
## 931  6006662                           HOUGHTON-KEARNEY ELEMENTARY  PUBLIC
## 1639 6094635                           COURREGES (ROCH) ELEMENTARY  PUBLIC
## 5309 6107536                                  PINKHAM ELEMENTARY  PUBLIC
## 5913 6931158                            BAYMONTE CHRISTIAN SCHOOL PRIVATE
## 4745  119032                               CREEKSIDE ELEMENTARY  PUBLIC
## 3810 6021729                               SAN RAFAEL ELEMENTARY  PUBLIC
## 5041  111369                          ALEXANDER HAMILTON ELEMENTARY  PUBLIC
## 4159 6054324                            ROCKFORD ELEMENTARY  PUBLIC
## 6131 6964167                              ST. LINUS ELEMENTARY PRIVATE
## 3458 6111488                             VALLEY VIEW ELEMENTARY  PUBLIC
## 1461 6112106                           ELITHA DONNER ELEMENTARY  PUBLIC
## 4615 6048730                         WALTER L. BACHRODT ELEMENTARY  PUBLIC
## 2631 6016992                            FAIRBURN AVENUE ELEMENTARY  PUBLIC
## 1325 6031926                            ABRAHAM LINCOLN ELEMENTARY  PUBLIC
## 5832 6913131                          REDWOOD CHRISTIAN ELEMENTARY PRIVATE
## 4988 6008163                                  PINE HILL ELEMENTARY  PUBLIC
## 700  6011795                              ARMA J. SHULL ELEMENTARY  PUBLIC
## 1160 6012322                              LAUREL STREET ELEMENTARY  PUBLIC
## 1815 6028716                               R. F. HAZARD ELEMENTARY  PUBLIC
## 6780 7040066                           CHILDREN'S HOUSE MONTESSORI PRIVATE
## 5449  107318                                  TWIN RIVERS CHARTER  PUBLIC
## 6324 6973259                                     CARDEN HALL, INC PRIVATE
## 735   100024                              OAK MEADOW ELEMENTARY  PUBLIC
## 3220  102731                                TOWNGATE ELEMENTARY  PUBLIC
## 945  6027676                                CENTRALIA ELEMENTARY  PUBLIC
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## 2460  117978                          GOETHE INTERNATIONAL CHARTER  PUBLIC
## 5473 6089429                                CULVERDALE ELEMENTARY  PUBLIC
## 4877 6068159                            CARLTON OAKS ELEMENTARY  PUBLIC
## 6402 6975882                               ST. VINCENT DE PAUL PRIVATE
## 3001  113050                           JOHN J. PERSHING ELEMENTARY  PUBLIC
## 1979 6104566                                TYRRELL ELEMENTARY  PUBLIC
## 3355 6038780                                        LAS PALMAS  PUBLIC
## 1116 6032833                             JOHN KELLEY ELEMENTARY  PUBLIC
## 4563 6041602                           KING (STARR) ELEMENTARY  PUBLIC
## 6036 6962724                                          NATIVITY PRIVATE
## 951  6066823                            LOS COYOTES ELEMENTARY  PUBLIC
## 1885 6045496                              LA PATERA ELEMENTARY  PUBLIC
## 2185 6005573                            TAHOE VALLEY ELEMENTARY  PUBLIC
## 3640 6058945                                  MCPHERSON MAGNET  PUBLIC
## 2261 6041917                               LINCOLN ELEMENTARY  PUBLIC
## 107   108480                            CROWNE HILL ELEMENTARY  PUBLIC
## 5200 4930350                                  SUNRIDGE CHARTER  PUBLIC
## 5977 6953988                    DELPHI ACADEMY OF LOS ANGELES PRIVATE
## 3490  110262                                   RISE COMMUNITY  PUBLIC
## 1711 6006274                                HEATON ELEMENTARY  PUBLIC
## 5316 3730942                         GUAJOME PARK ACADEMY CHARTER  PUBLIC
## 981  6003032                                MARIGOLD ELEMENTARY  PUBLIC
## 3334 6026827                            DONALDSON WAY ELEMENTARY  PUBLIC
## 3749 6048235                              EL CARMELO ELEMENTARY  PUBLIC
## 3915 6021869                       KELLOGG POLYTECHNIC ELEMENTARY  PUBLIC
## 6531 6980478                               ST. JOSEPH CATHOLIC PRIVATE
## 5396 6030852                               WILLMORE ELEMENTARY  PUBLIC
## 1658 6115943                SHIRAKAWA (GEORGE, SR.) ELEMENTARY  PUBLIC
## 1560 6051239                                TOLENAS ELEMENTARY  PUBLIC
## 447  6002828                                JACKSON ELEMENTARY  PUBLIC
## 4917 6010805                                SHAFFER ELEMENTARY  PUBLIC
## 2955 6025555                             LOS BANOS ELEMENTARY  PUBLIC
## 5808 6909824          ANNE SULLIVAN PRESCHOOL AND KINDERGARTEN PRIVATE
## 4605 6048599                             HORACE MANN ELEMENTARY  PUBLIC
## 2582 6016414                            CENTURY PARK ELEMENTARY  PUBLIC
## 5248 6053201                            VALLEY HOME ELEMENTARY  PUBLIC
## 4792 6030274                                 HOOVER ELEMENTARY  PUBLIC
## 3313 6004337                              VALHALLA ELEMENTARY  PUBLIC
## 5785 6906713                               TEHIYAH DAY SCHOOL PRIVATE
## 4721 6044945                                LAUREL ELEMENTARY  PUBLIC
## 286  6033583                               PIONEER ELEMENTARY  PUBLIC
## 4762 6117485                            COYOTE CREEK ELEMENTARY  PUBLIC
## 572  6011373                          CHARLES BURSCH ELEMENTARY  PUBLIC
## 1996 6110415                          BAUTISTA CREEK ELEMENTARY  PUBLIC
## 3680 6100333                              LEMONWOOD ELEMENTARY  PUBLIC
## 6961 7101660                    FIRST CHRISTIAN SCHOOL OF NAPA PRIVATE
## 4956  110718                             VISTA VERDE ELEMENTARY  PUBLIC
## 6510 6979470                               ST. ELIZABETH SETON PRIVATE
## 4992 6040505                          IMPERIAL BEACH CHARTER  PUBLIC
## 3951 6097216                              CHAPARRAL ELEMENTARY  PUBLIC
## 2546 6016034                           BLYTHE STREET ELEMENTARY  PUBLIC
## 5212 6049357                              GUADALUPE ELEMENTARY  PUBLIC
## 6948 7098833            MARINA VIEW PRESCHOOL AND KINDERGARTEN PRIVATE
## 1062 6118988                          MCMILLIN (CORKY) ELEMENTARY  PUBLIC
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## 1652 6047245                                MCKINLEY ELEMENTARY  PUBLIC
## 4388 3730751                                MT. EVEREST ACADEMY  PUBLIC
## 2967 6020127                               EL PORTAL ELEMENTARY  PUBLIC
## 2771 6018543 ONE HUNDRED SIXTEENTH STREET ELEMENTARY  PUBLIC
## 2687 6017644                         HUBBARD STREET ELEMENTARY  PUBLIC
## 4631 6034433                         CITRUS HEIGHTS ELEMENTARY  PUBLIC
## 4680 6002539                              CORVALLIS ELEMENTARY  PUBLIC
## 436  6031520                                COLLETT ELEMENTARY  PUBLIC
## 1463 6113187                     MAEOLA E. BEITZEL ELEMENTARY  PUBLIC
## 6033 6962583                   MARY STAR OF THE SEA ELEMENTARY PRIVATE
## 536  6011316                              PARAMOUNT ELEMENTARY  PUBLIC
## 6498 6978910                                          ST. ROBERT PRIVATE
## 6486 6978738                      OUR LADY OF MERCY ELEMENTARY PRIVATE
## 2165 6070833                                MURDOCK ELEMENTARY  PUBLIC
## 5740 6901177                     BRIGHTER DAYS MONTESSORI PRIVATE
## 3117 6025662                              JOHN MUIR ELEMENTARY  PUBLIC
## 6434 6976823                       DESERT ADVENTIST SCHOOL PRIVATE
## 4936 6055669                         BIG SPRINGS ELEMENTARY  PUBLIC
## 3404 6029375                         KILLYBROOKE ELEMENTARY  PUBLIC
## 6491 6978829                         ST. CHARLES ELEMENTARY PRIVATE
## 5805 6909295                      LAKE AVENUE CHURCH SCHOOL PRIVATE
## 1164 6012397                              ROSECRANS ELEMENTARY  PUBLIC
## 3095 6047641                       MARSHALL POMEROY ELEMENTARY  PUBLIC
## 4406 6039374                            CHESTERTON ELEMENTARY  PUBLIC
## 4470 6040224                                 TOLER ELEMENTARY  PUBLIC
## 5960 6938534                           HESPERIA CHRISTIAN PRIVATE
## 2347 6015242                            CARVER ELEMENTARY  PUBLIC
## 435  6031512                           ARLANZA ELEMENTARY  PUBLIC
## 4200 6022289                            HURLEY ELEMENTARY  PUBLIC
## 301   121046                       SEBASTIAN QUESTA ELEMENTARY  PUBLIC
## 2422  109249                      HOOPER AVENUE PRIMARY CENTER  PUBLIC
## 5083  116616                              GOLDEN OAK COMMUNITY  PUBLIC
## 5490 6115786                                       PLAZA VISTA  PUBLIC
## 1997 6118731                          JACOB WIENS ELEMENTARY  PUBLIC
## 4060 6004733                          ELLERHORST ELEMENTARY  PUBLIC
## 259   127605       HIGH TECH HIGH ELEMENTARY NORTH COUNTY  PUBLIC
## 2652 6017255                           GAULT STREET ELEMENTARY  PUBLIC
## 5179 6025894                        TULELAKE BASIN ELEMENTARY  PUBLIC
## 4981 6054910                              SONORA ELEMENTARY  PUBLIC
## 5696 6202766              CALVARY CHAPEL CHRISTIAN ACADEMY PRIVATE
## 318   116996                         RIVERBANK ELEMENTARY  PUBLIC
## 3558 6029656                           OAK VIEW ELEMENTARY  PUBLIC
## 2201  119313          JOHN AND JACQUELYN MILLER ELEMENTARY  PUBLIC
## 1328 6031959                        GEORGE WASHINGTON CHARTER  PUBLIC
## 1194 6053490                           OLIVE VIEW ELEMENTARY  PUBLIC
## 2056 6038319                                  JAMUL PRIMARY  PUBLIC
## 6445 6977003                          SINAI AKIBA ACADEMY PRIVATE
## 613   102749                          BROOKSIDE ELEMENTARY  PUBLIC
## 875  6111827                         JOHN MALCOM ELEMENTARY  PUBLIC
## 6684 6993836                                          NOTRE DAME PRIVATE
## 5686 6200760                SAN FRANCISCO PACIFIC ACADEMY PRIVATE
## 923  6035505                          VALLE VISTA ELEMENTARY  PUBLIC
## 129  6107841                         ALTA MURRIETA ELEMENTARY  PUBLIC
## 249  6053185                    OSBORN TWO-WAY IMMERSION ACADEMY  PUBLIC
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## 4642 6034581                    GREEN OAKS FUNDAMENTAL ELEMENTARY  PUBLIC
## 3463 6048136                           MINER (GEORGE) ELEMENTARY  PUBLIC
## 2285 6049605                                LIVE OAK ELEMENTARY  PUBLIC
## 5262 6056212                          SHERIDAN WAY ELEMENTARY  PUBLIC
## 603  6011571                               SUNKIST ELEMENTARY  PUBLIC
## 2879 6019723                           VENA AVENUE ELEMENTARY  PUBLIC
## 2659 6017321                                GRAHAM ELEMENTARY  PUBLIC
## 6413 6976245                    ST. JOHN'S LUTHERAN ELEMENTARY PRIVATE
## 2769 6018519                  ONE HUNDRED NINTH STREET ELEMENTARY  PUBLIC
## 242  6011118                       WILLIAM NORTHRUP ELEMENTARY  PUBLIC
## 3704 6049811                              VALENCIA ELEMENTARY  PUBLIC
## 6091 6963649                     ST. COLUMBKILLE ELEMENTARY PRIVATE
## 3593  100107                        VISTA GRANDE ELEMENTARY  PUBLIC
## 1015 6026082                             CHUALAR ELEMENTARY  PUBLIC
## 5354  114074                            FARMDALE ELEMENTARY  PUBLIC
## 4008 6111132                           BRYN MAWR ELEMENTARY  PUBLIC
## 2111 6113286                     KEYES TO LEARNING CHARTER  PUBLIC
## 2923 6094726                COMMUNITY MAGNET CHARTER ELEMENTARY  PUBLIC
## 3691  102665                            RADCLIFF ELEMENTARY  PUBLIC
## 3860 6030001                         CHARLES WAGNER ELEMENTARY  PUBLIC
## 409  6107510                        VICTORIA GROVES ELEMENTARY  PUBLIC
## 525   126664                      ALTA VISTA COMMUNITY CHARTER  PUBLIC
## 1418 6013296                              WRIGHT ELEMENTARY  PUBLIC
## 4766 6093264                              SUNSET ELEMENTARY  PUBLIC
## 1242 6012546                           MANZANITA ELEMENTARY  PUBLIC
## 895  6116578                         PACIFIC RIM ELEMENTARY  PUBLIC
## 2566 6016240                       CALABASH CHARTER ACADEMY  PUBLIC
## 5976 6944128                VALLEY CHRISTIAN ELEMENTARY SCHOOL PRIVATE
## 6975 7103989                          QUARRY LANE SCHOOL, THE PRIVATE
## 3918 6021893                              LINCOLN ELEMENTARY  PUBLIC
## 5380  122507          PARTNERSHIPS FOR STUDENT-CENTERED LEARNING  PUBLIC
## 3212 6003909                         CAMINO PABLO ELEMENTARY  PUBLIC
## 1554 6051098                          CLEO GORDON ELEMENTARY  PUBLIC
## 43    115089                            SKY MOUNTAIN CHARTER  PUBLIC
## 5259 6056170                           PIERPONT ELEMENTARY  PUBLIC
## 5378  108514                        FOSKETT RANCH ELEMENTARY  PUBLIC
## 1184 6056022                        WEATHERSFIELD ELEMENTARY  PUBLIC
## 2439  109439                         CESAR CHAVEZ ELEMENTARY  PUBLIC
## 146  6052369                CALI CALMECAC LANGUAGE ACADEMY  PUBLIC
## 3046 6003198                           MANZANITA ELEMENTARY  PUBLIC
## 773  6011951                      WILLIAM MCKINLEY ELEMENTARY  PUBLIC
## 2876 6019699                              VAN NUYS ELEMENTARY  PUBLIC
## 6856 7082266                          ACTS CHRISTIAN ACADEMY PRIVATE
## 3321 6112395                        GREGORY GARDENS ELEMENTARY  PUBLIC
## 3226 6032338                             SUNNYMEAD ELEMENTARY  PUBLIC
## 695  6046064                       BRUCE (ROBERT) ELEMENTARY  PUBLIC
## 3421 6108575                          OLIVE DRIVE ELEMENTARY  PUBLIC
## 4869 6113278                              SANTA ROSA CHARTER  PUBLIC
## 4473 6040265                        WASHINGTON ELEMENTARY  PUBLIC
## 5111 6053086                          SHERWOOD ELEMENTARY  PUBLIC
## 173   108357                        GEORGE KELLY ELEMENTARY  PUBLIC
## 2894 6019871                       WEST HOLLYWOOD ELEMENTARY  PUBLIC
## 665  6095343                         MAJESTIC WAY ELEMENTARY  PUBLIC
## 913  6090435                              PROCTOR ELEMENTARY  PUBLIC
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## 3287 6047963                          EDITH LANDELS ELEMENTARY  PUBLIC
## 1192  102301                               WOODSON ELEMENTARY  PUBLIC
## 2866 6019590                 TWENTY-EIGHTH STREET ELEMENTARY  PUBLIC
## 564  6009187                               WAYSIDE ELEMENTARY  PUBLIC
## 2665 6017396                          GRIFFIN AVENUE ELEMENTARY  PUBLIC
## 633  6057517                             WASHINGTON ELEMENTARY  PUBLIC
## 5908 6930085                           ST. JOHN'S LUTHERAN PRIVATE
## 417  6046122                            BEN PAINTER ELEMENTARY  PUBLIC
## 2514  128371                     NEW HORIZONS CHARTER ACADEMY  PUBLIC
## 5188 6030670                         MARJORIE VEEH ELEMENTARY  PUBLIC
## 2475  122168                       JAIME ESCALANTE ELEMENTARY  PUBLIC
## 724   127464                       MARY CASEY BLACK ELEMENTARY  PUBLIC
## 1030 6037881                      COOK (HAZEL GOES) ELEMENTARY  PUBLIC
## 1783 6028252                            BROOKHURST ELEMENTARY  PUBLIC
## 6378 6975445                   ESCONDIDO ADVENTIST ACADEMY PRIVATE
## 2714 6017917                           LOGAN STREET ELEMENTARY  PUBLIC
## 2748 6018287                            NESTLE AVENUE CHARTER  PUBLIC
## 6092 6963656                        ST. CORNELIUS ELEMENTARY PRIVATE
## 5142 6022974                            JOHN ADAMS ELEMENTARY  PUBLIC
## 1590 6033211                        PETER J. SHIELDS ELEMENTARY  PUBLIC
## 5551 6055974          MEADOWS ARTS AND TECHNOLOGY ELEMENTARY  PUBLIC
## 1431  105908                          ARLENE HEIN ELEMENTARY  PUBLIC
## 501   109975                           FUENTE NUEVA CHARTER  PUBLIC
## 1284 6056246                          BIRCH LANE ELEMENTARY  PUBLIC
## 3452 6024582                              RANCHO ELEMENTARY  PUBLIC
## 4005 6036594                            VICTORIA ELEMENTARY  PUBLIC
## 6255 6967517                           ST. ANTHONY SCHOOL PRIVATE
## 4191 6111959                         VENCIL BROWN ELEMENTARY  PUBLIC
## 3383  121608              HARVEST RIDGE COOPERATIVE CHARTER  PUBLIC
## 5468 6108880                           RIDGEVIEW ELEMENTARY  PUBLIC
## 5794 6907794                        FAITH LUTHERAN ELEMENTARY PRIVATE
## 3024 6008585                             MAGNOLIA ELEMENTARY  PUBLIC
## 4657 6034847                             PERSHING ELEMENTARY  PUBLIC
## 3225 6032320                               MORENO ELEMENTARY  PUBLIC
## 6976 7104037                         CANYON HEIGHTS ACADEMY PRIVATE
## 4243 6034201                              PARKWAY ELEMENTARY  PUBLIC
## 3384  100636                           PICO CANYON ELEMENTARY  PUBLIC
## 6074 6963417                         ST. ANTHONY ELEMENTARY PRIVATE
## 5081 6054373                         STONE CORRAL ELEMENTARY  PUBLIC
## 1389 6012967                             EASTSIDE ELEMENTARY  PUBLIC
## 2578 6016364                          CARSON STREET ELEMENTARY  PUBLIC
## 2575 6016331                       CAPISTRANO AVENUE ELEMENTARY  PUBLIC
## 2812 6019020                     SAN GABRIEL AVENUE ELEMENTARY  PUBLIC
## 3998 6036503                            FRANKLIN ELEMENTARY  PUBLIC
## 3393 6113047                       STEVENSON RANCH ELEMENTARY  PUBLIC
## 3387 6020796                              NEWHALL ELEMENTARY  PUBLIC
## 855  6027585                           CONCORDIA ELEMENTARY  PUBLIC
## 701  6011803                         FRED EKSTRAND ELEMENTARY  PUBLIC
## 730  6054977                            OLIVELANDS ELEMENTARY  PUBLIC
## 2889 6019822                       WALGROVE AVENUE ELEMENTARY  PUBLIC
## 2468  121707                      KIPP COMIENZA COMMUNITY PREP  PUBLIC
## 4821 6048797                              BOWERS ELEMENTARY  PUBLIC
## 515  6042964                   SANTA ROSA ROAD ACADEMIC ACADEMY  PUBLIC
## 2741 6018204                          MONTAGUE CHARTER ACADEMY  PUBLIC
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## 6923 7094279                    OLIVE BRANCH CHRISTIAN ACADEMY PRIVATE
## 3422 6118681                       WILLIAM B. BIMAT ELEMENTARY  PUBLIC
## 5034  100206                         GEORGE W. BUSH ELEMENTARY  PUBLIC
## 588  6031611                                CENTRAL ELEMENTARY  PUBLIC
## 1207 6031793                      GEORGE WASHINGTON ELEMENTARY  PUBLIC
## 2077 3731239                                  JULIAN CHARTER  PUBLIC
## 3326 6055156                                  MUPU ELEMENTARY  PUBLIC
## 1359 6012900                                WILLIAMS ELEMENTARY  PUBLIC
## 6693 6995658                     CONCORDIA SCHOOL, THE PRIVATE
## 3945 6070841                     LOS PENASQUITOS ELEMENTARY  PUBLIC
## 5267  108431                            GALILEO ACADEMY 101  PUBLIC
## 2176 6044044                           OCEAN SHORE ELEMENTARY  PUBLIC
## 2301 6042121                                        HOUSTON  PUBLIC
## 1901 6111157                        RAFFAELLO PALLA ELEMENTARY  PUBLIC
## 3295 6003958                                  AYERS ELEMENTARY  PUBLIC
## 3169 6020457                               MAYFLOWER ELEMENTARY  PUBLIC
## 6224 6965560                          ST. PAUL'S LUTHERAN PRIVATE
## 6784 7045198                       BETHEL CHRISTIAN SCHOOL PRIVATE
## 153  3430659                                NATOMAS CHARTER  PUBLIC
## 6679 6993166                      THE CHILDREN'S SCHOOL PRIVATE
## 6418 6976435                          ST. JOHN NOTRE DAME PRIVATE
## 6476 6978530                        BELMONT OAKS ACADEMY PRIVATE
## 3722 6106207                     DELLA S. LINDLEY ELEMENTARY  PUBLIC
## 6553 6980890                         ZION LUTHERAN SCHOOL PRIVATE
## 6653 6988125                      MARY LAW PRIVATE SCHOOL PRIVATE
## 1842 6051734                        GEYSERVILLE ELEMENTARY  PUBLIC
## 3675 6055347                        MARINA WEST ELEMENTARY  PUBLIC
## 4828 6048904                         LAURELWOOD ELEMENTARY  PUBLIC
## 3731 6021190                         TUMBLEWEED ELEMENTARY  PUBLIC
## 4682 6002554                            DEL REY ELEMENTARY  PUBLIC
## 2641 6017123                     FLORENCE AVENUE ELEMENTARY  PUBLIC
## 4105 6008114                       EAGLE PRAIRIE ELEMENTARY  PUBLIC
## 3263 6113070                            ONAGA ELEMENTARY  PUBLIC
## 2294  108217                       MANLIO SILVA ELEMENTARY  PUBLIC
## 5679 6144190                          WISHING WELL SCHOOL PRIVATE
## 3051  128504                  PEAK TO PEAK MOUNTAIN CHARTER  PUBLIC
## 4137 6032650                          JACKSON ELEMENTARY  PUBLIC
## 5148 6023071                             FERN ELEMENTARY  PUBLIC
## 900   102129                         CARPINTERIA FAMILY  PUBLIC
## 5524  120493                                    MONARCH  PUBLIC
## 1311  106575                          HARVEST ELEMENTARY  PUBLIC
## 88   6020416                          PACIFIC ELEMENTARY  PUBLIC
## 1333 6106082                     HARRY S. TRUMAN ELEMENTARY  PUBLIC
## 4616 6048748                         WASHINGTON ELEMENTARY  PUBLIC
## 4915 6007348                      WOODROW WILSON ELEMENTARY  PUBLIC
## 2358 6015374                            HOLMES ELEMENTARY  PUBLIC
## 3550 6096234                         GEHRINGER ELEMENTARY  PUBLIC
## 5532  119024                 ROCKETSHIP SI SE PUEDE ACADEMY  PUBLIC
## 3744 6118749                        GOLDEN POPPY ELEMENTARY  PUBLIC
## 347  6010961                            PALMS ELEMENTARY  PUBLIC
## 1631 6051718                        FORESTVILLE ELEMENTARY  PUBLIC
## 1448 6033104                      SAMUEL KENNEDY ELEMENTARY  PUBLIC
## 2919 6069157                 BERENECE CARLSON HOME HOSPITAL  PUBLIC
## 4453 6040000                          LANGUAGE ACADEMY  PUBLIC
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## 5258 6056154                                        MOUND ELEMENTARY  PUBLIC
## 558  6009096                                       MUNSEY ELEMENTARY  PUBLIC
## 2075 6010748                                JOHNSTONVILLE ELEMENTARY  PUBLIC
## 3929 6101133                                       DECKER ELEMENTARY  PUBLIC
## 1248 6012678                                    EL MARINO ELEMENTARY  PUBLIC
## 3290 6049464                                    STEVENSON ELEMENTARY  PUBLIC
## 4256 6059323                                           JOHN H. STILL  PUBLIC
## 98   6108278                                     WITHROW ELEMENTARY  PUBLIC
## 266   113878                                  HIGHER LEARNING ACADEMY  PUBLIC
## 548  6008940                                       FREMONT ELEMENTARY  PUBLIC
## 6237 6965818                          ST. PASCHAL BAYLON ELEMENTARY PRIVATE
## 974   118042                                    FOREST RANCH CHARTER  PUBLIC
## 4843 6022545                                       EDISON ELEMENTARY  PUBLIC
## 5451 5130125                                       YUBA CITY CHARTER  PUBLIC
## 1919 6014203                                     GRAZIDE ELEMENTARY  PUBLIC
## 1320 6052500                                      DENAIR ELEMENTARY  PUBLIC
## 6934 7096597    INTERNATIONAL CHRISTIAN MONTESSORI SCHOOL OF NEWPORT PRIVATE
## 1508 6038251                                        ROSE ELEMENTARY  PUBLIC
## 5004 6045041                                    BURI BURI ELEMENTARY  PUBLIC
## 4271 6071153                                    DEL CERRO ELEMENTARY  PUBLIC
## 871  6110852                                  ARROYO VISTA ELEMENTARY  PUBLIC
## 1518  102939                                ETIWANDA COLONY ELEMENTARY  PUBLIC
## 1143 6107452                                  RECHE CANYON ELEMENTARY  PUBLIC
## 5507  112177                                     MONTEREY BAY CHARTER  PUBLIC
## 5015 6022826                                   LAKE MARIE ELEMENTARY  PUBLIC
## 4285 6112452                                     ROBINSON ELEMENTARY  PUBLIC
## 21   6115844                                     TWIN OAKS ELEMENTARY  PUBLIC
## 2242 6038673                                   VISTA LA MESA ACADEMY  PUBLIC
## 4969 6026686                                  SAN VICENTE ELEMENTARY  PUBLIC
## 6446 6977045                                 ARCADIA CHRISTIAN SCHOOL PRIVATE
## 3394  101188                                         HUNT ELEMENTARY  PUBLIC
## 5406 6023626                              CHRISTIAN SORENSEN ELEMENTARY  PUBLIC
## 3609 6036297                                      KINGSLEY ELEMENTARY  PUBLIC
## 993   100594                                       LIBERTY ELEMENTARY  PUBLIC
## 3246 6095392                                   LOS PASEOS ELEMENTARY  PUBLIC
## 4568 6041727                                  WEST PORTAL ELEMENTARY  PUBLIC
## 4941 6055727                                       KNOLLS ELEMENTARY  PUBLIC
## 1102 6113583                                  COPPER HILLS ELEMENTARY  PUBLIC
## 6233 6965719                                   ST. RAPHAEL ELEMENTARY PRIVATE
## 4802 6030431                                   WASHINGTON ELEMENTARY  PUBLIC
## 4054 6010797                                     RICHMOND ELEMENTARY  PUBLIC
## 2081 6032171                                  INA ARBUCKLE ELEMENTARY  PUBLIC
## 5297 6054621                                       HOUSTON ELEMENTARY  PUBLIC
## 4250 6034284                                         TAHOE ELEMENTARY  PUBLIC
## 2691 6017685                                      IVANHOE ELEMENTARY  PUBLIC
##      enrollment  allvaccs conditional    medical  religious    dptMiss
## 1872        130 93.076923 0.000000000 0.11111111 0.88888889  6.9230769
## 3056         37 86.486486 0.600000000 0.00000000 0.40000000 10.8108108
## 1733        125 92.000000 0.100000000 0.00000000 0.90000000  8.0000000
## 4610        110 92.727273 0.500000000 0.00000000 0.50000000  5.4545455
## 5593         13 69.230769 1.000000000 0.00000000 0.00000000 30.7692308
## 4485        118 87.288136 0.866666667 0.13333333 0.00000000  8.4745763
## 3418         82 89.024390 0.111111111 0.00000000 0.88888889  9.7560976
## 2802         66 86.363636 1.000000000 0.00000000 0.00000000 12.1212121
```

```
## 4096         37 70.270270 0.727272727 0.00000000 0.27272727 29.7297297
## 1609        187 98.930481 0.500000000 0.50000000 0.00000000  1.0695187
## 2350         93 96.774194 1.000000000 0.00000000 0.00000000  1.0752688
## 4021         30 90.000000 0.333333333 0.00000000 0.66666667  6.6666667
## 1753         90 96.666667 1.000000000 0.00000000 0.00000000  2.2222222
## 3349         36 80.555556 1.000000000 0.00000000 0.00000000 13.8888889
## 2706        103 79.611650 0.761904762 0.04761905 0.19047619 13.5922330
## 121          48 91.666667 0.000000000 0.00000000 1.00000000  8.3333333
## 1836         61 80.327869 0.166666667 0.00000000 0.83333333 19.6721311
## 4087        105 98.095238 0.000000000 0.00000000 1.00000000  1.9047619
## 3140         23 73.913043 0.333333333 0.00000000 0.66666667 26.0869565
## 6179         31 87.096774 1.000000000 0.00000000 0.00000000  0.0000000
## 6879        112 53.571429 0.884615385 0.00000000 0.11538462 42.8571429
## 4880         58 96.551724 0.500000000 0.00000000 0.50000000  1.7241379
## 6458         52 96.153846 0.000000000 0.00000000 1.00000000  3.8461538
## 4344        121 98.347107 0.500000000 0.50000000 0.00000000  1.6528926
## 3446         99 96.969697 0.666666667 0.00000000 0.33333333  2.0202020
## 176          81 98.765432 0.000000000 0.00000000 1.00000000  1.2345679
## 2272         51 98.039216 1.000000000 0.00000000 0.00000000  1.9607843
## 1661         95 92.631579 0.142857143 0.42857143 0.42857143  7.3684211
## 1977         99 91.919192 1.000000000 0.00000000 0.00000000  8.0808081
## 504          29 31.034483 0.000000000 0.00000000 1.00000000 68.9655172
## 5796         25 84.000000 0.750000000 0.00000000 0.25000000 12.0000000
## 543         128 99.218750 1.000000000 0.00000000 0.00000000  0.7812500
## 5090         66 62.121212 0.600000000 0.00000000 0.40000000 36.3636364
## 2749        118 86.440678 0.375000000 0.00000000 0.62500000 12.7118644
## 6212         60 85.000000 0.444444444 0.00000000 0.55555556  8.3333333
## 2675        188 99.468085 1.000000000 0.00000000 0.00000000  0.5319149
## 3619         47 70.212766 0.000000000 0.00000000 1.00000000 29.7872340
## 5517         16 87.500000 1.000000000 0.00000000 0.00000000  6.2500000
## 2542         95 93.684211 0.333333333 0.00000000 0.66666667  4.2105263
## 1897         92 96.739130 0.000000000 0.00000000 1.00000000  3.2608696
## 1973         69 98.550725 1.000000000 0.00000000 0.00000000  1.4492754
## 4982         49 55.102041 0.909090909 0.00000000 0.09090909 36.7346939
## 4569         59 66.101695 1.000000000 0.00000000 0.00000000 30.5084746
## 3809         51 90.196078 1.000000000 0.00000000 0.00000000  9.8039216
## 1398         88 95.454545 0.750000000 0.00000000 0.25000000  4.5454545
## 4028        105 91.428571 0.222222222 0.00000000 0.77777778  7.6190476
## 4425        106 91.509434 0.333333333 0.33333333 0.33333333  6.6037736
## 5413         60 90.000000 1.000000000 0.00000000 0.00000000 10.0000000
## 3069         29 96.551724 0.000000000 0.00000000 1.00000000  3.4482759
## 3441        135 95.555556 0.833333333 0.00000000 0.16666667  3.7037037
## 1610        147 99.319728 1.000000000 0.00000000 0.00000000  0.6802721
## 5770         16 87.500000 1.000000000 0.00000000 0.00000000  0.0000000
## 1083        114 92.982456 0.625000000 0.00000000 0.37500000  6.1403509
## 4761         90 96.666667 0.666666667 0.00000000 0.33333333  2.2222222
## 46          120 95.000000 0.666666667 0.00000000 0.33333333  4.1666667
## 3433        132 90.909091 1.000000000 0.00000000 0.00000000  6.0606061
## 4968         77 98.701299 0.000000000 0.00000000 1.00000000  1.2987013
## 3147         72 95.833333 0.666666667 0.00000000 0.33333333  4.1666667
## 2524        141 71.631206 0.975000000 0.00000000 0.02500000 19.1489362
## 698         154 93.506494 0.300000000 0.10000000 0.60000000  5.8441558
## 1876         62 67.741935 0.700000000 0.00000000 0.30000000 27.4193548
## 5806         33 72.727273 0.888888889 0.00000000 0.11111111  6.0606061
```

```
## 2738        172 50.581395 1.000000000 0.00000000 0.00000000 42.4418605
## 6842         60 96.666667 0.500000000 0.00000000 0.50000000  3.3333333
## 3371         87 70.114943 0.038461538 0.00000000 0.96153846 29.8850575
## 5425        128 92.968750 0.333333333 0.00000000 0.66666667  4.6875000
## 3982        117 92.307692 0.111111111 0.00000000 0.88888889  6.8376068
## 1450         98 98.979592 1.000000000 0.00000000 0.00000000  1.0204082
## 5561         95 95.789474 1.000000000 0.00000000 0.00000000  3.1578947
## 2188         14 78.571429 0.666666667 0.00000000 0.33333333 14.2857143
## 6535         31 96.774194 1.000000000 0.00000000 0.00000000  0.0000000
## 6615         81 98.765432 1.000000000 0.00000000 0.00000000  1.2345679
## 4092         60 91.666667 0.400000000 0.00000000 0.60000000  8.3333333
## 545         115 93.043478 0.875000000 0.00000000 0.12500000  4.3478261
## 3939        160 93.750000 0.300000000 0.20000000 0.50000000  4.3750000
## 3713        110 99.090909 0.000000000 0.00000000 1.00000000  0.9090909
## 4201         86 98.837209 1.000000000 0.00000000 0.00000000  1.1627907
## 6895         16 93.750000 0.000000000 0.00000000 1.00000000  6.2500000
## 2123         52 96.153846 0.000000000 0.00000000 1.00000000  3.8461538
## 4402         28 92.857143 0.500000000 0.00000000 0.50000000  7.1428571
## 586          16 93.750000 0.000000000 0.00000000 1.00000000  6.2500000
## 1647        179 83.798883 0.965517241 0.00000000 0.03448276  5.5865922
## 2390         45 84.444444 0.571428571 0.00000000 0.42857143 13.3333333
## 6943        144 97.222222 0.000000000 0.25000000 0.75000000  2.7777778
## 6861         12 91.666667 1.000000000 0.00000000 0.00000000  8.3333333
## 293          66 93.939394 1.000000000 0.00000000 0.00000000  6.0606061
## 3141         18 88.888889 1.000000000 0.00000000 0.00000000 11.1111111
## 2862         57 98.245614 0.000000000 0.00000000 1.00000000  1.7543860
## 2834        134 92.537313 0.900000000 0.00000000 0.10000000  5.9701493
## 2099         20 90.000000 0.000000000 0.50000000 0.50000000 10.0000000
## 3930         94 97.872340 1.000000000 0.00000000 0.00000000  1.0638298
## 5450         82 98.780488 1.000000000 0.00000000 0.00000000  0.0000000
## 5320        148 98.648649 0.000000000 0.00000000 1.00000000  1.3513514
## 1179         56 89.285714 0.333333333 0.00000000 0.66666667  8.9285714
## 5252        109 79.816514 0.772727273 0.00000000 0.22727273 18.3486239
## 2501        104 83.653846 1.000000000 0.00000000 0.00000000 11.5384615
## 2521         72 81.944444 0.923076923 0.00000000 0.07692308 18.0555556
## 3597        121 98.347107 0.000000000 0.00000000 1.00000000  1.6528926
## 5762         55 85.454545 0.375000000 0.37500000 0.25000000  9.0909091
## 5183         78 96.153846 0.666666667 0.00000000 0.33333333  3.8461538
## 4077         51 98.039216 0.000000000 0.00000000 1.00000000  1.9607843
## 334         102 99.019608 1.000000000 0.00000000 0.00000000  0.0000000
## 4614        122 93.442623 0.500000000 0.00000000 0.50000000  5.7377049
## 2828        162 98.148148 1.000000000 0.00000000 0.00000000  0.6172840
## 397          46 97.826087 0.000000000 0.00000000 1.00000000  2.1739130
## 5032         78 94.871795 0.500000000 0.00000000 0.50000000  5.1282051
## 755         114 95.614035 1.000000000 0.00000000 0.00000000  3.5087719
## 6544         24 87.500000 1.000000000 0.00000000 0.00000000  8.3333333
## 2008        112 98.214286 1.000000000 0.00000000 0.00000000  0.0000000
## 1247        107 91.588785 0.555555556 0.00000000 0.44444444  4.6728972
## 6138         15 53.333333 1.000000000 0.00000000 0.00000000 33.3333333
## 903          12 66.666667 0.000000000 0.25000000 0.75000000 33.3333333
## 2433        148 99.324324 0.000000000 0.00000000 1.00000000  0.6756757
## 3131        115 75.652174 0.607142857 0.00000000 0.39285714 16.5217391
## 3268         32 21.875000 0.000000000 0.00000000 1.00000000 78.1250000
## 4734         45 82.222222 1.000000000 0.00000000 0.00000000 15.5555556
```

```
## 5312        104 91.346154 0.888888889 0.00000000 0.11111111  4.8076923
## 2938        145 94.482759 1.000000000 0.00000000 0.00000000  4.1379310
## 3111        134 88.805970 0.733333333 0.00000000 0.26666667  8.9552239
## 1648        111 90.990991 1.000000000 0.00000000 0.00000000  6.3063063
## 1937         50 96.000000 0.500000000 0.00000000 0.50000000  4.0000000
## 4964         97 94.845361 0.000000000 0.00000000 1.00000000  5.1546392
## 2538         48 77.083333 1.000000000 0.00000000 0.00000000 14.5833333
## 3353         71 88.732394 1.000000000 0.00000000 0.00000000  9.8591549
## 5544         23 86.956522 0.333333333 0.00000000 0.66666667 13.0434783
## 5275        126 90.476190 0.000000000 0.00000000 1.00000000  9.5238095
## 1829         79 97.468354 1.000000000 0.00000000 0.00000000  1.2658228
## 2256         29 51.724138 0.000000000 0.00000000 1.00000000 48.2758621
## 6502         20 90.000000 0.500000000 0.00000000 0.50000000  5.0000000
## 4928         75 73.333333 0.750000000 0.00000000 0.25000000 17.3333333
## 846          20 55.000000 0.000000000 0.00000000 1.00000000 45.0000000
## 5584         78 89.743590 0.875000000 0.00000000 0.12500000  7.6923077
## 1190        117 93.162393 0.500000000 0.00000000 0.50000000  3.4188034
## 1090        111 96.396396 1.000000000 0.00000000 0.00000000  3.6036036
## 5996         75 89.333333 0.250000000 0.12500000 0.62500000  8.0000000
## 411          81 96.296296 1.000000000 0.00000000 0.00000000  3.7037037
## 408          59 94.915254 0.000000000 0.00000000 1.00000000  5.0847458
## 6655         60 83.333333 0.500000000 0.00000000 0.50000000  8.3333333
## 3602        127 92.125984 1.000000000 0.00000000 0.00000000  6.2992126
## 3944        140 87.857143 0.941176471 0.00000000 0.05882353  3.5714286
## 1994        104 92.307692 0.500000000 0.00000000 0.50000000  7.6923077
## 5251         72 98.611111 0.000000000 0.00000000 1.00000000  1.3888889
## 3217        106 86.792453 0.642857143 0.00000000 0.35714286 11.3207547
## 5335         66 92.424242 0.400000000 0.00000000 0.60000000  4.5454545
## 2149         12 58.333333 0.800000000 0.00000000 0.20000000 33.3333333
## 1723         91 86.813187 1.000000000 0.00000000 0.00000000 10.9890110
## 5777         37 78.378378 0.750000000 0.00000000 0.25000000 10.8108108
## 1682         90 97.777778 1.000000000 0.00000000 0.00000000  2.2222222
## 5182         94 96.808511 0.666666667 0.00000000 0.33333333  3.1914894
## 5395         42 95.238095 1.000000000 0.00000000 0.00000000  2.3809524
## 606          12 75.000000 1.000000000 0.00000000 0.00000000 25.0000000
## 904         157 78.980892 0.909090909 0.00000000 0.09090909 17.8343949
## 2502        110 60.909091 0.697674419 0.00000000 0.30232558 28.1818182
## 742          86 87.209302 0.090909091 0.00000000 0.90909091 11.6279070
## 4689         81 82.716049 0.285714286 0.42857143 0.28571429 13.5802469
## 961          89 98.876404 1.000000000 0.00000000 0.00000000  1.1235955
## 6471         46 80.434783 0.555555556 0.00000000 0.44444444 19.5652174
## 3360         69 60.869565 0.740740741 0.00000000 0.25925926 28.9855072
## 1050         80 93.750000 0.400000000 0.00000000 0.60000000  6.2500000
## 3342         85 91.764706 0.714285714 0.00000000 0.28571429  8.2352941
## 3454         29 65.517241 0.200000000 0.00000000 0.80000000 31.0344828
## 2356        187 94.117647 0.909090909 0.00000000 0.09090909  2.6737968
## 4787        223 95.964126 1.000000000 0.00000000 0.00000000  2.2421525
## 393          99 68.686869 1.000000000 0.00000000 0.00000000 28.2828283
## 2989        122 80.327869 1.000000000 0.00000000 0.00000000 16.3934426
## 6801         29 93.103448 0.000000000 0.00000000 1.00000000  6.8965517
## 2029        130 99.230769 1.000000000 0.00000000 0.00000000  0.0000000
## 816         104 98.076923 0.000000000 0.00000000 1.00000000  1.9230769
## 2012         97 93.814433 0.166666667 0.00000000 0.83333333  6.1855670
## 247         104 92.307692 0.875000000 0.00000000 0.12500000  6.7307692
```

```
## 1817         94 93.617021 1.000000000 0.00000000 0.00000000  5.3191489
## 4023        175 84.571429 0.592592593 0.03703704 0.37037037  8.5714286
## 929          39 97.435897 1.000000000 0.00000000 0.00000000  0.0000000
## 3830         68 98.529412 0.000000000 0.00000000 1.00000000  1.4705882
## 3861         69 97.101449 0.000000000 0.00000000 1.00000000  2.8985507
## 5203         95 96.842105 0.333333333 0.00000000 0.66666667  3.1578947
## 5            65 80.000000 0.000000000 0.00000000 1.00000000 20.0000000
## 6070         42 83.333333 0.857142857 0.00000000 0.14285714 14.2857143
## 821          84 89.285714 0.666666667 0.00000000 0.33333333  8.3333333
## 177         179 97.765363 0.500000000 0.00000000 0.50000000  2.2346369
## 2293         96 85.416667 1.000000000 0.00000000 0.00000000 12.5000000
## 3789        118 95.762712 1.000000000 0.00000000 0.00000000  4.2372881
## 906          64 96.875000 1.000000000 0.00000000 0.00000000  3.1250000
## 4811        118 98.305085 0.500000000 0.50000000 0.00000000  0.8474576
## 3806         87 93.103448 0.833333333 0.00000000 0.16666667  6.8965517
## 1880         61 85.245902 0.000000000 0.00000000 1.00000000 14.7540984
## 5667         17 82.352941 0.666666667 0.00000000 0.33333333 17.6470588
## 6231         25 96.000000 0.000000000 0.00000000 1.00000000  4.0000000
## 4378         36 52.777778 0.764705882 0.00000000 0.23529412 41.6666667
## 2592        142 78.169014 0.806451613 0.00000000 0.19354839 14.7887324
## 3161         43 93.023256 0.666666667 0.00000000 0.33333333  6.9767442
## 3507         43 72.093023 1.000000000 0.00000000 0.00000000 23.2558140
## 4624         65 43.076923 0.459459459 0.00000000 0.54054054 47.6923077
## 5429        116 93.965517 0.857142857 0.00000000 0.14285714  5.1724138
## 2227         40 92.500000 0.333333333 0.00000000 0.66666667  5.0000000
## 5528         20 75.000000 0.200000000 0.00000000 0.80000000 20.0000000
## 6034         54 85.185185 0.500000000 0.37500000 0.12500000  7.4074074
## 2042         60 96.666667 1.000000000 0.00000000 0.00000000  3.3333333
## 5861         18 72.222222 0.000000000 0.00000000 1.00000000 27.7777778
## 6737         18 83.333333 1.000000000 0.00000000 0.00000000  0.0000000
## 3512         78 83.333333 0.923076923 0.00000000 0.07692308 12.8205128
## 2941         40 92.500000 0.666666667 0.00000000 0.33333333  7.5000000
## 6894         19 78.947368 1.000000000 0.00000000 0.00000000 10.5263158
## 1068         32 93.750000 0.000000000 0.00000000 1.00000000  6.2500000
## 1805         50 96.000000 0.500000000 0.00000000 0.50000000  4.0000000
## 4100         61 90.163934 0.166666667 0.00000000 0.83333333  8.1967213
## 5181         97 97.938144 0.000000000 0.00000000 1.00000000  2.0618557
## 235          38 97.368421 1.000000000 0.00000000 0.00000000  2.6315789
## 3876        127 92.125984 0.200000000 0.00000000 0.80000000  7.8740157
## 4584        103 95.145631 1.000000000 0.00000000 0.00000000  4.8543689
## 60           98 88.775510 0.363636364 0.00000000 0.63636364 11.2244898
## 5135        200 84.000000 0.062500000 0.00000000 0.93750000 15.5000000
## 2613        106 32.075472 1.000000000 0.00000000 0.00000000 59.4339623
## 1489         82 96.341463 0.333333333 0.00000000 0.66666667  2.4390244
## 3579        169 97.633136 0.500000000 0.00000000 0.50000000  1.1834320
## 5357        165 59.393939 0.000000000 0.00000000 1.00000000 40.6060606
## 4668         51 66.666667 0.882352941 0.00000000 0.11764706 29.4117647
## 788         134 96.268657 0.200000000 0.00000000 0.80000000  2.9850746
## 1857         71 92.957746 0.600000000 0.00000000 0.40000000  5.6338028
## 1929         23 78.260870 1.000000000 0.00000000 0.00000000 13.0434783
## 5512         31 22.580645 0.250000000 0.00000000 0.75000000 74.1935484
## 3493         98 93.877551 1.000000000 0.00000000 0.00000000  6.1224490
## 375          72 90.277778 0.857142857 0.00000000 0.14285714  4.1666667
## 1909        130 86.153846 1.000000000 0.00000000 0.00000000  9.2307692
```

```
## 2215        144 93.055556 0.500000000 0.00000000 0.50000000  5.5555556
## 4592         90 78.888889 0.736842105 0.05263158 0.21052632 13.3333333
## 4750        108 87.037037 0.714285714 0.07142857 0.21428571 12.9629630
## 132         105 91.428571 0.222222222 0.55555556 0.22222222  8.5714286
## 740          79 82.278481 0.214285714 0.00000000 0.78571429 16.4556962
## 2820         32 90.625000 1.000000000 0.00000000 0.00000000  3.1250000
## 2507        131 90.839695 1.000000000 0.00000000 0.00000000  5.3435115
## 6181         45 84.444444 0.857142857 0.14285714 0.00000000  6.6666667
## 5993         10 90.000000 1.000000000 0.00000000 0.00000000  0.0000000
## 535          91 95.604396 1.000000000 0.00000000 0.00000000  4.3956044
## 2044         87 93.103448 1.000000000 0.00000000 0.00000000  5.7471264
## 2329         93 97.849462 1.000000000 0.00000000 0.00000000  2.1505376
## 3195         99 95.959596 0.750000000 0.00000000 0.25000000  2.0202020
## 715         133 98.496241 1.000000000 0.00000000 0.00000000  0.7518797
## 3633         61 77.049180 0.928571429 0.00000000 0.07142857 21.3114754
## 2300         60 90.000000 1.000000000 0.00000000 0.00000000  8.3333333
## 3854        107 92.523364 1.000000000 0.00000000 0.00000000  6.5420561
## 1713         90 98.888889 0.000000000 0.00000000 1.00000000  1.1111111
## 2617         65 90.769231 0.833333333 0.00000000 0.16666667  7.6923077
## 444          60 95.000000 0.333333333 0.00000000 0.66666667  5.0000000
## 6638         34 82.352941 0.833333333 0.00000000 0.16666667 11.7647059
## 2664        137 97.080292 1.000000000 0.00000000 0.00000000  2.9197080
## 3900         17 70.588235 0.000000000 0.00000000 1.00000000 29.4117647
## 609          73 95.890411 0.333333333 0.33333333 0.33333333  4.1095890
## 394         116 75.862069 1.000000000 0.00000000 0.00000000  0.0000000
## 3081        153 96.732026 0.600000000 0.20000000 0.20000000  3.2679739
## 2817        149 88.590604 1.000000000 0.00000000 0.00000000  7.3825503
## 4489         82 90.243902 0.500000000 0.00000000 0.50000000  7.3170732
## 1972        101 83.168317 1.000000000 0.00000000 0.00000000  8.9108911
## 3904         86 96.511628 0.333333333 0.00000000 0.66666667  3.4883721
## 5705         20 80.000000 1.000000000 0.00000000 0.00000000  0.0000000
## 1941         71 97.183099 1.000000000 0.00000000 0.00000000  2.8169014
## 2847        133 98.496241 0.500000000 0.00000000 0.50000000  1.5037594
## 3553         87 93.103448 0.333333333 0.66666667 0.00000000  6.8965517
## 4351         61 98.360656 0.000000000 0.00000000 1.00000000  1.6393443
## 354         114 75.438596 1.000000000 0.00000000 0.00000000 21.0526316
## 5521        119 93.277311 0.625000000 0.00000000 0.37500000  5.0420168
## 2707         69 92.753623 0.200000000 0.00000000 0.80000000  7.2463768
## 2865        102 96.078431 1.000000000 0.00000000 0.00000000  2.9411765
## 2624         86 90.697674 0.750000000 0.00000000 0.25000000  8.1395349
## 990          59 30.508475 0.707317073 0.00000000 0.29268293 66.1016949
## 537          66 96.969697 0.500000000 0.50000000 0.00000000  3.0303030
## 65          108 84.259259 0.000000000 0.00000000 1.00000000 15.7407407
## 1206        186 99.462366 0.000000000 0.00000000 1.00000000  0.5376344
## 931          34 94.117647 0.500000000 0.00000000 0.50000000  5.8823529
## 1639         90 93.333333 1.000000000 0.00000000 0.00000000  2.2222222
## 5309         82 92.682927 0.333333333 0.00000000 0.66666667  4.8780488
## 5913         29 79.310345 0.166666667 0.00000000 0.83333333 17.2413793
## 4745        107 96.261682 0.250000000 0.00000000 0.75000000  2.8037383
## 3810        104 85.576923 0.800000000 0.00000000 0.20000000 12.5000000
## 5041        101 95.049505 1.000000000 0.00000000 0.00000000  3.9603960
## 4159         47 93.617021 0.333333333 0.00000000 0.66666667  4.2553191
## 6131         24 83.333333 1.000000000 0.00000000 0.00000000 16.6666667
## 3458         69 97.101449 0.500000000 0.00000000 0.50000000  2.8985507
```

```
## 1461        123 91.869919 0.700000000 0.00000000 0.30000000  6.5040650
## 4615        118 96.610169 0.500000000 0.00000000 0.50000000  3.3898305
## 2631        100 66.000000 0.852941176 0.00000000 0.14705882 21.0000000
## 1325        123 91.869919 0.600000000 0.00000000 0.40000000  6.5040650
## 5832         37 97.297297 1.000000000 0.00000000 0.00000000  2.7027027
## 4988         69 72.463768 0.842105263 0.00000000 0.15789474 15.9420290
## 700          92 93.478261 0.500000000 0.00000000 0.50000000  5.4347826
## 1160        106 90.566038 1.000000000 0.00000000 0.00000000  9.4339623
## 1815        109 98.165138 1.000000000 0.00000000 0.00000000  1.8348624
## 6780         15 80.000000 0.000000000 0.00000000 1.00000000 20.0000000
## 5449         43 90.697674 0.000000000 0.00000000 1.00000000  9.3023256
## 6324         40 57.500000 0.823529412 0.00000000 0.17647059 22.5000000
## 735         109 82.568807 0.000000000 0.00000000 1.00000000 17.4311927
## 3220        159 84.905660 0.916666667 0.04166667 0.04166667 14.4654088
## 945          83 93.975904 1.000000000 0.00000000 0.00000000  4.8192771
## 2460        112 85.714286 0.000000000 0.00000000 1.00000000 14.2857143
## 5473         70 77.142857 0.312500000 0.06250000 0.62500000 18.5714286
## 4877         69 95.652174 0.333333333 0.00000000 0.66666667  2.8985507
## 6402         28 89.285714 0.666666667 0.00000000 0.33333333 10.7142857
## 3001        126 96.825397 1.000000000 0.00000000 0.00000000  2.3809524
## 1979        111 86.486486 1.000000000 0.00000000 0.00000000  9.9099099
## 3355         81 98.765432 1.000000000 0.00000000 0.00000000  0.0000000
## 1116         92 97.826087 1.000000000 0.00000000 0.00000000  1.0869565
## 4563         61 68.852459 1.000000000 0.00000000 0.00000000 29.5081967
## 6036         27 92.592593 1.000000000 0.00000000 0.00000000  3.7037037
## 951          69 95.652174 0.333333333 0.00000000 0.66666667  4.3478261
## 1885         53 98.113208 0.000000000 0.00000000 1.00000000  1.8867925
## 2185         88 71.590909 0.080000000 0.32000000 0.60000000 27.2727273
## 3640         96 82.291667 0.705882353 0.00000000 0.29411765 14.5833333
## 2261         84 97.619048 1.000000000 0.00000000 0.00000000  2.3809524
## 107         100 86.000000 0.285714286 0.00000000 0.71428571 14.0000000
## 5200         41 39.024390 0.000000000 0.00000000 1.00000000 60.9756098
## 5977         22  4.545455 0.285714286 0.00000000 0.71428571 95.4545455
## 3490         53 81.132075 0.900000000 0.00000000 0.10000000 15.0943396
## 1711        119 89.075630 1.000000000 0.00000000 0.00000000  8.4033613
## 5316         27 92.592593 0.500000000 0.00000000 0.50000000  3.7037037
## 981          85 92.941176 0.000000000 0.00000000 1.00000000  7.0588235
## 3334         95 98.947368 0.000000000 0.00000000 1.00000000  1.0526316
## 3749         66 95.454545 0.000000000 0.33333333 0.66666667  4.5454545
## 3915         49 91.836735 1.000000000 0.00000000 0.00000000  6.1224490
## 6531         21 71.428571 0.833333333 0.00000000 0.16666667 14.2857143
## 5396         70 85.714286 1.000000000 0.00000000 0.00000000 10.0000000
## 1658         90 71.111111 1.000000000 0.00000000 0.00000000 17.7777778
## 1560        105 97.142857 0.666666667 0.00000000 0.33333333  2.8571429
## 447          88 75.000000 0.772727273 0.00000000 0.22727273 19.3181818
## 4917         23 52.173913 1.000000000 0.00000000 0.00000000 43.4782609
## 2955         92 96.739130 0.666666667 0.00000000 0.33333333  2.1739130
## 5808         18 77.777778 0.000000000 0.00000000 1.00000000 22.2222222
## 4605        114 96.491228 0.750000000 0.00000000 0.25000000  3.5087719
## 2582         79 60.759494 0.967741935 0.00000000 0.03225806 22.7848101
## 5248         21 95.238095 0.000000000 0.00000000 1.00000000  4.7619048
## 4792         70 97.142857 1.000000000 0.00000000 0.00000000  1.4285714
## 3313         90 78.888889 0.894736842 0.00000000 0.10526316 13.3333333
## 5785         23 73.913043 0.666666667 0.00000000 0.33333333 17.3913043
```

```
## 4721         74 98.648649 0.000000000 0.00000000 1.00000000  1.3513514
## 286          99 88.888889 0.545454545 0.00000000 0.45454545 10.1010101
## 4762        173 96.531792 0.666666667 0.00000000 0.33333333  1.7341040
## 572          94 97.872340 0.500000000 0.00000000 0.50000000  2.1276596
## 1996        131 96.183206 0.600000000 0.00000000 0.40000000  3.8167939
## 3680        146 98.630137 1.000000000 0.00000000 0.00000000  1.3698630
## 6961         17 94.117647 0.000000000 0.00000000 1.00000000  5.8823529
## 4956         84 97.619048 1.000000000 0.00000000 0.00000000  2.3809524
## 6510         25 96.000000 1.000000000 0.00000000 0.00000000  4.0000000
## 4992        116 81.896552 0.666666667 0.00000000 0.33333333 15.5172414
## 3951        154 94.155844 0.222222222 0.00000000 0.77777778  4.5454545
## 2546         97 96.907216 1.000000000 0.00000000 0.00000000  3.0927835
## 5212         80 88.750000 0.000000000 0.00000000 1.00000000 11.2500000
## 6948         10 90.000000 0.000000000 0.00000000 1.00000000 10.0000000
## 1062         96 98.958333 1.000000000 0.00000000 0.00000000  1.0416667
## 1652         71 85.915493 1.000000000 0.00000000 0.00000000  9.8591549
## 4388         25 60.000000 0.100000000 0.00000000 0.90000000 36.0000000
## 2967        103 90.291262 0.500000000 0.00000000 0.50000000  8.7378641
## 2771        110 80.000000 1.000000000 0.00000000 0.00000000 14.5454545
## 2687        115 94.782609 0.833333333 0.00000000 0.16666667  3.4782609
## 4631         51 76.470588 0.916666667 0.00000000 0.08333333 17.6470588
## 4680        110 95.454545 1.000000000 0.00000000 0.00000000  2.7272727
## 436          96 94.791667 1.000000000 0.00000000 0.00000000  4.1666667
## 1463        118 93.220339 0.000000000 0.12500000 0.87500000  6.7796610
## 6033         29 96.551724 0.000000000 1.00000000 0.00000000  3.4482759
## 536          65 98.461538 1.000000000 0.00000000 0.00000000  1.5384615
## 6498         36 97.222222 0.000000000 0.00000000 1.00000000  2.7777778
## 6486         43 95.348837 1.000000000 0.00000000 0.00000000  4.6511628
## 2165        129 93.023256 0.111111111 0.33333333 0.55555556  6.2015504
## 5740         23 13.043478 0.800000000 0.00000000 0.20000000 86.9565217
## 3117         99 93.939394 0.833333333 0.16666667 0.00000000  6.0606061
## 6434         17 76.470588 1.000000000 0.00000000 0.00000000  0.0000000
## 4936         91 95.604396 0.750000000 0.00000000 0.25000000  3.2967033
## 3404         63 92.063492 0.800000000 0.00000000 0.20000000  4.7619048
## 6491         33 93.939394 1.000000000 0.00000000 0.00000000  0.0000000
## 5805         18 88.888889 1.000000000 0.00000000 0.00000000 11.1111111
## 1164        129 93.798450 1.000000000 0.00000000 0.00000000  5.4263566
## 3095        114 92.982456 1.000000000 0.00000000 0.00000000  7.0175439
## 4406         99 93.939394 0.666666667 0.16666667 0.16666667  4.0404040
## 4470         64 92.187500 0.200000000 0.00000000 0.80000000  6.2500000
## 5960         22 86.363636 0.000000000 0.00000000 1.00000000 13.6363636
## 2347        104 83.653846 0.647058824 0.00000000 0.35294118 11.5384615
## 435         104 98.076923 1.000000000 0.00000000 0.00000000  0.9615385
## 4200        131 96.946565 0.750000000 0.00000000 0.25000000  1.5267176
## 301         115 89.565217 0.833333333 0.08333333 0.08333333  6.0869565
## 2422        248 99.193548 0.000000000 0.50000000 0.50000000  0.8064516
## 5083         64 93.750000 0.000000000 0.00000000 1.00000000  6.2500000
## 5490         97 82.474227 0.823529412 0.00000000 0.17647059 12.3711340
## 1997        150 96.000000 0.833333333 0.00000000 0.16666667  1.3333333
## 4060         40 97.500000 0.000000000 0.00000000 1.00000000  2.5000000
## 259          44 95.454545 0.500000000 0.00000000 0.50000000  4.5454545
## 2652         99 91.919192 1.000000000 0.00000000 0.00000000  4.0404040
## 5179         55 92.727273 1.000000000 0.00000000 0.00000000  7.2727273
## 4981         98 88.775510 0.181818182 0.00000000 0.81818182 11.2244898
```

```
## 5696         18 88.888889 0.500000000 0.00000000 0.50000000  5.5555556
## 318         102 77.450980 0.565217391 0.00000000 0.43478261 18.6274510
## 3558        146 93.835616 0.888888889 0.00000000 0.11111111  5.4794521
## 2201        101 96.039604 1.000000000 0.00000000 0.00000000  2.9702970
## 1328        172 91.279070 0.200000000 0.00000000 0.80000000  8.1395349
## 1194        118 98.305085 0.000000000 0.00000000 1.00000000  1.6949153
## 2056         62 85.483871 0.888888889 0.00000000 0.11111111  8.0645161
## 6445         47 70.212766 0.785714286 0.00000000 0.21428571 17.0212766
## 613         115 67.826087 0.135135135 0.00000000 0.86486486 29.5652174
## 875          98 63.265306 0.777777778 0.00000000 0.22222222 24.4897959
## 6684         20 90.000000 0.500000000 0.00000000 0.50000000 10.0000000
## 5686         13 84.615385 1.000000000 0.00000000 0.00000000 15.3846154
## 923          72 95.833333 0.333333333 0.00000000 0.66666667  4.1666667
## 129         153 95.424837 0.285714286 0.14285714 0.57142857  3.9215686
## 249         165 97.575758 0.000000000 0.00000000 1.00000000  2.4242424
## 4642         58 82.758621 0.700000000 0.00000000 0.30000000 15.5172414
## 3463         95 91.578947 0.500000000 0.00000000 0.50000000  7.3684211
## 2285        106 83.018868 0.833333333 0.05555556 0.11111111 11.3207547
## 5262        100 77.000000 1.000000000 0.00000000 0.00000000 20.0000000
## 603          84 96.428571 1.000000000 0.00000000 0.00000000  3.5714286
## 2879         79 97.468354 1.000000000 0.00000000 0.00000000  0.0000000
## 2659        141 98.581560 0.500000000 0.00000000 0.50000000  1.4184397
## 6413         18 83.333333 0.000000000 0.00000000 1.00000000 16.6666667
## 2769         88 77.272727 1.000000000 0.00000000 0.00000000 19.3181818
## 242          64 98.437500 0.000000000 0.00000000 1.00000000  1.5625000
## 3704        110 88.181818 0.307692308 0.00000000 0.69230769 11.8181818
## 6091         54 87.037037 1.000000000 0.00000000 0.00000000  0.0000000
## 3593         95 98.947368 1.000000000 0.00000000 0.00000000  1.0526316
## 1015         48 89.583333 1.000000000 0.00000000 0.00000000  8.3333333
## 5354        159 93.710692 1.000000000 0.00000000 0.00000000  5.6603774
## 4008        105 90.476190 0.500000000 0.00000000 0.50000000  8.5714286
## 2111         32 71.875000 0.000000000 0.00000000 1.00000000 28.1250000
## 2923         71 74.647887 0.611111111 0.16666667 0.22222222 14.0845070
## 3691         90 98.888889 0.000000000 1.00000000 0.00000000  1.1111111
## 3860         69 92.753623 0.200000000 0.00000000 0.80000000  5.7971014
## 409          63 95.238095 0.000000000 0.00000000 1.00000000  4.7619048
## 525          22 63.636364 0.375000000 0.00000000 0.62500000 22.7272727
## 1418         73 84.931507 1.000000000 0.00000000 0.00000000  1.3698630
## 4766        112 98.214286 0.500000000 0.50000000 0.00000000  1.7857143
## 1242         39 94.871795 1.000000000 0.00000000 0.00000000  2.5641026
## 895         126 85.714286 0.055555556 0.00000000 0.94444444 14.2857143
## 2566         76 84.210526 0.666666667 0.00000000 0.33333333  9.2105263
## 5976         91 94.505495 0.200000000 0.00000000 0.80000000  4.3956044
## 6975         58 87.931034 0.571428571 0.14285714 0.28571429 12.0689655
## 3918         64 93.750000 1.000000000 0.00000000 0.00000000  3.1250000
## 5380         45 60.000000 0.000000000 0.00000000 1.00000000 40.0000000
## 3212         72 95.833333 1.000000000 0.00000000 0.00000000  0.0000000
## 1554        128 98.437500 1.000000000 0.00000000 0.00000000  1.5625000
## 43          193 34.196891 0.007874016 0.00000000 0.99212598 65.8031088
## 5259         42 71.428571 0.916666667 0.00000000 0.08333333  9.5238095
## 5378         85 89.411765 0.111111111 0.00000000 0.88888889 10.5882353
## 1184         57 89.473684 0.000000000 0.00000000 1.00000000 10.5263158
## 2439         55 89.090909 1.000000000 0.00000000 0.00000000  7.2727273
## 146         144 95.138889 0.142857143 0.00000000 0.85714286  4.1666667
```

```
## 3046         28 89.285714 0.000000000 0.00000000 1.00000000 10.7142857
## 773          86 84.883721 0.461538462 0.00000000 0.53846154 10.4651163
## 2876        142 97.887324 0.666666667 0.00000000 0.33333333  2.1126761
## 6856         29 51.724138 1.000000000 0.00000000 0.00000000 48.2758621
## 3321         66 95.454545 0.000000000 0.33333333 0.66666667  4.5454545
## 3226        147 99.319728 0.000000000 0.00000000 1.00000000  0.6802721
## 695         144 98.611111 1.000000000 0.00000000 0.00000000  1.3888889
## 3421         87 90.804598 0.000000000 0.12500000 0.87500000  9.1954023
## 4869         20 80.000000 0.750000000 0.00000000 0.25000000 15.0000000
## 4473         67 79.104478 0.928571429 0.07142857 0.00000000 19.4029851
## 5111        105 84.761905 0.687500000 0.00000000 0.31250000 10.4761905
## 173         108 98.148148 0.500000000 0.00000000 0.50000000  1.8518519
## 2894         92 91.304348 0.250000000 0.00000000 0.75000000  8.6956522
## 665          93 97.849462 1.000000000 0.00000000 0.00000000  2.1505376
## 913          79 88.607595 0.000000000 0.44444444 0.55555556 11.3924051
## 3287         77 96.103896 0.333333333 0.00000000 0.66666667  3.8961039
## 1192         75 96.000000 0.000000000 0.33333333 0.66666667  4.0000000
## 2866        139 82.014388 1.000000000 0.00000000 0.00000000 13.6690647
## 564         115 78.260870 0.880000000 0.12000000 0.00000000  5.2173913
## 2665         80 88.750000 1.000000000 0.00000000 0.00000000  8.7500000
## 633         130 99.230769 1.000000000 0.00000000 0.00000000  0.7692308
## 5908         37 94.594595 0.000000000 0.00000000 1.00000000  5.4054054
## 417          60 90.000000 1.000000000 0.00000000 0.00000000  6.6666667
## 2514         45 93.333333 1.000000000 0.00000000 0.00000000  2.2222222
## 5188         84 89.285714 0.777777778 0.11111111 0.11111111  7.1428571
## 2475        107 95.327103 1.000000000 0.00000000 0.00000000  4.6728972
## 724          75 92.000000 1.000000000 0.00000000 0.00000000  6.6666667
## 1030         57 96.491228 1.000000000 0.00000000 0.00000000  3.5087719
## 1783         70 98.571429 1.000000000 0.00000000 0.00000000  1.4285714
## 6378         11 90.909091 0.000000000 1.00000000 0.00000000  9.0909091
## 2714         51 98.039216 1.000000000 0.00000000 0.00000000  0.0000000
## 2748        114 91.228070 0.800000000 0.00000000 0.20000000  5.2631579
## 6092         41 82.926829 1.000000000 0.00000000 0.00000000  9.7560976
## 5142         93 94.623656 0.600000000 0.00000000 0.40000000  3.2258065
## 1590         57 80.701754 0.090909091 0.00000000 0.90909091 19.2982456
## 5551         61 86.885246 0.000000000 0.00000000 1.00000000 13.1147541
## 1431        151 92.052980 0.750000000 0.00000000 0.25000000  4.6357616
## 501          22 13.636364 0.368421053 0.00000000 0.63157895 77.2727273
## 1284         90 90.000000 0.444444444 0.00000000 0.55555556  7.7777778
## 3452         82 86.585366 1.000000000 0.00000000 0.00000000  7.3170732
## 4005         98 95.918367 0.250000000 0.00000000 0.75000000  3.0612245
## 6255         25 96.000000 1.000000000 0.00000000 0.00000000  4.0000000
## 4191         91 84.615385 0.785714286 0.00000000 0.21428571 14.2857143
## 3383         59 77.966102 0.076923077 0.00000000 0.92307692 22.0338983
## 5468        108 94.444444 0.333333333 0.00000000 0.66666667  5.5555556
## 5794         19 94.736842 0.000000000 0.00000000 1.00000000  5.2631579
## 3024         16 93.750000 1.000000000 0.00000000 0.00000000  6.2500000
## 4657         57 89.473684 0.500000000 0.00000000 0.50000000  8.7719298
## 3225         71 91.549296 1.000000000 0.00000000 0.00000000  5.6338028
## 6976         20 90.000000 0.500000000 0.00000000 0.50000000 10.0000000
## 4243         65 87.692308 1.000000000 0.00000000 0.00000000 10.7692308
## 3384        114 85.087719 0.705882353 0.00000000 0.29411765 11.4035088
## 6074         13 76.923077 1.000000000 0.00000000 0.00000000 15.3846154
## 5081         20 95.000000 1.000000000 0.00000000 0.00000000  5.0000000
```

```
## 1389        134 97.014925 0.500000000 0.00000000 0.50000000  2.9850746
## 2578        131 52.671756 1.000000000 0.00000000 0.00000000 27.4809160
## 2575         82 98.780488 0.000000000 0.00000000 1.00000000  1.2195122
## 2812        119 69.747899 1.000000000 0.00000000 0.00000000 16.8067227
## 3998        126 93.650794 0.000000000 0.00000000 1.00000000  6.3492063
## 3393         73 93.150685 0.800000000 0.00000000 0.20000000  2.7397260
## 3387        122 97.540984 0.333333333 0.00000000 0.66666667  2.4590164
## 855         106 70.754717 0.161290323 0.00000000 0.83870968 26.4150943
## 701          72 95.833333 0.333333333 0.00000000 0.66666667  4.1666667
## 730          53 94.339623 0.000000000 0.00000000 1.00000000  5.6603774
## 2889         67 85.074627 0.400000000 0.10000000 0.50000000 14.9253731
## 2468        118 99.152542 1.000000000 0.00000000 0.00000000  0.8474576
## 4821         64 85.937500 0.777777778 0.00000000 0.22222222 12.5000000
## 515          86 88.372093 0.500000000 0.00000000 0.50000000 11.6279070
## 2741        180 97.222222 0.800000000 0.00000000 0.20000000  2.7777778
## 6923         31 93.548387 1.000000000 0.00000000 0.00000000  0.0000000
## 3422         53 84.905660 0.375000000 0.00000000 0.62500000 11.3207547
## 5034        130 97.692308 1.000000000 0.00000000 0.00000000  2.3076923
## 588         141 98.581560 0.000000000 0.00000000 1.00000000  1.4184397
## 1207        126 93.650794 0.500000000 0.00000000 0.50000000  5.5555556
## 2077        138 44.202899 0.298701299 0.00000000 0.70129870 51.4492754
## 3326         14 78.571429 0.333333333 0.00000000 0.66666667 21.4285714
## 1359        148 95.270270 1.000000000 0.00000000 0.00000000  2.7027027
## 6693         11 81.818182 0.000000000 0.00000000 1.00000000 18.1818182
## 3945         83 96.385542 0.000000000 0.00000000 1.00000000  3.6144578
## 5267         70 92.857143 0.800000000 0.00000000 0.20000000  7.1428571
## 2176         48 95.833333 0.000000000 0.00000000 1.00000000  4.1666667
## 2301         11 90.909091 1.000000000 0.00000000 0.00000000  9.0909091
## 1901        195 97.948718 1.000000000 0.00000000 0.00000000  2.0512821
## 3295         70 92.857143 0.800000000 0.00000000 0.20000000  5.7142857
## 3169         88 95.454545 0.750000000 0.25000000 0.00000000  2.2727273
## 6224         19 84.210526 0.333333333 0.00000000 0.66666667 15.7894737
## 6784         43 37.209302 0.148148148 0.00000000 0.85185185 62.7906977
## 153          74 67.567568 0.666666667 0.00000000 0.33333333 27.0270270
## 6679         32 75.000000 0.250000000 0.00000000 0.75000000 18.7500000
## 6418         33 96.969697 0.000000000 0.00000000 1.00000000  3.0303030
## 6476         53 96.226415 0.500000000 0.00000000 0.50000000  1.8867925
## 3722        110 92.727273 1.000000000 0.00000000 0.00000000  4.5454545
## 6553         18 88.888889 0.000000000 0.00000000 1.00000000 11.1111111
## 6653         23 78.260870 0.800000000 0.00000000 0.20000000 21.7391304
## 1842         22 90.909091 1.000000000 0.00000000 0.00000000  9.0909091
## 3675         91 95.604396 1.000000000 0.00000000 0.00000000  2.1978022
## 4828        129 96.124031 0.600000000 0.00000000 0.40000000  2.3255814
## 3731        212 98.113208 0.750000000 0.00000000 0.25000000  1.4150943
## 4682        101 90.099010 0.900000000 0.00000000 0.10000000  7.9207921
## 2641        134 81.343284 1.000000000 0.00000000 0.00000000 11.9402985
## 4105         39 94.871795 0.000000000 0.00000000 1.00000000  5.1282051
## 3263         89 91.011236 0.375000000 0.00000000 0.62500000  8.9887640
## 2294        118 98.305085 0.500000000 0.00000000 0.50000000  1.6949153
## 5679         24 37.500000 0.000000000 0.00000000 1.00000000 62.5000000
## 3051         11 81.818182 0.000000000 0.00000000 1.00000000 18.1818182
## 4137        126 96.031746 1.000000000 0.00000000 0.00000000  1.5873016
## 5148        136 91.911765 0.545454545 0.00000000 0.45454545  3.6764706
## 900          12 83.333333 0.000000000 0.00000000 1.00000000 16.6666667
```

```
## 5524         23 78.260870 1.000000000 0.00000000 0.00000000 21.7391304
## 1311         71 97.183099 1.000000000 0.00000000 0.00000000  2.8169014
## 88           91 92.307692 0.428571429 0.28571429 0.28571429  6.5934066
## 1333         78 97.435897 0.500000000 0.00000000 0.50000000  2.5641026
## 4616         98 94.897959 1.000000000 0.00000000 0.00000000  2.0408163
## 4915         60 96.666667 1.000000000 0.00000000 0.00000000  0.0000000
## 2358         93 92.473118 1.000000000 0.00000000 0.00000000  4.3010753
## 3550        141 94.326241 0.000000000 0.00000000 1.00000000  5.6737589
## 5532         94 29.787234 1.000000000 0.00000000 0.00000000 32.9787234
## 3744        117 93.162393 0.625000000 0.00000000 0.37500000  5.9829060
## 347          78 97.435897 1.000000000 0.00000000 0.00000000  1.2820513
## 1631         49 91.836735 0.250000000 0.00000000 0.75000000  8.1632653
## 1448        122 95.901639 1.000000000 0.00000000 0.00000000  0.8196721
## 2919         20 40.000000 0.166666667 0.75000000 0.08333333 60.0000000
## 4453        149 91.946309 0.166666667 0.00000000 0.83333333  8.0536913
## 5258         97 84.536082 0.600000000 0.00000000 0.40000000 14.4329897
## 558         141 96.453901 1.000000000 0.00000000 0.00000000  1.4184397
## 2075         18 72.222222 0.600000000 0.00000000 0.40000000 27.7777778
## 3929         76 92.105263 0.666666667 0.00000000 0.33333333  7.8947368
## 1248        167 94.011976 0.500000000 0.00000000 0.50000000  3.5928144
## 3290         74 90.540541 0.142857143 0.00000000 0.85714286  9.4594595
## 4256         85 90.588235 0.500000000 0.00000000 0.50000000  9.4117647
## 98          119 95.798319 0.000000000 0.00000000 1.00000000  4.2016807
## 266          38 94.736842 0.500000000 0.00000000 0.50000000  5.2631579
## 548         158 89.240506 0.705882353 0.23529412 0.05882353  8.2278481
## 6237         30 90.000000 1.000000000 0.00000000 0.00000000 10.0000000
## 974          15 60.000000 0.833333333 0.00000000 0.16666667 40.0000000
## 4843         76 98.684211 0.000000000 0.00000000 1.00000000  1.3157895
## 5451         13 84.615385 0.500000000 0.00000000 0.50000000  7.6923077
## 1919         71 98.591549 0.000000000 0.00000000 1.00000000  1.4084507
## 1320         90 85.555556 0.076923077 0.07692308 0.84615385 13.3333333
## 6934         22 86.363636 0.666666667 0.00000000 0.33333333 13.6363636
## 1508        111 99.099099 1.000000000 0.00000000 0.00000000  0.9009009
## 5004         97 97.938144 0.500000000 0.00000000 0.50000000  1.0309278
## 4271         47 87.234043 0.000000000 0.00000000 1.00000000 12.7659574
## 871          69 76.811594 0.875000000 0.00000000 0.12500000 15.9420290
## 1518        116 95.689655 0.200000000 0.00000000 0.80000000  4.3103448
## 1143         82 86.585366 1.000000000 0.00000000 0.00000000  6.0975610
## 5507         65 47.692308 0.794117647 0.00000000 0.20588235 18.4615385
## 5015         48 95.833333 1.000000000 0.00000000 0.00000000  2.0833333
## 4285         66 93.939394 0.500000000 0.25000000 0.25000000  6.0606061
## 21           49 87.755102 0.500000000 0.00000000 0.50000000 10.2040816
## 2242         73 98.630137 0.000000000 0.00000000 1.00000000  1.3698630
## 4969         63 98.412698 0.000000000 0.00000000 1.00000000  1.5873016
## 6446         23 95.652174 1.000000000 0.00000000 0.00000000  0.0000000
## 3394         92 86.956522 0.833333333 0.00000000 0.16666667 13.0434783
## 5406         81 90.123457 0.500000000 0.00000000 0.50000000  8.6419753
## 3609        150 96.666667 0.800000000 0.00000000 0.20000000  2.6666667
## 993          72 97.222222 0.500000000 0.00000000 0.50000000  2.7777778
## 3246         85 90.588235 0.625000000 0.00000000 0.37500000  8.2352941
## 4568         99 95.959596 0.750000000 0.00000000 0.25000000  2.0202020
## 4941         36 97.222222 1.000000000 0.00000000 0.00000000  2.7777778
## 1102         85 94.117647 0.000000000 0.00000000 1.00000000  5.8823529
## 6233         31 70.967742 1.000000000 0.00000000 0.00000000 29.0322581
```

```
## 4802        178 88.202247 1.000000000 0.00000000 0.00000000 10.1123596
## 4054         20 90.000000 0.500000000 0.00000000 0.50000000  5.0000000
## 2081         78 98.717949 1.000000000 0.00000000 0.00000000  1.2820513
## 5297         87 93.103448 0.833333333 0.00000000 0.16666667  6.8965517
## 4250         47 89.361702 1.000000000 0.00000000 0.00000000 10.6382979
## 2691         66 72.727273 1.000000000 0.00000000 0.00000000  7.5757576
##         polMiss    mmrMiss    hepMiss    varMiss     nonvax conditional_t
## 1872  6.9230769  6.9230769  6.9230769  6.9230769  6.9230769     0.0000000
## 3056 10.8108108 10.8108108 10.8108108  8.1081081 13.5135135     8.1081081
## 1733  7.2000000  7.2000000  8.0000000  7.2000000  8.0000000     0.8000000
## 4610  5.4545455  5.4545455  7.2727273  3.6363636  7.2727273     3.6363636
## 5593 30.7692308 30.7692308  0.0000000 30.7692308 30.7692308    30.7692308
## 4485  6.7796610 11.8644068  4.2372881  4.2372881 12.7118644    11.0169492
## 3418  9.7560976 10.9756098  9.7560976 10.9756098 10.9756098     1.2195122
## 2802 10.6060606  1.5151515  3.0303030  1.5151515 13.6363636    13.6363636
## 4096 29.7297297 29.7297297 10.8108108 10.8108108 29.7297297    21.6216216
## 1609  0.5347594  0.5347594  0.5347594  0.5347594  1.0695187     0.5347594
## 2350  1.0752688  2.1505376  0.0000000  0.0000000  3.2258065     3.2258065
## 4021  6.6666667 10.0000000  6.6666667  6.6666667 10.0000000     3.3333333
## 1753  2.2222222  2.2222222  0.0000000  2.2222222  3.3333333     3.3333333
## 3349 13.8888889 16.6666667  2.7777778  0.0000000 19.4444444    19.4444444
## 2706 11.6504854 16.5048544  8.7378641  6.7961165 20.3883495    15.5339806
## 121   8.3333333  8.3333333  8.3333333  8.3333333  8.3333333     0.0000000
## 1836 19.6721311 19.6721311 16.3934426 16.3934426 19.6721311     3.2786885
## 4087  1.9047619  1.9047619  1.9047619  1.9047619  1.9047619     0.0000000
## 3140 17.3913043 17.3913043 17.3913043 17.3913043 26.0869565     8.6956522
## 6179  3.2258065  9.6774194  0.0000000  0.0000000 12.9032258    12.9032258
## 6879 37.5000000 41.0714286  6.2500000  5.3571429 46.4285714    41.0714286
## 4880  3.4482759  1.7241379  3.4482759  1.7241379  3.4482759     1.7241379
## 6458  3.8461538  3.8461538  3.8461538  3.8461538  3.8461538     0.0000000
## 4344  0.8264463  1.6528926  0.8264463  0.8264463  1.6528926     0.8264463
## 3446  2.0202020  3.0303030  1.0101010  1.0101010  3.0303030     2.0202020
## 176   1.2345679  1.2345679  1.2345679  1.2345679  1.2345679     0.0000000
## 2272  0.0000000  1.9607843  0.0000000  0.0000000  1.9607843     1.9607843
## 1661  7.3684211  7.3684211  7.3684211  6.3157895  7.3684211     1.0526316
## 1977  8.0808081  0.0000000  7.0707071  1.0101010  8.0808081     8.0808081
## 504  68.9655172 68.9655172 68.9655172 68.9655172 68.9655172     0.0000000
## 5796 12.0000000 12.0000000  4.0000000  4.0000000 16.0000000    12.0000000
## 543   0.0000000  0.7812500  0.0000000  0.0000000  0.7812500     0.7812500
## 5090 33.3333333 34.8484848 28.7878788 27.2727273 37.8787879    22.7272727
## 2749 12.7118644 11.0169492  9.3220339  8.4745763 13.5593220     5.0847458
## 6212 10.0000000 15.0000000  8.3333333  8.3333333 15.0000000     6.6666667
## 2675  0.5319149  0.5319149  0.0000000  0.0000000  0.5319149     0.5319149
## 3619 29.7872340 29.7872340 29.7872340 29.7872340 29.7872340     0.0000000
## 5517  0.0000000 12.5000000  0.0000000  0.0000000 12.5000000    12.5000000
## 2542  4.2105263  6.3157895  4.2105263  4.2105263  6.3157895     2.1052632
## 1897  3.2608696  3.2608696  3.2608696  3.2608696  3.2608696     0.0000000
## 1973  1.4492754  1.4492754  1.4492754  1.4492754  1.4492754     1.4492754
## 4982 32.6530612 38.7755102 12.2448980  8.1632653 44.8979592    40.8163265
## 4569 27.1186441 25.4237288 25.4237288 28.8135593 33.8983051    33.8983051
## 3809  9.8039216  9.8039216  0.0000000  0.0000000  9.8039216     9.8039216
## 1398  3.4090909  4.5454545  2.2727273  1.1363636  4.5454545     3.4090909
## 4028  7.6190476  8.5714286  7.6190476  6.6666667  8.5714286     1.9047619
## 4425  5.6603774  5.6603774  7.5471698  5.6603774  8.4905660     2.8301887
```

```
## 5413  8.3333333  8.3333333  6.6666667  3.3333333 10.0000000    10.0000000
## 3069  3.4482759  3.4482759  3.4482759  3.4482759  3.4482759     0.0000000
## 3441  4.4444444  2.9629630  0.7407407  0.7407407  4.4444444     3.7037037
## 1610  0.0000000  0.0000000  0.0000000  0.0000000  0.6802721     0.6802721
## 5770  0.0000000 12.5000000  0.0000000 12.5000000 12.5000000    12.5000000
## 1083  6.1403509  7.0175439  2.6315789  6.1403509  7.0175439     4.3859649
## 4761  1.1111111  1.1111111  2.2222222  1.1111111  3.3333333     2.2222222
## 46    1.6666667  2.5000000  1.6666667  1.6666667  5.0000000     3.3333333
## 3433  5.3030303  6.8181818  2.2727273  0.7575758  9.0909091     9.0909091
## 4968  1.2987013  1.2987013  1.2987013  1.2987013  1.2987013     0.0000000
## 3147  4.1666667  2.7777778  2.7777778  1.3888889  4.1666667     2.7777778
## 2524 20.5673759  4.2553191 21.9858156  2.1276596 28.3687943    27.6595745
## 698   5.8441558  5.8441558  5.1948052  4.5454545  6.4935065     1.9480519
## 1876 27.4193548 30.6451613 14.5161290 12.9032258 32.2580645    22.5806452
## 5806  9.0909091 15.1515152  9.0909091  9.0909091 27.2727273    24.2424242
## 2738 43.0232558 45.9302326 40.1162791 38.9534884 49.4186047    49.4186047
## 6842  3.3333333  3.3333333  1.6666667  1.6666667  3.3333333     1.6666667
## 3371 29.8850575 29.8850575 28.7356322 28.7356322 29.8850575     1.1494253
## 5425  4.6875000  6.2500000  4.6875000  5.4687500  7.0312500     2.3437500
## 3982  6.8376068  7.6923077  6.8376068  6.8376068  7.6923077     0.8547009
## 1450  1.0204082  1.0204082  0.0000000  0.0000000  1.0204082     1.0204082
## 5561  1.0526316  1.0526316  2.1052632  0.0000000  4.2105263     4.2105263
## 2188 14.2857143 21.4285714 14.2857143  7.1428571 21.4285714    14.2857143
## 6535  3.2258065  0.0000000  3.2258065  3.2258065  3.2258065     3.2258065
## 6615  1.2345679  1.2345679  0.0000000  1.2345679  1.2345679     1.2345679
## 4092  6.6666667  8.3333333  6.6666667  5.0000000  8.3333333     3.3333333
## 545   1.7391304  6.9565217  1.7391304  0.8695652  6.9565217     6.0869565
## 3939  4.3750000  4.3750000  6.2500000  4.3750000  6.2500000     1.8750000
## 3713  0.9090909  0.9090909  0.9090909  0.9090909  0.9090909     0.0000000
## 4201  1.1627907  1.1627907  1.1627907  1.1627907  1.1627907     1.1627907
## 6895  6.2500000  6.2500000  6.2500000  6.2500000  6.2500000     0.0000000
## 2123  3.8461538  3.8461538  3.8461538  3.8461538  3.8461538     0.0000000
## 4402  3.5714286  3.5714286  7.1428571  3.5714286  7.1428571     3.5714286
## 586   6.2500000  6.2500000  6.2500000  6.2500000  6.2500000     0.0000000
## 1647  5.5865922  5.5865922  5.5865922  5.5865922 16.2011173    15.6424581
## 2390 13.3333333 11.1111111 15.5555556  6.6666667 15.5555556     8.8888889
## 6943  2.7777778  2.7777778  2.7777778  2.7777778  2.7777778     0.0000000
## 6861  8.3333333  8.3333333  8.3333333  8.3333333  8.3333333     8.3333333
## 293   4.5454545  4.5454545  1.5151515  0.0000000  6.0606061     6.0606061
## 3141  5.5555556  0.0000000  0.0000000  0.0000000 11.1111111    11.1111111
## 2862  1.7543860  1.7543860  1.7543860  1.7543860  1.7543860     0.0000000
## 2834  4.4776119  6.7164179  2.2388060  2.2388060  7.4626866     6.7164179
## 2099 10.0000000 10.0000000 10.0000000 10.0000000 10.0000000     0.0000000
## 3930  0.0000000  2.1276596  0.0000000  0.0000000  2.1276596     2.1276596
## 5450  0.0000000  0.0000000  1.2195122  0.0000000  1.2195122     1.2195122
## 5320  1.3513514  1.3513514  1.3513514  1.3513514  1.3513514     0.0000000
## 1179  8.9285714  8.9285714  8.9285714  8.9285714 10.7142857     3.5714286
## 5252 19.2660550 17.4311927 11.0091743 10.0917431 20.1834862    15.5963303
## 2501 11.5384615 13.4615385  2.8846154  1.9230769 16.3461538    16.3461538
## 2521 18.0555556 18.0555556  5.5555556  5.5555556 18.0555556    16.6666667
## 3597  1.6528926  1.6528926  1.6528926  1.6528926  1.6528926     0.0000000
## 5762  9.0909091 12.7272727 14.5454545  9.0909091 14.5454545     5.4545455
## 5183  2.5641026  3.8461538  1.2820513  1.2820513  3.8461538     2.5641026
## 4077  1.9607843  1.9607843  1.9607843  1.9607843  1.9607843     0.0000000
```

```
## 334   0.9803922  0.0000000  0.0000000  0.0000000  0.9803922     0.9803922
## 4614  4.9180328  6.5573770  4.0983607  4.9180328  6.5573770     3.2786885
## 2828  0.6172840  0.6172840  0.6172840  0.0000000  1.8518519     1.8518519
## 397   2.1739130  2.1739130  2.1739130  2.1739130  2.1739130     0.0000000
## 5032  2.5641026  5.1282051  2.5641026  2.5641026  5.1282051     2.5641026
## 755   2.6315789  2.6315789  0.0000000  0.0000000  4.3859649     4.3859649
## 6544  8.3333333  4.1666667  8.3333333  4.1666667 12.5000000    12.5000000
## 2008  0.0000000  1.7857143  0.0000000  0.0000000  1.7857143     1.7857143
## 1247  4.6728972  4.6728972  5.6074766  3.7383178  8.4112150     4.6728972
## 6138 26.6666667 26.6666667 33.3333333  0.0000000 46.6666667    46.6666667
## 903  33.3333333 33.3333333 33.3333333 33.3333333 33.3333333     0.0000000
## 2433  0.6756757  0.6756757  0.6756757  0.6756757  0.6756757     0.0000000
## 3131 15.6521739 18.2608696 13.9130435 11.3043478 24.3478261    14.7826087
## 3268 78.1250000 78.1250000 78.1250000 78.1250000 78.1250000     0.0000000
## 4734 13.3333333 11.1111111  6.6666667  4.4444444 17.7777778    17.7777778
## 5312  4.8076923  6.7307692  1.9230769  1.9230769  8.6538462     7.6923077
## 2938  2.7586207  4.1379310  0.6896552  0.0000000  5.5172414     5.5172414
## 3111  8.9552239 10.4477612  5.2238806  3.7313433 11.1940299     8.2089552
## 1648  5.4054054  3.6036036  2.7027027  1.8018018  9.0090090     9.0090090
## 1937  2.0000000  2.0000000  2.0000000  2.0000000  4.0000000     2.0000000
## 4964  5.1546392  5.1546392  5.1546392  5.1546392  5.1546392     0.0000000
## 2538 10.4166667 16.6666667  0.0000000  0.0000000 22.9166667    22.9166667
## 3353  9.8591549  9.8591549  7.0422535  5.6338028 11.2676056    11.2676056
## 5544  8.6956522  8.6956522  8.6956522  8.6956522 13.0434783     4.3478261
## 5275  9.5238095  9.5238095  9.5238095  9.5238095  9.5238095     0.0000000
## 1829  1.2658228  1.2658228  2.5316456  1.2658228  2.5316456     2.5316456
## 2256 48.2758621 48.2758621 48.2758621 48.2758621 48.2758621     0.0000000
## 6502  5.0000000 10.0000000  5.0000000 10.0000000 10.0000000     5.0000000
## 4928 22.6666667 26.6666667 17.3333333 16.0000000 26.6666667    20.0000000
## 846  45.0000000 45.0000000 45.0000000 45.0000000 45.0000000     0.0000000
## 5584  8.9743590  6.4102564  3.8461538  1.2820513 10.2564103     8.9743590
## 1190  4.2735043  6.8376068  3.4188034  3.4188034  6.8376068     3.4188034
## 1090  2.7027027  1.8018018  0.9009009  0.0000000  3.6036036     3.6036036
## 5996 10.6666667  8.0000000 10.6666667  9.3333333 10.6666667     2.6666667
## 411   3.7037037  1.2345679  1.2345679  0.0000000  3.7037037     3.7037037
## 408   5.0847458  5.0847458  5.0847458  5.0847458  5.0847458     0.0000000
## 6655  8.3333333 13.3333333  8.3333333 11.6666667 16.6666667     8.3333333
## 3602  6.2992126  7.8740157  4.7244094  4.7244094  7.8740157     7.8740157
## 3944  3.5714286  0.7142857  5.0000000  9.2857143 12.1428571    11.4285714
## 1994  6.7307692  5.7692308  5.7692308  3.8461538  7.6923077     3.8461538
## 5251  1.3888889  1.3888889  1.3888889  1.3888889  1.3888889     0.0000000
## 3217  8.4905660  9.4339623  5.6603774  5.6603774 13.2075472     8.4905660
## 5335  4.5454545  4.5454545  7.5757576  4.5454545  7.5757576     3.0303030
## 2149 41.6666667  8.3333333 16.6666667  8.3333333 41.6666667    33.3333333
## 1723  8.7912088  7.6923077  2.1978022  2.1978022 13.1868132    13.1868132
## 5777 18.9189189 18.9189189 13.5135135 10.8108108 21.6216216    16.2162162
## 1682  1.1111111  2.2222222  1.1111111  1.1111111  2.2222222     2.2222222
## 5182  3.1914894  3.1914894  1.0638298  1.0638298  3.1914894     2.1276596
## 5395  2.3809524  4.7619048  0.0000000  0.0000000  4.7619048     4.7619048
## 606  25.0000000 25.0000000 25.0000000 25.0000000 25.0000000    25.0000000
## 904  17.1974522 18.4713376  7.0063694  6.3694268 21.0191083    19.1082803
## 2502 25.4545455 32.7272727 15.4545455 13.6363636 39.0909091    27.2727273
## 742  11.6279070 11.6279070 12.7906977 11.6279070 12.7906977     1.1627907
## 4689 13.5802469 17.2839506 14.8148148 13.5802469 17.2839506     4.9382716
```

```
## 961   0.0000000  0.0000000  0.0000000  0.0000000  1.1235955    1.1235955
## 6471 19.5652174 19.5652174  8.6956522  8.6956522 19.5652174   10.8695652
## 3360 20.2898551 30.4347826 33.3333333 26.0869565 39.1304348   28.9855072
## 1050  6.2500000  6.2500000  6.2500000  3.7500000  6.2500000    2.5000000
## 3342  2.3529412  5.8823529  2.3529412  2.3529412  8.2352941    5.8823529
## 3454 34.4827586 34.4827586 31.0344828 27.5862069 34.4827586    6.8965517
## 2356  4.2780749  5.3475936  2.6737968  2.6737968  5.8823529    5.3475936
## 4787  2.2421525  2.2421525  0.8968610  0.4484305  4.0358744    4.0358744
## 393  25.2525253 23.2323232  1.0101010  0.0000000 31.3131313   31.3131313
## 2989 13.1147541 16.3934426  3.2786885  1.6393443 19.6721311   19.6721311
## 6801  6.8965517  6.8965517  6.8965517  6.8965517  6.8965517    0.0000000
## 2029  0.0000000  0.7692308  0.0000000  0.7692308  0.7692308    0.7692308
## 816   1.9230769  1.9230769  1.9230769  1.9230769  1.9230769    0.0000000
## 2012  6.1855670  6.1855670  6.1855670  6.1855670  6.1855670    1.0309278
## 247   3.8461538  5.7692308  2.8846154  0.9615385  7.6923077    6.7307692
## 1817  5.3191489  5.3191489  1.0638298  1.0638298  6.3829787    6.3829787
## 4023  9.7142857  9.7142857 10.8571429  9.7142857 15.4285714    9.1428571
## 929   0.0000000  2.5641026  0.0000000  0.0000000  2.5641026    2.5641026
## 3830  1.4705882  1.4705882  1.4705882  1.4705882  1.4705882    0.0000000
## 3861  2.8985507  2.8985507  2.8985507  2.8985507  2.8985507    0.0000000
## 5203  2.1052632  2.1052632  2.1052632  2.1052632  3.1578947    1.0526316
## 5    20.0000000 20.0000000 20.0000000 20.0000000 20.0000000    0.0000000
## 6070 11.9047619 16.6666667  2.3809524  2.3809524 16.6666667   14.2857143
## 821   8.3333333 10.7142857  5.9523810  3.5714286 10.7142857    7.1428571
## 177   1.1173184  1.1173184  1.1173184  1.1173184  2.2346369    1.1173184
## 2293 12.5000000 12.5000000  0.0000000  0.0000000 14.5833333   14.5833333
## 3789  3.3898305  4.2372881  0.0000000  0.0000000  4.2372881    4.2372881
## 906   3.1250000  1.5625000  1.5625000  1.5625000  3.1250000    3.1250000
## 4811  0.8474576  1.6949153  0.8474576  0.8474576  1.6949153    0.8474576
## 3806  6.8965517  6.8965517  6.8965517  1.1494253  6.8965517    5.7471264
## 1880 14.7540984 14.7540984 14.7540984 14.7540984 14.7540984    0.0000000
## 5667 17.6470588 17.6470588  5.8823529  5.8823529 17.6470588   11.7647059
## 6231  4.0000000  4.0000000  4.0000000  4.0000000  4.0000000    0.0000000
## 4378 38.8888889 36.1111111 27.7777778 36.1111111 47.2222222   36.1111111
## 2592 15.4929577 18.3098592 11.9718310  7.0422535 21.8309859   17.6056338
## 3161  2.3255814  4.6511628  2.3255814  2.3255814  6.9767442    4.6511628
## 3507 11.6279070  4.6511628 13.9534884 11.6279070 27.9069767   27.9069767
## 4624 47.6923077 46.1538462 49.2307692 44.6153846 56.9230769   26.1538462
## 5429  6.0344828  5.1724138  1.7241379  0.8620690  6.0344828    5.1724138
## 2227  5.0000000  5.0000000  7.5000000  5.0000000  7.5000000    2.5000000
## 5528 20.0000000 20.0000000 25.0000000 20.0000000 25.0000000    5.0000000
## 6034  9.2592593 11.1111111  9.2592593  9.2592593 14.8148148    7.4074074
## 2042  3.3333333  3.3333333  0.0000000  0.0000000  3.3333333    3.3333333
## 5861 27.7777778 27.7777778 27.7777778 27.7777778 27.7777778    0.0000000
## 6737 11.1111111 16.6666667  0.0000000  0.0000000 16.6666667   16.6666667
## 3512 11.5384615  8.9743590  8.9743590  6.4102564 16.6666667   15.3846154
## 2941  7.5000000  7.5000000  7.5000000  7.5000000  7.5000000    5.0000000
## 6894 10.5263158  0.0000000  0.0000000  0.0000000 21.0526316   21.0526316
## 1068  6.2500000  6.2500000  6.2500000  6.2500000  6.2500000    0.0000000
## 1805  4.0000000  4.0000000  2.0000000  2.0000000  4.0000000    2.0000000
## 4100  9.8360656  8.1967213  8.1967213  8.1967213  9.8360656    1.6393443
## 5181  2.0618557  2.0618557  2.0618557  2.0618557  2.0618557    0.0000000
## 235   0.0000000  0.0000000  0.0000000  0.0000000  2.6315789    2.6315789
## 3876  7.8740157  7.8740157  6.2992126  6.2992126  7.8740157    1.5748031
```

```
## 4584  3.8834951  2.9126214  0.0000000  0.0000000  4.8543689     4.8543689
## 60   11.2244898 11.2244898  8.1632653  7.1428571 11.2244898     4.0816327
## 5135 16.0000000 15.5000000 15.0000000 15.0000000 16.0000000     1.0000000
## 2613 43.3962264 14.1509434 18.8679245 21.6981132 67.9245283    67.9245283
## 1489  3.6585366  3.6585366  2.4390244  2.4390244  3.6585366     1.2195122
## 3579  1.1834320  2.3668639  1.1834320  1.1834320  2.3668639     1.1834320
## 5357 40.6060606 40.6060606 40.6060606 40.6060606 40.6060606     0.0000000
## 4668 15.6862745 27.4509804  7.8431373  7.8431373 33.3333333    29.4117647
## 788   3.7313433  2.9850746  2.9850746  2.9850746  3.7313433     0.7462687
## 1857  5.6338028  7.0422535  2.8169014  2.8169014  7.0422535     4.2253521
## 1929 13.0434783 21.7391304  4.3478261  4.3478261 21.7391304    21.7391304
## 5512 74.1935484 77.4193548 64.5161290 64.5161290 77.4193548    19.3548387
## 3493  4.0816327  6.1224490  0.0000000  0.0000000  6.1224490     6.1224490
## 375   4.1666667  4.1666667  5.5555556  2.7777778  9.7222222     8.3333333
## 1909  4.6153846  0.7692308  9.2307692  0.7692308 13.8461538    13.8461538
## 2215  4.1666667  4.1666667  3.4722222  3.4722222  6.9444444     3.4722222
## 4592 13.3333333 12.2222222  5.5555556  5.5555556 21.1111111    15.5555556
## 4750 11.1111111  3.7037037  4.6296296  3.7037037 12.9629630     9.2592593
## 132   8.5714286  7.6190476  6.6666667  6.6666667  8.5714286     1.9047619
## 740  16.4556962 17.7215190 15.1898734 15.1898734 17.7215190     3.7974684
## 2820  3.1250000  9.3750000  0.0000000  0.0000000  9.3750000     9.3750000
## 2507  6.1068702  7.6335878  3.0534351  0.7633588  9.1603053     9.1603053
## 6181  6.6666667 13.3333333  2.2222222  2.2222222 15.5555556    13.3333333
## 5993 10.0000000  0.0000000  0.0000000  0.0000000 10.0000000    10.0000000
## 535   4.3956044  3.2967033  1.0989011  0.0000000  4.3956044     4.3956044
## 2044  4.5977011  3.4482759  2.2988506  2.2988506  6.8965517     6.8965517
## 2329  2.1505376  0.0000000  1.0752688  0.0000000  2.1505376     2.1505376
## 3195  1.0101010  2.0202020  2.0202020  1.0101010  4.0404040     3.0303030
## 715   0.0000000  1.5037594  0.7518797  0.0000000  1.5037594     1.5037594
## 3633 22.9508197 21.3114754  3.2786885  6.5573770 22.9508197    21.3114754
## 2300  8.3333333 10.0000000  1.6666667  0.0000000 10.0000000    10.0000000
## 3854  4.6728972  2.8037383  0.0000000  0.0000000  7.4766355     7.4766355
## 1713  1.1111111  1.1111111  1.1111111  1.1111111  1.1111111     0.0000000
## 2617  7.6923077  9.2307692  3.0769231  3.0769231  9.2307692     7.6923077
## 444   3.3333333  3.3333333  5.0000000  3.3333333  5.0000000     1.6666667
## 6638 11.7647059 17.6470588  5.8823529  2.9411765 17.6470588    14.7058824
## 2664  1.4598540  2.1897810  0.0000000  0.0000000  2.9197080     2.9197080
## 3900 29.4117647 29.4117647 29.4117647 29.4117647 29.4117647     0.0000000
## 609   4.1095890  4.1095890  2.7397260  2.7397260  4.1095890     1.3698630
## 394  12.0689655 12.0689655  0.0000000  0.0000000 24.1379310    24.1379310
## 3081  2.6143791  1.9607843  1.9607843  1.3071895  3.2679739     1.9607843
## 2817  5.3691275  6.0402685  0.6711409  0.0000000 11.4093960    11.4093960
## 4489  7.3170732  6.0975610  8.5365854  4.8780488  9.7560976     4.8780488
## 1972 11.8811881  0.9900990  7.9207921  4.9504950 16.8316832    16.8316832
## 3904  3.4883721  3.4883721  3.4883721  3.4883721  3.4883721     1.1627907
## 5705 10.0000000  5.0000000 20.0000000 10.0000000 20.0000000    20.0000000
## 1941  2.8169014  1.4084507  2.8169014  1.4084507  2.8169014     2.8169014
## 2847  0.7518797  0.7518797  0.7518797  0.7518797  1.5037594     0.7518797
## 3553  6.8965517  6.8965517  4.5977011  4.5977011  6.8965517     2.2988506
## 4351  1.6393443  1.6393443  1.6393443  1.6393443  1.6393443     0.0000000
## 354  14.9122807 21.9298246  0.8771930  2.6315789 24.5614035    24.5614035
## 5521  4.2016807  6.7226891  3.3613445  3.3613445  6.7226891     4.2016807
## 2707  7.2463768  7.2463768  5.7971014  5.7971014  7.2463768     1.4492754
## 2865  2.9411765  3.9215686  1.9607843  0.0000000  3.9215686     3.9215686
```

```
## 2624  8.1395349  6.9767442  3.4883721  2.3255814  9.3023256     6.9767442
## 990  61.0169492 67.7966102 50.8474576 47.4576271 69.4915254    49.1525424
## 537   3.0303030  3.0303030  1.5151515  1.5151515  3.0303030     1.5151515
## 65   15.7407407 15.7407407 15.7407407 15.7407407 15.7407407     0.0000000
## 1206  0.5376344  0.5376344  0.5376344  0.5376344  0.5376344     0.0000000
## 931   2.9411765  5.8823529  2.9411765  2.9411765  5.8823529     2.9411765
## 1639  0.0000000  0.0000000  4.4444444  0.0000000  6.6666667     6.6666667
## 5309  4.8780488  6.0975610  6.0975610  4.8780488  7.3170732     2.4390244
## 5913 20.6896552 17.2413793 17.2413793 17.2413793 20.6896552     3.4482759
## 4745  2.8037383  2.8037383  3.7383178  2.8037383  3.7383178     0.9345794
## 3810 10.5769231 11.5384615  2.8846154  2.8846154 14.4230769    11.5384615
## 5041  3.9603960  3.9603960  1.9801980  1.9801980  4.9504950     4.9504950
## 4159  4.2553191  6.3829787  4.2553191  4.2553191  6.3829787     2.1276596
## 6131 12.5000000 16.6666667  0.0000000  0.0000000 16.6666667    16.6666667
## 3458  2.8985507  2.8985507  2.8985507  1.4492754  2.8985507     1.4492754
## 1461  7.3170732  6.5040650  4.0650407  3.2520325  8.1300813     5.6910569
## 4615  2.5423729  2.5423729  2.5423729  2.5423729  3.3898305     1.6949153
## 2631 24.0000000 25.0000000 18.0000000  7.0000000 34.0000000    29.0000000
## 1325  6.5040650  7.3170732  4.0650407  4.8780488  8.1300813     4.8780488
## 5832  0.0000000  2.7027027  0.0000000  0.0000000  2.7027027     2.7027027
## 4988 13.0434783 15.9420290 13.0434783 15.9420290 27.5362319    23.1884058
## 700   5.4347826  5.4347826  4.3478261  3.2608696  6.5217391     3.2608696
## 1160  9.4339623  9.4339623  6.6037736  5.6603774  9.4339623     9.4339623
## 1815  0.9174312  1.8348624  0.0000000  0.0000000  1.8348624     1.8348624
## 6780 20.0000000 20.0000000 20.0000000 20.0000000 20.0000000     0.0000000
## 5449  9.3023256  9.3023256  9.3023256  9.3023256  9.3023256     0.0000000
## 6324 25.0000000 37.5000000 12.5000000  7.5000000 42.5000000    35.0000000
## 735  17.4311927 17.4311927 17.4311927 17.4311927 17.4311927     0.0000000
## 3220  6.9182390  4.4025157  1.2578616  1.8867925 15.0943396    13.8364780
## 945   2.4096386  3.6144578  0.0000000  0.0000000  6.0240964     6.0240964
## 2460 14.2857143 14.2857143 14.2857143 14.2857143 14.2857143     0.0000000
## 5473 18.5714286 21.4285714 18.5714286 15.7142857 22.8571429     7.1428571
## 4877  2.8985507  4.3478261  2.8985507  4.3478261  4.3478261     1.4492754
## 6402 10.7142857 10.7142857  3.5714286  3.5714286 10.7142857     7.1428571
## 3001  2.3809524  3.1746032  0.7936508  0.7936508  3.1746032     3.1746032
## 1979  9.9099099 12.6126126  3.6036036  4.5045045 13.5135135    13.5135135
## 3355  0.0000000  1.2345679  0.0000000  0.0000000  1.2345679     1.2345679
## 1116  1.0869565  2.1739130  0.0000000  0.0000000  2.1739130     2.1739130
## 4563 29.5081967 27.8688525 27.8688525 27.8688525 31.1475410    31.1475410
## 6036  3.7037037  7.4074074  0.0000000  3.7037037  7.4074074     7.4074074
## 951   4.3478261  2.8985507  2.8985507  2.8985507  4.3478261     1.4492754
## 1885  1.8867925  1.8867925  1.8867925  1.8867925  1.8867925     0.0000000
## 2185 28.4090909 28.4090909 26.1363636 26.1363636 28.4090909     2.2727273
## 3640 14.5833333 14.5833333  6.2500000  5.2083333 17.7083333    12.5000000
## 2261  2.3809524  2.3809524  0.0000000  0.0000000  2.3809524     2.3809524
## 107  14.0000000 14.0000000 14.0000000 14.0000000 14.0000000     4.0000000
## 5200 60.9756098 60.9756098 60.9756098 60.9756098 60.9756098     0.0000000
## 5977 95.4545455 95.4545455 72.7272727 77.2727273 95.4545455    27.2727273
## 3490 11.3207547  9.4339623  7.5471698  3.7735849 18.8679245    16.9811321
## 1711  8.4033613  7.5630252  1.6806723  0.0000000 10.9243697    10.9243697
## 5316  7.4074074  3.7037037  3.7037037  3.7037037  7.4074074     3.7037037
## 981   7.0588235  7.0588235  7.0588235  7.0588235  7.0588235     0.0000000
## 3334  1.0526316  1.0526316  1.0526316  1.0526316  1.0526316     0.0000000
## 3749  4.5454545  4.5454545  4.5454545  4.5454545  4.5454545     0.0000000
```

```
## 3915  8.1632653  6.1224490  0.0000000  0.0000000  8.1632653    8.1632653
## 6531 19.0476190 14.2857143  9.5238095  4.7619048 28.5714286   23.8095238
## 5396 11.4285714 10.0000000  0.0000000  0.0000000 14.2857143   14.2857143
## 1658 13.3333333 17.7777778 15.5555556 14.4444444 28.8888889   28.8888889
## 1560  0.9523810  1.9047619  1.9047619  0.9523810  2.8571429    1.9047619
## 447  18.1818182 23.8636364 10.2272727  9.0909091 25.0000000   19.3181818
## 4917 43.4782609 47.8260870 17.3913043 17.3913043 47.8260870   47.8260870
## 2955  1.0869565  2.1739130  2.1739130  1.0869565  3.2608696    2.1739130
## 5808 22.2222222 22.2222222 22.2222222 22.2222222 22.2222222    0.0000000
## 4605  2.6315789  3.5087719  3.5087719  1.7543860  3.5087719    2.6315789
## 2582 20.2531646 18.9873418 13.9240506  7.5949367 39.2405063   37.9746835
## 5248  4.7619048  4.7619048  4.7619048  4.7619048  4.7619048    0.0000000
## 4792  2.8571429  1.4285714  1.4285714  1.4285714  2.8571429    2.8571429
## 3313 13.3333333 14.4444444  8.8888889  7.7777778 21.1111111   18.8888889
## 5785 13.0434783 17.3913043 13.0434783 13.0434783 26.0869565   17.3913043
## 4721  1.3513514  1.3513514  1.3513514  1.3513514  1.3513514    0.0000000
## 286  10.1010101 11.1111111  5.0505051  5.0505051 11.1111111    6.0606061
## 4762  1.7341040  2.8901734  1.1560694  1.1560694  3.4682081    2.3121387
## 572   2.1276596  2.1276596  1.0638298  1.0638298  2.1276596    1.0638298
## 1996  3.0534351  2.2900763  3.8167939  1.5267176  3.8167939    2.2900763
## 3680  0.6849315  0.6849315  0.6849315  0.6849315  1.3698630    1.3698630
## 6961  5.8823529  5.8823529  5.8823529  5.8823529  5.8823529    0.0000000
## 4956  2.3809524  2.3809524  0.0000000  0.0000000  2.3809524    2.3809524
## 6510  4.0000000  4.0000000  0.0000000  4.0000000  4.0000000    4.0000000
## 4992 15.5172414 14.6551724  9.4827586  7.7586207 18.1034483   12.0689655
## 3951  4.5454545  5.8441558  4.5454545  4.5454545  5.8441558    1.2987013
## 2546  3.0927835  2.0618557  0.0000000  1.0309278  3.0927835    3.0927835
## 5212 11.2500000 11.2500000 11.2500000 11.2500000 11.2500000    0.0000000
## 6948 10.0000000 10.0000000 10.0000000 10.0000000 10.0000000    0.0000000
## 1062  1.0416667  1.0416667  1.0416667  1.0416667  1.0416667    1.0416667
## 1652  8.4507042  9.8591549  7.0422535  7.0422535 14.0845070   14.0845070
## 4388 36.0000000 36.0000000 40.0000000 36.0000000 40.0000000    4.0000000
## 2967  7.7669903  9.7087379  6.7961165  5.8252427  9.7087379    4.8543689
## 2771 15.4545455 14.5454545  7.2727273  9.0909091 20.0000000   20.0000000
## 2687  3.4782609  5.2173913  2.6086957  1.7391304  5.2173913    4.3478261
## 4631 17.6470588 15.6862745  3.9215686  1.9607843 23.5294118   21.5686275
## 4680  0.9090909  3.6363636  0.9090909  0.9090909  4.5454545    4.5454545
## 436   2.0833333  3.1250000  2.0833333  0.0000000  5.2083333    5.2083333
## 1463  6.7796610  6.7796610  6.7796610  6.7796610  6.7796610    0.0000000
## 6033  3.4482759  3.4482759  3.4482759  3.4482759  3.4482759    0.0000000
## 536   1.5384615  1.5384615  1.5384615  1.5384615  1.5384615    1.5384615
## 6498  2.7777778  2.7777778  2.7777778  2.7777778  2.7777778    0.0000000
## 6486  4.6511628  2.3255814  0.0000000  0.0000000  4.6511628    4.6511628
## 2165  6.2015504  6.9767442  6.2015504  6.2015504  6.9767442    0.7751938
## 5740 82.6086957 86.9565217 17.3913043 21.7391304 86.9565217   69.5652174
## 3117  2.0202020  1.0101010  2.0202020  2.0202020  6.0606061    5.0505051
## 6434  0.0000000  5.8823529 17.6470588  5.8823529 23.5294118   23.5294118
## 4936  2.1978022  2.1978022  2.1978022  1.0989011  4.3956044    3.2967033
## 3404  3.1746032  6.3492063  1.5873016  1.5873016  7.9365079    6.3492063
## 6491  0.0000000  0.0000000  0.0000000  6.0606061  6.0606061    6.0606061
## 5805 11.1111111 11.1111111  0.0000000  0.0000000 11.1111111   11.1111111
## 1164  5.4263566  6.2015504  4.6511628  4.6511628  6.2015504    6.2015504
## 3095  7.0175439  7.0175439  7.0175439  7.0175439  7.0175439    7.0175439
## 4406  5.0505051  6.0606061  2.0202020  3.0303030  6.0606061    4.0404040
```

```
## 4470  7.8125000  7.8125000  6.2500000  6.2500000  7.8125000     1.5625000
## 5960 13.6363636 13.6363636 13.6363636 13.6363636 13.6363636     0.0000000
## 2347 11.5384615 15.3846154  8.6538462  6.7307692 16.3461538    10.5769231
## 435   0.9615385  1.9230769  0.0000000  0.0000000  1.9230769     1.9230769
## 4200  1.5267176  0.7633588  3.0534351  0.7633588  3.0534351     2.2900763
## 301   6.0869565  5.2173913  2.6086957  1.7391304 10.4347826     8.6956522
## 2422  0.8064516  0.8064516  0.8064516  0.8064516  0.8064516     0.0000000
## 5083  6.2500000  6.2500000  6.2500000  6.2500000  6.2500000     0.0000000
## 5490 13.4020619  9.2783505  7.2164948  4.1237113 17.5257732    14.4329897
## 1997  2.0000000  1.3333333  2.0000000  0.6666667  4.0000000     3.3333333
## 4060  2.5000000  2.5000000  2.5000000  2.5000000  2.5000000     0.0000000
## 259   4.5454545  2.2727273  4.5454545  4.5454545  4.5454545     2.2727273
## 2652  3.0303030  5.0505051  0.0000000  0.0000000  8.0808081     8.0808081
## 5179  7.2727273  5.4545455  1.8181818  5.4545455  7.2727273     7.2727273
## 4981  9.1836735  9.1836735  9.1836735  9.1836735 11.2244898     2.0408163
## 5696 11.1111111 11.1111111  5.5555556  5.5555556 11.1111111     5.5555556
## 318  18.6274510 19.6078431 13.7254902 11.7647059 22.5490196    12.7450980
## 3558  4.1095890  4.7945205  1.3698630  1.3698630  6.1643836     5.4794521
## 2201  1.9801980  1.9801980  0.9900990  0.0000000  3.9603960     3.9603960
## 1328  7.5581395  7.5581395  7.5581395  6.9767442  8.7209302     1.7441860
## 1194  1.6949153  1.6949153  1.6949153  1.6949153  1.6949153     0.0000000
## 2056  8.0645161  9.6774194  4.8387097  4.8387097 14.5161290    12.9032258
## 6445 19.1489362 19.1489362 14.8936170  8.5106383 29.7872340    23.4042553
## 613  30.4347826 29.5652174 28.6956522 27.8260870 32.1739130     4.3478261
## 875  28.5714286 30.6122449 19.3877551  8.1632653 36.7346939    28.5714286
## 6684 10.0000000 10.0000000  5.0000000  5.0000000 10.0000000     5.0000000
## 5686 15.3846154 15.3846154  0.0000000  7.6923077 15.3846154    15.3846154
## 923   4.1666667  4.1666667  4.1666667  2.7777778  4.1666667     1.3888889
## 129   3.9215686  3.9215686  4.5751634  3.2679739  4.5751634     1.3071895
## 249   2.4242424  2.4242424  2.4242424  2.4242424  2.4242424     0.0000000
## 4642 13.7931034 15.5172414  6.8965517  5.1724138 17.2413793    12.0689655
## 3463  6.3157895  5.2631579  4.2105263  5.2631579  8.4210526     4.2105263
## 2285  7.5471698  8.4905660  6.6037736 13.2075472 16.9811321    14.1509434
## 5262 19.0000000 21.0000000  0.0000000 15.0000000 23.0000000    23.0000000
## 603   3.5714286  3.5714286  2.3809524  1.1904762  3.5714286     3.5714286
## 2879  0.0000000  1.2658228  2.5316456  0.0000000  2.5316456     2.5316456
## 2659  1.4184397  0.7092199  1.4184397  0.7092199  1.4184397     0.7092199
## 6413 16.6666667 16.6666667 16.6666667 16.6666667 16.6666667     0.0000000
## 2769 18.1818182  3.4090909  4.5454545  4.5454545 22.7272727    22.7272727
## 242   1.5625000  1.5625000  1.5625000  1.5625000  1.5625000     0.0000000
## 3704 11.8181818 10.9090909  9.0909091  8.1818182 11.8181818     3.6363636
## 6091  0.0000000 12.9629630  0.0000000 12.9629630 12.9629630    12.9629630
## 3593  0.0000000  1.0526316  0.0000000  0.0000000  1.0526316     1.0526316
## 1015  8.3333333  8.3333333  8.3333333  6.2500000 10.4166667    10.4166667
## 5354  5.6603774  6.2893082  0.6289308  0.0000000  6.2893082     6.2893082
## 4008  8.5714286  6.6666667  6.6666667  4.7619048  9.5238095     4.7619048
## 2111 28.1250000 28.1250000 28.1250000 28.1250000 28.1250000     0.0000000
## 2923 14.0845070 18.3098592 15.4929577 11.2676056 25.3521127    15.4929577
## 3691  1.1111111  1.1111111  1.1111111  1.1111111  1.1111111     0.0000000
## 3860  7.2463768  7.2463768  5.7971014  5.7971014  7.2463768     1.4492754
## 409   4.7619048  4.7619048  4.7619048  4.7619048  4.7619048     0.0000000
## 525  27.2727273 36.3636364 22.7272727 27.2727273 36.3636364    13.6363636
## 1418  9.5890411  4.1095890  0.0000000  0.0000000 15.0684932    15.0684932
## 4766  0.8928571  0.8928571  0.8928571  0.8928571  1.7857143     0.8928571
```

```
## 1242  2.5641026  5.1282051  2.5641026  0.0000000  5.1282051     5.1282051
## 895  14.2857143 14.2857143 13.4920635 13.4920635 14.2857143     0.7936508
## 2566  9.2105263 10.5263158  6.5789474  6.5789474 15.7894737    10.5263158
## 5976  4.3956044  4.3956044  5.4945055  4.3956044  5.4945055     1.0989011
## 6975 10.3448276  8.6206897  6.8965517  5.1724138 12.0689655     6.8965517
## 3918  1.5625000  4.6875000  0.0000000  0.0000000  6.2500000     6.2500000
## 5380 40.0000000 40.0000000 40.0000000 40.0000000 40.0000000     0.0000000
## 3212  1.3888889  1.3888889  1.3888889  0.0000000  4.1666667     4.1666667
## 1554  0.7812500  1.5625000  0.7812500  0.7812500  1.5625000     1.5625000
## 43   65.2849741 65.2849741 65.2849741 65.2849741 65.8031088     0.5181347
## 5259  9.5238095  9.5238095  7.1428571  2.3809524 28.5714286    26.1904762
## 5378 10.5882353 10.5882353  9.4117647  9.4117647 10.5882353     1.1764706
## 1184 10.5263158 10.5263158 10.5263158 10.5263158 10.5263158     0.0000000
## 2439  3.6363636  9.0909091  1.8181818  3.6363636 10.9090909    10.9090909
## 146   4.1666667  4.1666667  4.8611111  4.1666667  4.8611111     0.6944444
## 3046 10.7142857 10.7142857 10.7142857 10.7142857 10.7142857     0.0000000
## 773  13.9534884 15.1162791 11.6279070  9.3023256 15.1162791     6.9767442
## 2876  2.1126761  2.1126761  0.7042254  0.7042254  2.1126761     1.4084507
## 6856 48.2758621 48.2758621  0.0000000  0.0000000 48.2758621    48.2758621
## 3321  4.5454545  4.5454545  4.5454545  4.5454545  4.5454545     0.0000000
## 3226  0.6802721  0.6802721  0.6802721  0.6802721  0.6802721     0.0000000
## 695   0.0000000  1.3888889  0.0000000  0.0000000  1.3888889     1.3888889
## 3421  9.1954023  9.1954023  9.1954023  9.1954023  9.1954023     0.0000000
## 4869 15.0000000 20.0000000 15.0000000 15.0000000 20.0000000    15.0000000
## 4473 19.4029851 20.8955224  4.4776119  7.4626866 20.8955224    19.4029851
## 5111 10.4761905 10.4761905  4.7619048  4.7619048 15.2380952    10.4761905
## 173   1.8518519  1.8518519  1.8518519  0.9259259  1.8518519     0.9259259
## 2894  8.6956522  7.6086957  7.6086957  6.5217391  8.6956522     2.1739130
## 665   0.0000000  2.1505376  0.0000000  0.0000000  2.1505376     2.1505376
## 913  11.3924051 11.3924051 11.3924051 11.3924051 11.3924051     0.0000000
## 3287  3.8961039  2.5974026  2.5974026  2.5974026  3.8961039     1.2987013
## 1192  4.0000000  4.0000000  4.0000000  4.0000000  4.0000000     0.0000000
## 2866 12.2302158 12.9496403  0.0000000 16.5467626 17.9856115    17.9856115
## 564   2.6086957 21.7391304 10.4347826 21.7391304 21.7391304    19.1304348
## 2665  7.5000000  6.2500000  1.2500000  0.0000000 11.2500000    11.2500000
## 633   0.0000000  0.0000000  0.7692308  0.0000000  0.7692308     0.7692308
## 5908  5.4054054  5.4054054  5.4054054  5.4054054  5.4054054     0.0000000
## 417   3.3333333  5.0000000  1.6666667  0.0000000 10.0000000    10.0000000
## 2514  2.2222222  2.2222222  4.4444444  0.0000000  6.6666667     6.6666667
## 5188  8.3333333  8.3333333  3.5714286  2.3809524 10.7142857     8.3333333
## 2475  4.6728972  3.7383178  0.0000000  0.0000000  4.6728972     4.6728972
## 724   5.3333333  8.0000000  1.3333333  1.3333333  8.0000000     8.0000000
## 1030  3.5087719  3.5087719  1.7543860  0.0000000  3.5087719     3.5087719
## 1783  1.4285714  1.4285714  0.0000000  0.0000000  1.4285714     1.4285714
## 6378  9.0909091  9.0909091  9.0909091  9.0909091  9.0909091     0.0000000
## 2714  0.0000000  0.0000000  0.0000000  1.9607843  1.9607843     1.9607843
## 2748  3.5087719  7.0175439  2.6315789  1.7543860  8.7719298     7.0175439
## 6092 12.1951220 17.0731707  4.8780488  7.3170732 17.0731707    17.0731707
## 5142  3.2258065  4.3010753  2.1505376  2.1505376  5.3763441     3.2258065
## 1590 19.2982456 17.5438596 19.2982456 17.5438596 19.2982456     1.7543860
## 5551 13.1147541 13.1147541 13.1147541 13.1147541 13.1147541     0.0000000
## 1431  3.3112583  4.6357616  3.9735099  2.6490066  7.9470199     5.9602649
## 501  63.6363636 77.2727273 63.6363636 59.0909091 86.3636364    31.8181818
## 1284  7.7777778  6.6666667 10.0000000  6.6666667 10.0000000     4.4444444
```

```
## 3452  6.0975610  4.8780488  3.6585366  1.2195122 13.4146341    13.4146341
## 4005  3.0612245  4.0816327  3.0612245  3.0612245  4.0816327     1.0204082
## 6255  4.0000000  0.0000000  0.0000000  0.0000000  4.0000000     4.0000000
## 4191 14.2857143 13.1868132  4.3956044  5.4945055 15.3846154    12.0879121
## 3383 22.0338983 22.0338983 22.0338983 22.0338983 22.0338983     1.6949153
## 5468  5.5555556  4.6296296  3.7037037  3.7037037  5.5555556     1.8518519
## 5794  5.2631579  5.2631579  5.2631579  5.2631579  5.2631579     0.0000000
## 3024  0.0000000  0.0000000  0.0000000  0.0000000  6.2500000     6.2500000
## 4657  8.7719298 10.5263158  5.2631579  7.0175439 10.5263158     5.2631579
## 3225  5.6338028  4.2253521  1.4084507  1.4084507  8.4507042     8.4507042
## 6976 10.0000000 10.0000000 10.0000000  5.0000000 10.0000000     5.0000000
## 4243  9.2307692 12.3076923  0.0000000  0.0000000 12.3076923    12.3076923
## 3384 10.5263158  8.7719298  5.2631579  4.3859649 14.9122807    10.5263158
## 6074 15.3846154 23.0769231  0.0000000  0.0000000 23.0769231    23.0769231
## 5081  0.0000000  0.0000000  0.0000000  0.0000000  5.0000000     5.0000000
## 1389  1.4925373  1.4925373  1.4925373  1.4925373  2.9850746     1.4925373
## 2578 28.2442748  5.3435115  8.3969466  6.1068702 47.3282443    47.3282443
## 2575  1.2195122  1.2195122  1.2195122  1.2195122  1.2195122     0.0000000
## 2812 22.6890756 15.9663866  4.2016807  1.6806723 30.2521008    30.2521008
## 3998  6.3492063  6.3492063  6.3492063  6.3492063  6.3492063     0.0000000
## 3393  2.7397260  4.1095890  4.1095890  2.7397260  6.8493151     5.4794521
## 3387  1.6393443  1.6393443  1.6393443  1.6393443  2.4590164     0.8196721
## 855  27.3584906 26.4150943 25.4716981 24.5283019 29.2452830     4.7169811
## 701   2.7777778  4.1666667  2.7777778  2.7777778  4.1666667     1.3888889
## 730   5.6603774  5.6603774  5.6603774  5.6603774  5.6603774     0.0000000
## 2889 13.4328358 14.9253731  8.9552239  8.9552239 14.9253731     5.9701493
## 2468  0.8474576  0.0000000  0.8474576  0.0000000  0.8474576     0.8474576
## 4821  9.3750000 10.9375000  6.2500000  3.1250000 14.0625000    10.9375000
## 515  11.6279070 10.4651163  5.8139535  5.8139535 11.6279070     5.8139535
## 2741  2.2222222  2.2222222  0.5555556  0.5555556  2.7777778     2.2222222
## 6923  3.2258065  3.2258065  0.0000000  0.0000000  6.4516129     6.4516129
## 3422 11.3207547 11.3207547 15.0943396  9.4339623 15.0943396     5.6603774
## 5034  2.3076923  0.0000000  0.0000000  0.0000000  2.3076923     2.3076923
## 588   1.4184397  1.4184397  1.4184397  1.4184397  1.4184397     0.0000000
## 1207  3.9682540  6.3492063  4.7619048  3.9682540  6.3492063     3.1746032
## 2077 51.4492754 53.6231884 43.4782609 40.5797101 55.7971014    16.6666667
## 3326 21.4285714 21.4285714 21.4285714 14.2857143 21.4285714     7.1428571
## 1359  1.3513514  2.7027027  1.3513514  2.0270270  4.7297297     4.7297297
## 6693 18.1818182 18.1818182 18.1818182 18.1818182 18.1818182     0.0000000
## 3945  3.6144578  3.6144578  3.6144578  3.6144578  3.6144578     0.0000000
## 5267  2.8571429  7.1428571  2.8571429  2.8571429  7.1428571     5.7142857
## 2176  4.1666667  4.1666667  4.1666667  4.1666667  4.1666667     0.0000000
## 2301  0.0000000  0.0000000  0.0000000  0.0000000  9.0909091     9.0909091
## 1901  1.5384615  1.0256410  0.5128205  0.0000000  2.0512821     2.0512821
## 3295  5.7142857  4.2857143  2.8571429  2.8571429  7.1428571     5.7142857
## 3169  2.2727273  4.5454545  1.1363636  1.1363636  4.5454545     3.4090909
## 6224 10.5263158 10.5263158 10.5263158 10.5263158 15.7894737     5.2631579
## 6784 62.7906977 62.7906977 55.8139535 58.1395349 62.7906977     9.3023256
## 153  24.3243243 29.7297297 14.8648649 10.8108108 32.4324324    21.6216216
## 6679 25.0000000 25.0000000 18.7500000 18.7500000 25.0000000     6.2500000
## 6418  3.0303030  3.0303030  3.0303030  3.0303030  3.0303030     0.0000000
## 6476  1.8867925  1.8867925  3.7735849  1.8867925  3.7735849     1.8867925
## 3722  4.5454545  1.8181818  0.0000000  0.9090909  7.2727273     7.2727273
## 6553 11.1111111 11.1111111 11.1111111 11.1111111 11.1111111     0.0000000
```

```
## 6653 21.7391304 17.3913043  4.3478261  4.3478261 21.7391304    17.3913043
## 1842  4.5454545  0.0000000  0.0000000  0.0000000  9.0909091     9.0909091
## 3675  1.0989011  3.2967033  0.0000000  0.0000000  4.3956044     4.3956044
## 4828  1.5503876  2.3255814  3.1007752  2.3255814  3.8759690     2.3255814
## 3731  1.4150943  1.8867925  0.9433962  0.9433962  1.8867925     1.4150943
## 4682  5.9405941  7.9207921  1.9801980  1.9801980  9.9009901     8.9108911
## 2641 11.9402985  5.9701493  5.2238806  5.2238806 18.6567164    18.6567164
## 4105  5.1282051  5.1282051  5.1282051  5.1282051  5.1282051     0.0000000
## 3263  8.9887640  8.9887640  8.9887640  8.9887640  8.9887640     3.3707865
## 2294  0.8474576  0.8474576  0.8474576  0.8474576  1.6949153     0.8474576
## 5679 62.5000000 62.5000000 62.5000000 62.5000000 62.5000000     0.0000000
## 3051 18.1818182 18.1818182 18.1818182 18.1818182 18.1818182     0.0000000
## 4137  0.7936508  2.3809524  0.0000000  0.0000000  3.9682540     3.9682540
## 5148  3.6764706  7.3529412  4.4117647  7.3529412  8.0882353     4.4117647
## 900  16.6666667 16.6666667 16.6666667 16.6666667 16.6666667     0.0000000
## 5524 17.3913043 13.0434783 13.0434783 13.0434783 21.7391304    21.7391304
## 1311  2.8169014  2.8169014  2.8169014  1.4084507  2.8169014     2.8169014
## 88    6.5934066  4.3956044  5.4945055  4.3956044  7.6923077     3.2967033
## 1333  1.2820513  1.2820513  1.2820513  1.2820513  2.5641026     1.2820513
## 4616  2.0408163  5.1020408  2.0408163  2.0408163  5.1020408     5.1020408
## 4915  0.0000000  1.6666667  1.6666667  0.0000000  3.3333333     3.3333333
## 2358  5.3763441  6.4516129  2.1505376  2.1505376  7.5268817     7.5268817
## 3550  5.6737589  5.6737589  5.6737589  5.6737589  5.6737589     0.0000000
## 5532 38.2978723 31.9148936  8.5106383  7.4468085 70.2127660    70.2127660
## 3744  3.4188034  4.2735043  5.1282051  3.4188034  6.8376068     4.2735043
## 347   0.0000000  0.0000000  1.2820513  0.0000000  2.5641026     2.5641026
## 1631  8.1632653  8.1632653  6.1224490  8.1632653  8.1632653     2.0408163
## 1448  1.6393443  2.4590164  0.0000000  0.8196721  4.0983607     4.0983607
## 2919 60.0000000 60.0000000 60.0000000 60.0000000 60.0000000    10.0000000
## 4453  8.0536913  6.7114094  6.7114094  6.7114094  8.0536913     1.3422819
## 5258 15.4639175 15.4639175  7.2164948  6.1855670 15.4639175     9.2783505
## 558   0.7092199  3.5460993  0.7092199  0.7092199  3.5460993     3.5460993
## 2075 22.2222222 22.2222222 11.1111111 11.1111111 27.7777778    16.6666667
## 3929  7.8947368  7.8947368  2.6315789  2.6315789  7.8947368     5.2631579
## 1248  4.1916168  4.1916168  5.3892216  3.5928144  5.9880240     2.9940120
## 3290  9.4594595  9.4594595  9.4594595  9.4594595  9.4594595     1.3513514
## 4256  7.0588235  9.4117647  7.0588235  5.8823529  9.4117647     4.7058824
## 98    4.2016807  4.2016807  4.2016807  4.2016807  4.2016807     0.0000000
## 266   2.6315789  5.2631579  5.2631579  2.6315789  5.2631579     2.6315789
## 548   6.3291139 10.7594937  5.6962025  4.4303797 10.7594937     7.5949367
## 6237  6.6666667  6.6666667  6.6666667  3.3333333 10.0000000    10.0000000
## 974  40.0000000 40.0000000 40.0000000 40.0000000 40.0000000    33.3333333
## 4843  1.3157895  1.3157895  1.3157895  1.3157895  1.3157895     0.0000000
## 5451  7.6923077 15.3846154  7.6923077 15.3846154 15.3846154     7.6923077
## 1919  1.4084507  1.4084507  1.4084507  1.4084507  1.4084507     0.0000000
## 1320 13.3333333 13.3333333 14.4444444 13.3333333 14.4444444     1.1111111
## 6934 13.6363636 13.6363636 13.6363636 13.6363636 13.6363636     9.0909091
## 1508  0.9009009  0.9009009  0.0000000  0.9009009  0.9009009     0.9009009
## 5004  1.0309278  1.0309278  2.0618557  1.0309278  2.0618557     1.0309278
## 4271 12.7659574 12.7659574 12.7659574 12.7659574 12.7659574     0.0000000
## 871  11.5942029 14.4927536  4.3478261  2.8985507 23.1884058    20.2898551
## 1518  3.4482759  4.3103448  3.4482759  3.4482759  4.3103448     0.8620690
## 1143  2.4390244  9.7560976  1.2195122  0.0000000 13.4146341    13.4146341
## 5507 33.8461538 38.4615385 40.0000000 44.6153846 52.3076923    41.5384615
```

```
## 5015  2.0833333  4.1666667  0.0000000  4.1666667  4.1666667     4.1666667
## 4285  6.0606061  6.0606061  4.5454545  4.5454545  6.0606061     3.0303030
## 21   12.2448980 12.2448980  8.1632653 10.2040816 12.2448980     6.1224490
## 2242  1.3698630  1.3698630  1.3698630  1.3698630  1.3698630     0.0000000
## 4969  1.5873016  1.5873016  1.5873016  1.5873016  1.5873016     0.0000000
## 6446  4.3478261  0.0000000  0.0000000  0.0000000  4.3478261     4.3478261
## 3394 13.0434783 13.0434783  2.1739130  2.1739130 13.0434783    10.8695652
## 5406  6.1728395  8.6419753  6.1728395  4.9382716  9.8765432     4.9382716
## 3609  2.6666667  2.6666667  0.6666667  2.0000000  3.3333333     2.6666667
## 993   1.3888889  1.3888889  1.3888889  1.3888889  2.7777778     1.3888889
## 3246  8.2352941  3.5294118  9.4117647  3.5294118  9.4117647     5.8823529
## 4568  2.0202020  2.0202020  1.0101010  2.0202020  4.0404040     3.0303030
## 4941  0.0000000  2.7777778  0.0000000  0.0000000  2.7777778     2.7777778
## 1102  5.8823529  5.8823529  5.8823529  5.8823529  5.8823529     0.0000000
## 6233 29.0322581 22.5806452  0.0000000  0.0000000 29.0322581    29.0322581
## 4802  6.1797753  9.5505618  3.3707865  2.2471910 11.7977528    11.7977528
## 4054  5.0000000  5.0000000 10.0000000  5.0000000 10.0000000     5.0000000
## 2081  0.0000000  0.0000000  0.0000000  0.0000000  1.2820513     1.2820513
## 5297  5.7471264  5.7471264  3.4482759  3.4482759  6.8965517     5.7471264
## 4250  8.5106383 10.6382979  4.2553191  4.2553191 10.6382979    10.6382979
## 2691  7.5757576  3.0303030  4.5454545  4.5454545 27.2727273    27.2727273
##       medical_t         not_r      rel_t uc_religious pubpriv_n
## 1872  0.7692308  7.692308e-01  6.1538462    3.4782573         1
## 3056  0.0000000  8.108108e+00  5.4054054    2.0259704         1
## 1733  0.0000000  8.000000e-01  7.2000000    3.3597032         1
## 4610  0.0000000  3.636364e+00  3.6363636    2.2927170         1
## 5593  0.0000000  3.076923e+01  0.0000000    0.9589841         0
## 4485  1.6949153  1.271186e+01  0.0000000    1.1368152         1
## 3418  0.0000000  1.219512e+00  9.7560976    3.3300647         1
## 2802  0.0000000  1.363636e+01  0.0000000    0.9589841         1
## 4096  0.0000000  2.162162e+01  8.1081081    1.6864748         1
## 1609  0.5347594  1.069519e+00  0.0000000    1.6258506         1
## 2350  0.0000000  3.225806e+00  0.0000000    0.9589841         1
## 4021  0.0000000  3.333333e+00  6.6666667    2.7372946         1
## 1753  0.0000000  3.333333e+00  0.0000000    0.9589841         1
## 3349  0.0000000  1.944444e+01  0.0000000    0.9589841         1
## 2706  0.9708738  1.650485e+01  3.8834951    1.5305839         1
## 121   0.0000000  1.065814e-14  8.3333333    3.6264498         1
## 1836  0.0000000  3.278689e+00 16.3934426    3.1818722         1
## 4087  0.0000000  7.327472e-15  1.9047619    3.6264498         1
## 3140  0.0000000  8.695652e+00 17.3913043    2.7372946         1
## 6179  0.0000000  1.290323e+01  0.0000000    0.9589841         0
## 6879  0.0000000  4.107143e+01  5.3571429    1.2667686         0
## 4880  0.0000000  1.724138e+00  1.7241379    2.2927170         1
## 6458  0.0000000 -6.661338e-15  3.8461538    3.6264498         0
## 4344  0.8264463  1.652893e+00  0.0000000    1.6258506         1
## 3446  0.0000000  2.020202e+00  1.0101010    1.8481394         1
## 176   0.0000000  1.998401e-15  1.2345679    3.6264498         1
## 2272  0.0000000  1.960784e+00  0.0000000    0.9589841         1
## 1661  3.1578947  4.210526e+00  3.1578947    2.6737835         1
## 1977  0.0000000  8.080808e+00  0.0000000    0.9589841         1
## 504   0.0000000 -1.421085e-14 68.9655172    3.6264498         1
## 5796  0.0000000  1.200000e+01  4.0000000    1.6258506         0
## 543   0.0000000  7.812500e-01  0.0000000    0.9589841         1
```

```
## 5090  0.0000000  2.272727e+01 15.1515152    2.0259704         1
## 2749  0.0000000  5.084746e+00  8.4745763    2.6261502         1
## 6212  0.0000000  6.666667e+00  8.3333333    2.4409095         0
## 2675  0.0000000  5.319149e-01  0.0000000    0.9589841         1
## 3619  0.0000000  3.552714e-15 29.7872340    3.6264498         1
## 5517  0.0000000  1.250000e+01  0.0000000    0.9589841         1
## 2542  0.0000000  2.105263e+00  4.2105263    2.7372946         1
## 1897  0.0000000 -4.440892e-16  3.2608696    3.6264498         1
## 1973  0.0000000  1.449275e+00  0.0000000    0.9589841         1
## 4982  0.0000000  4.081633e+01  4.0816327    1.2014810         1
## 4569  0.0000000  3.389831e+01  0.0000000    0.9589841         1
## 3809  0.0000000  9.803922e+00  0.0000000    0.9589841         1
## 1398  0.0000000  3.409091e+00  1.1363636    1.6258506         1
## 4028  0.0000000  1.904762e+00  6.6666667    3.0336797         1
## 4425  2.8301887  5.660377e+00  2.8301887    2.2927170         1
## 5413  0.0000000  1.000000e+01  0.0000000    0.9589841         1
## 3069  0.0000000  2.664535e-15  3.4482759    3.6264498         1
## 3441  0.0000000  3.703704e+00  0.7407407    1.4035617         1
## 1610  0.0000000  6.802721e-01  0.0000000    0.9589841         1
## 5770  0.0000000  1.250000e+01  0.0000000    0.9589841         0
## 1083  0.0000000  4.385965e+00  2.6315789    1.9592838         1
## 4761  0.0000000  2.222222e+00  1.1111111    1.8481394         1
## 46    0.0000000  3.333333e+00  1.6666667    1.8481394         1
## 3433  0.0000000  9.090909e+00  0.0000000    0.9589841         1
## 4968  0.0000000  4.440892e-15  1.2987013    3.6264498         1
## 3147  0.0000000  2.777778e+00  1.3888889    1.8481394         1
## 2524  0.0000000  2.765957e+01  0.7092199    1.0256708         1
## 698   0.6493506  2.597403e+00  3.8961039    2.6928368         1
## 1876  0.0000000  2.258065e+01  9.6774194    1.7592238         1
## 5806  0.0000000  2.424242e+01  3.0303030    1.2553692         0
## 2738  0.0000000  4.941860e+01  0.0000000    0.9589841         1
## 6842  0.0000000  1.666667e+00  1.6666667    2.2927170         0
## 3371  0.0000000  1.149425e+00 28.7356322    3.5238550         1
## 5425  0.0000000  2.343750e+00  4.6875000    2.7372946         1
## 3982  0.0000000  8.547009e-01  6.8376068    3.3300647         1
## 1450  0.0000000  1.020408e+00  0.0000000    0.9589841         1
## 5561  0.0000000  4.210526e+00  0.0000000    0.9589841         1
## 2188  0.0000000  1.428571e+01  7.1428571    1.8481394         1
## 6535  0.0000000  3.225806e+00  0.0000000    0.9589841         0
## 6615  0.0000000  1.234568e+00  0.0000000    0.9589841         0
## 4092  0.0000000  3.333333e+00  5.0000000    2.5594635         1
## 545   0.0000000  6.086957e+00  0.8695652    1.2924173         1
## 3939  1.2500000  3.125000e+00  3.1250000    2.5594635         1
## 3713  0.0000000 -2.553513e-15  0.9090909    3.6264498         1
## 4201  0.0000000  1.162791e+00  0.0000000    0.9589841         1
## 6895  0.0000000  0.000000e+00  6.2500000    3.6264498         0
## 2123  0.0000000 -6.661338e-15  3.8461538    3.6264498         1
## 4402  0.0000000  3.571429e+00  3.5714286    2.2927170         1
## 586   0.0000000  0.000000e+00  6.2500000    3.6264498         1
## 1647  0.0000000  1.564246e+01  0.5586592    1.0509657         1
## 2390  0.0000000  8.888889e+00  6.6666667    2.1021837         1
## 6943  0.6944444  6.944444e-01  2.0833333    3.2930166         0
## 6861  0.0000000  8.333333e+00  0.0000000    0.9589841         0
## 293   0.0000000  6.060606e+00  0.0000000    0.9589841         1
```

```
## 3141  0.0000000  1.111111e+01  0.0000000    0.9589841         1
## 2862  0.0000000  7.327472e-15  1.7543860    3.6264498         1
## 2834  0.0000000  6.716418e+00  0.7462687    1.2257307         1
## 2099  5.0000000  5.000000e+00  5.0000000    2.9595834         1
## 3930  0.0000000  2.127660e+00  0.0000000    0.9589841         1
## 5450  0.0000000  1.219512e+00  0.0000000    0.9589841         1
## 5320  0.0000000  3.108624e-15  1.3513514    3.6264498         1
## 1179  0.0000000  3.571429e+00  7.1428571    2.7372946         1
## 5252  0.0000000  1.559633e+01  4.5871560    1.5652263         1
## 2501  0.0000000  1.634615e+01  0.0000000    0.9589841         1
## 2521  0.0000000  1.666667e+01  1.3888889    1.1641738         1
## 3597  0.0000000 -7.327472e-15  1.6528926    3.6264498         1
## 5762  5.4545455  1.090909e+01  3.6363636    2.1260004         0
## 5183  0.0000000  2.564103e+00  1.2820513    1.8481394         1
## 4077  0.0000000  7.327472e-15  1.9607843    3.6264498         1
## 334   0.0000000  9.803922e-01  0.0000000    0.9589841         1
## 4614  0.0000000  3.278689e+00  3.2786885    2.2927170         1
## 2828  0.0000000  1.851852e+00  0.0000000    0.9589841         1
## 397   0.0000000  4.440892e-15  2.1739130    3.6264498         1
## 5032  0.0000000  2.564103e+00  2.5641026    2.2927170         1
## 755   0.0000000  4.385965e+00  0.0000000    0.9589841         1
## 6544  0.0000000  1.250000e+01  0.0000000    0.9589841         0
## 2008  0.0000000  1.785714e+00  0.0000000    0.9589841         1
## 1247  0.0000000  4.672897e+00  3.7383178    2.1445244         1
## 6138  0.0000000  4.666667e+01  0.0000000    0.9589841         0
## 903   8.3333333  8.333333e+00 25.0000000    3.2930166         1
## 2433  0.0000000  1.554312e-15  0.6756757    3.6264498         1
## 3131  0.0000000  1.478261e+01  9.5652174    2.0069171         1
## 3268  0.0000000  0.000000e+00 78.1250000    3.6264498         1
## 4734  0.0000000  1.777778e+01  0.0000000    0.9589841         1
## 5312  0.0000000  7.692308e+00  0.9615385    1.2553692         1
## 2938  0.0000000  5.517241e+00  0.0000000    0.9589841         1
## 3111  0.0000000  8.208955e+00  2.9850746    1.6703083         1
## 1648  0.0000000  9.009009e+00  0.0000000    0.9589841         1
## 1937  0.0000000  2.000000e+00  2.0000000    2.2927170         1
## 4964  0.0000000  1.065814e-14  5.1546392    3.6264498         1
## 2538  0.0000000  2.291667e+01  0.0000000    0.9589841         1
## 3353  0.0000000  1.126761e+01  0.0000000    0.9589841         1
## 5544  0.0000000  4.347826e+00  8.6956522    2.7372946         1
## 5275  0.0000000 -5.329071e-15  9.5238095    3.6264498         1
## 1829  0.0000000  2.531646e+00  0.0000000    0.9589841         1
## 2256  0.0000000  0.000000e+00 48.2758621    3.6264498         1
## 6502  0.0000000  5.000000e+00  5.0000000    2.2927170         0
## 4928  0.0000000  2.000000e+01  6.6666667    1.6258506         1
## 846   0.0000000 -7.105427e-15 45.0000000    3.6264498         1
## 5584  0.0000000  8.974359e+00  1.2820513    1.2924173         1
## 1190  0.0000000  3.418803e+00  3.4188034    2.2927170         1
## 1090  0.0000000  3.603604e+00  0.0000000    0.9589841         1
## 5996  1.3333333  4.000000e+00  6.6666667    2.7928668         0
## 411   0.0000000  3.703704e+00  0.0000000    0.9589841         1
## 408   0.0000000 -3.552714e-15  5.0847458    3.6264498         1
## 6655  0.0000000  8.333333e+00  8.3333333    2.2927170         0
## 3602  0.0000000  7.874016e+00  0.0000000    0.9589841         1
## 3944  0.0000000  1.142857e+01  0.7142857    1.1158939         1
```

```
## 1994  0.0000000  3.846154e+00  3.8461538    2.2927170         1
## 5251  0.0000000 -3.108624e-15  1.3888889    3.6264498         1
## 3217  0.0000000  8.490566e+00  4.7169811    1.9116504         1
## 5335  0.0000000  3.030303e+00  4.5454545    2.5594635         1
## 2149  0.0000000  3.333333e+01  8.3333333    1.4924773         1
## 1723  0.0000000  1.318681e+01  0.0000000    0.9589841         1
## 5777  0.0000000  1.621622e+01  5.4054054    1.6258506         0
## 1682  0.0000000  2.222222e+00  0.0000000    0.9589841         1
## 5182  0.0000000  2.127660e+00  1.0638298    1.8481394         1
## 5395  0.0000000  4.761905e+00  0.0000000    0.9589841         1
## 606   0.0000000  2.500000e+01  0.0000000    0.9589841         1
## 904   0.0000000  1.910828e+01  1.9108280    1.2014810         1
## 2502  0.0000000  2.727273e+01 11.8181818    1.7654272         1
## 742   0.0000000  1.162791e+00 11.6279070    3.3839529         1
## 4689  7.4074074  1.234568e+01  4.9382716    2.2927170         1
## 961   0.0000000  1.123596e+00  0.0000000    0.9589841         1
## 6471  0.0000000  1.086957e+01  8.6956522    2.1445244         0
## 3360  0.0000000  2.898551e+01 10.1449275    1.6505493         1
## 1050  0.0000000  2.500000e+00  3.7500000    2.5594635         1
## 3342  0.0000000  5.882353e+00  2.3529412    1.7211172         1
## 3454  0.0000000  6.896552e+00 27.5862069    3.0929567         1
## 2356  0.0000000  5.347594e+00  0.5347594    1.2014810         1
## 4787  0.0000000  4.035874e+00  0.0000000    0.9589841         1
## 393   0.0000000  3.131313e+01  0.0000000    0.9589841         1
## 2989  0.0000000  1.967213e+01  0.0000000    0.9589841         1
## 6801  0.0000000  5.329071e-15  6.8965517    3.6264498         0
## 2029  0.0000000  7.692308e-01  0.0000000    0.9589841         1
## 816   0.0000000  1.088019e-14  1.9230769    3.6264498         1
## 2012  0.0000000  1.030928e+00  5.1546392    3.1818722         1
## 247   0.0000000  6.730769e+00  0.9615385    1.2924173         1
## 1817  0.0000000  6.382979e+00  0.0000000    0.9589841         1
## 4023  0.5714286  9.714286e+00  5.7142857    1.9963319         1
## 929   0.0000000  2.564103e+00  0.0000000    0.9589841         1
## 3830  0.0000000 -1.554312e-15  1.4705882    3.6264498         1
## 3861  0.0000000  5.773160e-15  2.8985507    3.6264498         1
## 5203  0.0000000  1.052632e+00  2.1052632    2.7372946         1
## 5     0.0000000  0.000000e+00 20.0000000    3.6264498         1
## 6070  0.0000000  1.428571e+01  2.3809524    1.3400507         0
## 821   0.0000000  7.142857e+00  3.5714286    1.8481394         1
## 177   0.0000000  1.117318e+00  1.1173184    2.2927170         1
## 2293  0.0000000  1.458333e+01  0.0000000    0.9589841         1
## 3789  0.0000000  4.237288e+00  0.0000000    0.9589841         1
## 906   0.0000000  3.125000e+00  0.0000000    0.9589841         1
## 4811  0.8474576  1.694915e+00  0.0000000    1.6258506         1
## 3806  0.0000000  5.747126e+00  1.1494253    1.4035617         1
## 1880  0.0000000  8.881784e-15 14.7540984    3.6264498         1
## 5667  0.0000000  1.176471e+01  5.8823529    1.8481394         0
## 6231  0.0000000  0.000000e+00  4.0000000    3.6264498         0
## 4378  0.0000000  3.611111e+01 11.1111111    1.5866231         1
## 2592  0.0000000  1.760563e+01  4.2253521    1.4752678         1
## 3161  0.0000000  4.651163e+00  2.3255814    1.8481394         1
## 3507  0.0000000  2.790698e+01  0.0000000    0.9589841         1
## 4624  0.0000000  2.615385e+01 30.7692308    2.4008575         1
## 5429  0.0000000  5.172414e+00  0.8620690    1.3400507         1
```

```
## 2227  0.0000000  2.500000e+00  5.0000000    2.7372946         1
## 5528  0.0000000  5.000000e+00 20.0000000    3.0929567         1
## 6034  5.5555556  1.296296e+01  1.8518519    1.7925672         0
## 2042  0.0000000  3.333333e+00  0.0000000    0.9589841         1
## 5861  0.0000000  7.105427e-15 27.7777778    3.6264498         0
## 6737  0.0000000  1.666667e+01  0.0000000    0.9589841         0
## 3512  0.0000000  1.538462e+01  1.2820513    1.1641738         1
## 2941  0.0000000  5.000000e+00  2.5000000    1.8481394         1
## 6894  0.0000000  2.105263e+01  0.0000000    0.9589841         0
## 1068  0.0000000  0.000000e+00  6.2500000    3.6264498         1
## 1805  0.0000000  2.000000e+00  2.0000000    2.2927170         1
## 4100  0.0000000  1.639344e+00  8.1967213    3.1818722         1
## 5181  0.0000000  7.105427e-15  2.0618557    3.6264498         1
## 235   0.0000000  2.631579e+00  0.0000000    0.9589841         1
## 3876  0.0000000  1.574803e+00  6.2992126    3.0929567         1
## 4584  0.0000000  4.854369e+00  0.0000000    0.9589841         1
## 60    0.0000000  4.081633e+00  7.1428571    2.6564623         1
## 5135  0.0000000  1.000000e+00 15.0000000    3.4597332         1
## 2613  0.0000000  6.792453e+01  0.0000000    0.9589841         1
## 1489  0.0000000  1.219512e+00  2.4390244    2.7372946         1
## 3579  0.0000000  1.183432e+00  1.1834320    2.2927170         1
## 5357  0.0000000 -7.105427e-15 40.6060606    3.6264498         1
## 4668  0.0000000  2.941176e+01  3.9215686    1.2728036         1
## 788   0.0000000  7.462687e-01  2.9850746    3.0929567         1
## 1857  0.0000000  4.225352e+00  2.8169014    2.0259704         1
## 1929  0.0000000  2.173913e+01  0.0000000    0.9589841         1
## 5512  0.0000000  1.935484e+01 58.0645161    2.9595834         1
## 3493  0.0000000  6.122449e+00  0.0000000    0.9589841         1
## 375   0.0000000  8.333333e+00  1.3888889    1.3400507         1
## 1909  0.0000000  1.384615e+01  0.0000000    0.9589841         1
## 2215  0.0000000  3.472222e+00  3.4722222    2.2927170         1
## 4592  1.1111111  1.666667e+01  4.4444444    1.5907523         1
## 4750  0.9259259  1.018519e+01  2.7777778    1.6258506         1
## 132   4.7619048  6.666667e+00  1.9047619    2.2927170         1
## 740   0.0000000  3.797468e+00 13.9240506    3.0548500         1
## 2820  0.0000000  9.375000e+00  0.0000000    0.9589841         1
## 2507  0.0000000  9.160305e+00  0.0000000    0.9589841         1
## 6181  2.2222222  1.555556e+01  0.0000000    1.1495174         0
## 5993  0.0000000  1.000000e+01  0.0000000    0.9589841         0
## 535   0.0000000  4.395604e+00  0.0000000    0.9589841         1
## 2044  0.0000000  6.896552e+00  0.0000000    0.9589841         1
## 2329  0.0000000  2.150538e+00  0.0000000    0.9589841         1
## 3195  0.0000000  3.030303e+00  1.0101010    1.6258506         1
## 715   0.0000000  1.503759e+00  0.0000000    0.9589841         1
## 3633  0.0000000  2.131148e+01  1.6393443    1.1495174         1
## 2300  0.0000000  1.000000e+01  0.0000000    0.9589841         1
## 3854  0.0000000  7.476636e+00  0.0000000    0.9589841         1
## 1713  0.0000000  3.108624e-15  1.1111111    3.6264498         1
## 2617  0.0000000  7.692308e+00  1.5384615    1.4035617         1
## 444   0.0000000  1.666667e+00  3.3333333    2.7372946         1
## 6638  0.0000000  1.470588e+01  2.9411765    1.4035617         0
## 2664  0.0000000  2.919708e+00  0.0000000    0.9589841         1
## 3900  0.0000000 -7.105427e-15 29.4117647    3.6264498         1
## 609   1.3698630  2.739726e+00  1.3698630    2.2927170         1
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## 394   0.0000000  2.413793e+01  0.0000000    0.9589841         1
## 3081  0.6535948  2.614379e+00  0.6535948    1.7592238         1
## 2817  0.0000000  1.140940e+01  0.0000000    0.9589841         1
## 4489  0.0000000  4.878049e+00  4.8780488    2.2927170         1
## 1972  0.0000000  1.683168e+01  0.0000000    0.9589841         1
## 3904  0.0000000  1.162791e+00  2.3255814    2.7372946         1
## 5705  0.0000000  2.000000e+01  0.0000000    0.9589841         0
## 1941  0.0000000  2.816901e+00  0.0000000    0.9589841         1
## 2847  0.0000000  7.518797e-01  0.7518797    2.2927170         1
## 3553  4.5977011  6.896552e+00  0.0000000    1.8481394         1
## 4351  0.0000000  8.881784e-16  1.6393443    3.6264498         1
## 354   0.0000000  2.456140e+01  0.0000000    0.9589841         1
## 5521  0.0000000  4.201681e+00  2.5210084    1.9592838         1
## 2707  0.0000000  1.449275e+00  5.7971014    3.0929567         1
## 2865  0.0000000  3.921569e+00  0.0000000    0.9589841         1
## 2624  0.0000000  6.976744e+00  2.3255814    1.6258506         1
## 990   0.0000000  4.915254e+01 20.3389831    1.7397058         1
## 537   1.5151515  3.030303e+00  0.0000000    1.6258506         1
## 65    0.0000000  7.105427e-15 15.7407407    3.6264498         1
## 1206  0.0000000 -5.884182e-15  0.5376344    3.6264498         1
## 931   0.0000000  2.941176e+00  2.9411765    2.2927170         1
## 1639  0.0000000  6.666667e+00  0.0000000    0.9589841         1
## 5309  0.0000000  2.439024e+00  4.8780488    2.7372946         1
## 5913  0.0000000  3.448276e+00 17.2413793    3.1818722         0
## 4745  0.0000000  9.345794e-01  2.8037383    2.9595834         1
## 3810  0.0000000  1.153846e+01  2.8846154    1.4924773         1
## 5041  0.0000000  4.950495e+00  0.0000000    0.9589841         1
## 4159  0.0000000  2.127660e+00  4.2553191    2.7372946         1
## 6131  0.0000000  1.666667e+01  0.0000000    0.9589841         0
## 3458  0.0000000  1.449275e+00  1.4492754    2.2927170         1
## 1461  0.0000000  5.691057e+00  2.4390244    1.7592238         1
## 4615  0.0000000  1.694915e+00  1.6949153    2.2927170         1
## 2631  0.0000000  2.900000e+01  5.0000000    1.3512585         1
## 1325  0.0000000  4.878049e+00  3.2520325    2.0259704         1
## 5832  0.0000000  2.702703e+00  0.0000000    0.9589841         0
## 4988  0.0000000  2.318841e+01  4.3478261    1.3801629         1
## 700   0.0000000  3.260870e+00  3.2608696    2.2927170         1
## 1160  0.0000000  9.433962e+00  0.0000000    0.9589841         1
## 1815  0.0000000  1.834862e+00  0.0000000    0.9589841         1
## 6780  0.0000000  0.000000e+00 20.0000000    3.6264498         0
## 5449  0.0000000  1.776357e-15  9.3023256    3.6264498         1
## 6324  0.0000000  3.500000e+01  7.5000000    1.4297134         0
## 735   0.0000000 -7.105427e-15 17.4311927    3.6264498         1
## 3220  0.6289308  1.446541e+01  0.6289308    1.1257007         1
## 945   0.0000000  6.024096e+00  0.0000000    0.9589841         1
## 2460  0.0000000  7.105427e-15 14.2857143    3.6264498         1
## 5473  1.4285714  8.571429e+00 14.2857143    2.7095085         1
## 4877  0.0000000  1.449275e+00  2.8985507    2.7372946         1
## 6402  0.0000000  7.142857e+00  3.5714286    1.8481394         0
## 3001  0.0000000  3.174603e+00  0.0000000    0.9589841         1
## 1979  0.0000000  1.351351e+01  0.0000000    0.9589841         1
## 3355  0.0000000  1.234568e+00  0.0000000    0.9589841         1
## 1116  0.0000000  2.173913e+00  0.0000000    0.9589841         1
## 4563  0.0000000  3.114754e+01  0.0000000    0.9589841         1
```

```
## 6036  0.0000000  7.407407e+00  0.0000000    0.9589841         0
## 951   0.0000000  1.449275e+00  2.8985507    2.7372946         1
## 1885  0.0000000  3.996803e-15  1.8867925    3.6264498         1
## 2185  9.0909091  1.136364e+01 17.0454545    2.9862580         1
## 3640  0.0000000  1.250000e+01  5.2083333    1.7435329         1
## 2261  0.0000000  2.380952e+00  0.0000000    0.9589841         1
## 107   0.0000000  4.000000e+00 10.0000000    2.8643168         1
## 5200  0.0000000  0.000000e+00 60.9756098    3.6264498         1
## 5977  0.0000000  2.727273e+01 68.1818182    2.8643168         0
## 3490  0.0000000  1.698113e+01  1.8867925    1.2257307         1
## 1711  0.0000000  1.092437e+01  0.0000000    0.9589841         1
## 5316  0.0000000  3.703704e+00  3.7037037    2.2927170         1
## 981   0.0000000  3.552714e-15  7.0588235    3.6264498         1
## 3334  0.0000000  1.554312e-15  1.0526316    3.6264498         1
## 3749  1.5151515  1.515152e+00  3.0303030    3.1818722         1
## 3915  0.0000000  8.163265e+00  0.0000000    0.9589841         1
## 6531  0.0000000  2.380952e+01  4.7619048    1.4035617         0
## 5396  0.0000000  1.428571e+01  0.0000000    0.9589841         1
## 1658  0.0000000  2.888889e+01  0.0000000    0.9589841         1
## 1560  0.0000000  1.904762e+00  0.9523810    1.8481394         1
## 447   0.0000000  1.931818e+01  5.6818182    1.5652263         1
## 4917  0.0000000  4.782609e+01  0.0000000    0.9589841         1
## 2955  0.0000000  2.173913e+00  1.0869565    1.8481394         1
## 5808  0.0000000 -7.105427e-15 22.2222222    3.6264498         0
## 4605  0.0000000  2.631579e+00  0.8771930    1.6258506         1
## 2582  0.0000000  3.797468e+01  1.2658228    1.0450314         1
## 5248  0.0000000  1.154632e-14  4.7619048    3.6264498         1
## 4792  0.0000000  2.857143e+00  0.0000000    0.9589841         1
## 3313  0.0000000  1.888889e+01  2.2222222    1.2397700         1
## 5785  0.0000000  1.739130e+01  8.6956522    1.8481394         0
## 4721  0.0000000  3.108624e-15  1.3513514    3.6264498         1
## 286   0.0000000  6.060606e+00  5.0505051    2.1714685         1
## 4762  0.0000000  2.312139e+00  1.1560694    1.8481394         1
## 572   0.0000000  1.063830e+00  1.0638298    2.2927170         1
## 1996  0.0000000  2.290076e+00  1.5267176    2.0259704         1
## 3680  0.0000000  1.369863e+00  0.0000000    0.9589841         1
## 6961  0.0000000  7.993606e-15  5.8823529    3.6264498         0
## 4956  0.0000000  2.380952e+00  0.0000000    0.9589841         1
## 6510  0.0000000  4.000000e+00  0.0000000    0.9589841         0
## 4992  0.0000000  1.206897e+01  6.0344828    1.8481394         1
## 3951  0.0000000  1.298701e+00  4.5454545    3.0336797         1
## 2546  0.0000000  3.092784e+00  0.0000000    0.9589841         1
## 5212  0.0000000  0.000000e+00 11.2500000    3.6264498         1
## 6948  0.0000000  0.000000e+00 10.0000000    3.6264498         0
## 1062  0.0000000  1.041667e+00  0.0000000    0.9589841         1
## 1652  0.0000000  1.408451e+01  0.0000000    0.9589841         1
## 4388  0.0000000  4.000000e+00 36.0000000    3.3597032         1
## 2967  0.0000000  4.854369e+00  4.8543689    2.2927170         1
## 2771  0.0000000  2.000000e+01  0.0000000    0.9589841         1
## 2687  0.0000000  4.347826e+00  0.8695652    1.4035617         1
## 4631  0.0000000  2.156863e+01  1.9607843    1.1812729         1
## 4680  0.0000000  4.545455e+00  0.0000000    0.9589841         1
## 436   0.0000000  5.208333e+00  0.0000000    0.9589841         1
## 1463  0.8474576  8.474576e-01  5.9322034    3.4597332         1
```

```
## 6033  3.4482759  3.448276e+00  0.0000000    2.2927170         0
## 536   0.0000000  1.538462e+00  0.0000000    0.9589841         1
## 6498  0.0000000  7.993606e-15  2.7777778    3.6264498         0
## 6486  0.0000000  4.651163e+00  0.0000000    0.9589841         0
## 2165  2.3255814  3.100775e+00  3.8759690    2.8854871         1
## 5740  0.0000000  6.956522e+01 17.3913043    1.4924773         0
## 3117  1.0101010  6.060606e+00  0.0000000    1.1812729         1
## 6434  0.0000000  2.352941e+01  0.0000000    0.9589841         0
## 4936  0.0000000  3.296703e+00  1.0989011    1.6258506         1
## 3404  0.0000000  6.349206e+00  1.5873016    1.4924773         1
## 6491  0.0000000  6.060606e+00  0.0000000    0.9589841         0
## 5805  0.0000000  1.111111e+01  0.0000000    0.9589841         0
## 1164  0.0000000  6.201550e+00  0.0000000    0.9589841         1
## 3095  0.0000000  7.017544e+00  0.0000000    0.9589841         1
## 4406  1.0101010  5.050505e+00  1.0101010    1.6258506         1
## 4470  0.0000000  1.562500e+00  6.2500000    3.0929567         1
## 5960  0.0000000  5.329071e-15 13.6363636    3.6264498         0
## 2347  0.0000000  1.057692e+01  5.7692308    1.9004426         1
## 435   0.0000000  1.923077e+00  0.0000000    0.9589841         1
## 4200  0.0000000  2.290076e+00  0.7633588    1.6258506         1
## 301   0.8695652  9.565217e+00  0.8695652    1.2924173         1
## 2422  0.4032258  4.032258e-01  0.4032258    2.9595834         1
## 5083  0.0000000  0.000000e+00  6.2500000    3.6264498         1
## 5490  0.0000000  1.443299e+01  3.0927835    1.4297134         1
## 1997  0.0000000  3.333333e+00  0.6666667    1.4035617         1
## 4060  0.0000000  0.000000e+00  2.5000000    3.6264498         1
## 259   0.0000000  2.272727e+00  2.2727273    2.2927170         1
## 2652  0.0000000  8.080808e+00  0.0000000    0.9589841         1
## 5179  0.0000000  7.272727e+00  0.0000000    0.9589841         1
## 4981  0.0000000  2.040816e+00  9.1836735    3.1414560         1
## 5696  0.0000000  5.555556e+00  5.5555556    2.2927170         0
## 318   0.0000000  1.274510e+01  9.8039216    2.1187518         1
## 3558  0.0000000  5.479452e+00  0.6849315    1.2553692         1
## 2201  0.0000000  3.960396e+00  0.0000000    0.9589841         1
## 1328  0.0000000  1.744186e+00  6.9767442    3.0929567         1
## 1194  0.0000000 -8.881784e-16  1.6949153    3.6264498         1
## 2056  0.0000000  1.290323e+01  1.6129032    1.2553692         1
## 6445  0.0000000  2.340426e+01  6.3829787    1.5305839         0
## 613   0.0000000  4.347826e+00 27.8260870    3.2659815         1
## 875   0.0000000  2.857143e+01  8.1632653    1.5517543         1
## 6684  0.0000000  5.000000e+00  5.0000000    2.2927170         0
## 5686  0.0000000  1.538462e+01  0.0000000    0.9589841         0
## 923   0.0000000  1.388889e+00  2.7777778    2.7372946         1
## 129   0.6535948  1.960784e+00  2.6143791    2.6737835         1
## 249   0.0000000 -2.220446e-15  2.4242424    3.6264498         1
## 4642  0.0000000  1.206897e+01  5.1724138    1.7592238         1
## 3463  0.0000000  4.210526e+00  4.2105263    2.2927170         1
## 2285  0.9433962  1.509434e+01  1.8867925    1.3294655         1
## 5262  0.0000000  2.300000e+01  0.0000000    0.9589841         1
## 603   0.0000000  3.571429e+00  0.0000000    0.9589841         1
## 2879  0.0000000  2.531646e+00  0.0000000    0.9589841         1
## 2659  0.0000000  7.092199e-01  0.7092199    2.2927170         1
## 6413  0.0000000 -7.105427e-15 16.6666667    3.6264498         0
## 2769  0.0000000  2.272727e+01  0.0000000    0.9589841         1
```

```
## 242   0.0000000  0.000000e+00  1.5625000    3.6264498         1
## 3704  0.0000000  3.636364e+00  8.1818182    2.8056911         1
## 6091  0.0000000  1.296296e+01  0.0000000    0.9589841         0
## 3593  0.0000000  1.052632e+00  0.0000000    0.9589841         1
## 1015  0.0000000  1.041667e+01  0.0000000    0.9589841         1
## 5354  0.0000000  6.289308e+00  0.0000000    0.9589841         1
## 4008  0.0000000  4.761905e+00  4.7619048    2.2927170         1
## 2111  0.0000000  0.000000e+00 28.1250000    3.6264498         1
## 2923  4.2253521  1.971831e+01  5.6338028    1.7740431         1
## 3691  1.1111111  1.111111e+00  0.0000000    2.2927170         1
## 3860  0.0000000  1.449275e+00  5.7971014    3.0929567         1
## 409   0.0000000  1.154632e-14  4.7619048    3.6264498         1
## 525   0.0000000  1.363636e+01 22.7272727    2.6261502         1
## 1418  0.0000000  1.506849e+01  0.0000000    0.9589841         1
## 4766  0.8928571  1.785714e+00  0.0000000    1.6258506         1
## 1242  0.0000000  5.128205e+00  0.0000000    0.9589841         1
## 895   0.0000000  7.936508e-01 13.4920635    3.4782573         1
## 2566  0.0000000  1.052632e+01  5.2631579    1.8481394         1
## 5976  0.0000000  1.098901e+00  4.3956044    3.0929567         0
## 6975  1.7241379  8.620690e+00  3.4482759    1.9116504         0
## 3918  0.0000000  6.250000e+00  0.0000000    0.9589841         1
## 5380  0.0000000  0.000000e+00 40.0000000    3.6264498         1
## 3212  0.0000000  4.166667e+00  0.0000000    0.9589841         1
## 1554  0.0000000  1.562500e+00  0.0000000    0.9589841         1
## 43    0.0000000  5.181347e-01 65.2849741    3.6054461         1
## 5259  0.0000000  2.619048e+01  2.3809524    1.1812729         1
## 5378  0.0000000  1.176471e+00  9.4117647    3.3300647         1
## 1184  0.0000000  1.776357e-15 10.5263158    3.6264498         1
## 2439  0.0000000  1.090909e+01  0.0000000    0.9589841         1
## 146   0.0000000  6.944444e-01  4.1666667    3.2453833         1
## 3046  0.0000000 -5.329071e-15 10.7142857    3.6264498         1
## 773   0.0000000  6.976744e+00  8.1395349    2.3953118         1
## 2876  0.0000000  1.408451e+00  0.7042254    1.8481394         1
## 6856  0.0000000  4.827586e+01  0.0000000    0.9589841         0
## 3321  1.5151515  1.515152e+00  3.0303030    3.1818722         1
## 3226  0.0000000  1.665335e-15  0.6802721    3.6264498         1
## 695   0.0000000  1.388889e+00  0.0000000    0.9589841         1
## 3421  1.1494253  1.149425e+00  8.0459770    3.4597332         1
## 4869  0.0000000  1.500000e+01  5.0000000    1.6258506         1
## 4473  1.4925373  2.089552e+01  0.0000000    1.0542508         1
## 5111  0.0000000  1.047619e+01  4.7619048    1.7925672         1
## 173   0.0000000  9.259259e-01  0.9259259    2.2927170         1
## 2894  0.0000000  2.173913e+00  6.5217391    2.9595834         1
## 665   0.0000000  2.150538e+00  0.0000000    0.9589841         1
## 913   5.0632911  5.063291e+00  6.3291139    3.0336797         1
## 3287  0.0000000  1.298701e+00  2.5974026    2.7372946         1
## 1192  1.3333333  1.333333e+00  2.6666667    3.1818722         1
## 2866  0.0000000  1.798561e+01  0.0000000    0.9589841         1
## 564   2.6086957  2.173913e+01  0.0000000    1.1190321         1
## 2665  0.0000000  1.125000e+01  0.0000000    0.9589841         1
## 633   0.0000000  7.692308e-01  0.0000000    0.9589841         1
## 5908  0.0000000 -1.776357e-15  5.4054054    3.6264498         0
## 417   0.0000000  1.000000e+01  0.0000000    0.9589841         1
## 2514  0.0000000  6.666667e+00  0.0000000    0.9589841         1
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## 5188  1.1904762  9.523810e+00  1.1904762    1.4035617         1
## 2475  0.0000000  4.672897e+00  0.0000000    0.9589841         1
## 724   0.0000000  8.000000e+00  0.0000000    0.9589841         1
## 1030  0.0000000  3.508772e+00  0.0000000    0.9589841         1
## 1783  0.0000000  1.428571e+00  0.0000000    0.9589841         1
## 6378  9.0909091  9.090909e+00  0.0000000    2.2927170         0
## 2714  0.0000000  1.960784e+00  0.0000000    0.9589841         1
## 2748  0.0000000  7.017544e+00  1.7543860    1.4924773         1
## 6092  0.0000000  1.707317e+01  0.0000000    0.9589841         0
## 5142  0.0000000  3.225806e+00  2.1505376    2.0259704         1
## 1590  0.0000000  1.754386e+00 17.5438596    3.3839529         1
## 5551  0.0000000  7.105427e-15 13.1147541    3.6264498         1
## 1431  0.0000000  5.960265e+00  1.9867550    1.6258506         1
## 501   0.0000000  3.181818e+01 54.5454545    2.6436993         1
## 1284  0.0000000  4.444444e+00  5.5555556    2.4409095         1
## 3452  0.0000000  1.341463e+01  0.0000000    0.9589841         1
## 4005  0.0000000  1.020408e+00  3.0612245    2.9595834         1
## 6255  0.0000000  4.000000e+00  0.0000000    0.9589841         0
## 4191  0.0000000  1.208791e+01  3.2967033    1.5305839         1
## 3383  0.0000000  1.694915e+00 20.3389831    3.4212601         1
## 5468  0.0000000  1.851852e+00  3.7037037    2.7372946         1
## 5794  0.0000000  7.993606e-15  5.2631579    3.6264498         0
## 3024  0.0000000  6.250000e+00  0.0000000    0.9589841         1
## 4657  0.0000000  5.263158e+00  5.2631579    2.2927170         1
## 3225  0.0000000  8.450704e+00  0.0000000    0.9589841         1
## 6976  0.0000000  5.000000e+00  5.0000000    2.2927170         0
## 4243  0.0000000  1.230769e+01  0.0000000    0.9589841         1
## 3384  0.0000000  1.052632e+01  4.3859649    1.7435329         1
## 6074  0.0000000  2.307692e+01  0.0000000    0.9589841         0
## 5081  0.0000000  5.000000e+00  0.0000000    0.9589841         1
## 1389  0.0000000  1.492537e+00  1.4925373    2.2927170         1
## 2578  0.0000000  4.732824e+01  0.0000000    0.9589841         1
## 2575  0.0000000 -6.661338e-16  1.2195122    3.6264498         1
## 2812  0.0000000  3.025210e+01  0.0000000    0.9589841         1
## 3998  0.0000000  6.217249e-15  6.3492063    3.6264498         1
## 3393  0.0000000  5.479452e+00  1.3698630    1.4924773         1
## 3387  0.0000000  8.196721e-01  1.6393443    2.7372946         1
## 855   0.0000000  4.716981e+00 24.5283019    3.1962134         1
## 701   0.0000000  1.388889e+00  2.7777778    2.7372946         1
## 730   0.0000000 -2.664535e-15  5.6603774    3.6264498         1
## 2889  1.4925373  7.462687e+00  7.4626866    2.4260903         1
## 2468  0.0000000  8.474576e-01  0.0000000    0.9589841         1
## 4821  0.0000000  1.093750e+01  3.1250000    1.5517543         1
## 515   0.0000000  5.813953e+00  5.8139535    2.2927170         1
## 2741  0.0000000  2.222222e+00  0.5555556    1.4924773         1
## 6923  0.0000000  6.451613e+00  0.0000000    0.9589841         0
## 3422  0.0000000  5.660377e+00  9.4339623    2.6261502         1
## 5034  0.0000000  2.307692e+00  0.0000000    0.9589841         1
## 588   0.0000000  8.215650e-15  1.4184397    3.6264498         1
## 1207  0.0000000  3.174603e+00  3.1746032    2.2927170         1
## 2077  0.0000000  1.666667e+01 39.1304348    2.8296743         1
## 3326  0.0000000  7.142857e+00 14.2857143    2.7372946         1
## 1359  0.0000000  4.729730e+00  0.0000000    0.9589841         1
## 6693  0.0000000 -1.065814e-14 18.1818182    3.6264498         0
```

```
## 3945  0.0000000 -4.440892e-15  3.6144578    3.6264498         1
## 5267  0.0000000  5.714286e+00  1.4285714    1.4924773         1
## 2176  0.0000000 -8.881784e-15  4.1666667    3.6264498         1
## 2301  0.0000000  9.090909e+00  0.0000000    0.9589841         1
## 1901  0.0000000  2.051282e+00  0.0000000    0.9589841         1
## 3295  0.0000000  5.714286e+00  1.4285714    1.4924773         1
## 3169  1.1363636  4.545455e+00  0.0000000    1.2924173         1
## 6224  0.0000000  5.263158e+00 10.5263158    2.7372946         0
## 6784  0.0000000  9.302326e+00 53.4883721    3.2312697         0
## 153   0.0000000  2.162162e+01 10.8108108    1.8481394         1
## 6679  0.0000000  6.250000e+00 18.7500000    2.9595834         0
## 6418  0.0000000  8.881784e-16  3.0303030    3.6264498         0
## 6476  0.0000000  1.886792e+00  1.8867925    2.2927170         0
## 3722  0.0000000  7.272727e+00  0.0000000    0.9589841         1
## 6553  0.0000000  3.552714e-15 11.1111111    3.6264498         0
## 6653  0.0000000  1.739130e+01  4.3478261    1.4924773         0
## 1842  0.0000000  9.090909e+00  0.0000000    0.9589841         1
## 3675  0.0000000  4.395604e+00  0.0000000    0.9589841         1
## 4828  0.0000000  2.325581e+00  1.5503876    2.0259704         1
## 3731  0.0000000  1.415094e+00  0.4716981    1.6258506         1
## 4682  0.0000000  8.910891e+00  0.9900990    1.2257307         1
## 2641  0.0000000  1.865672e+01  0.0000000    0.9589841         1
## 4105  0.0000000  1.065814e-14  5.1282051    3.6264498         1
## 3263  0.0000000  3.370787e+00  5.6179775    2.6261502         1
## 2294  0.0000000  8.474576e-01  0.8474576    2.2927170         1
## 5679  0.0000000  0.000000e+00 62.5000000    3.6264498         0
## 3051  0.0000000 -1.065814e-14 18.1818182    3.6264498         1
## 4137  0.0000000  3.968254e+00  0.0000000    0.9589841         1
## 5148  0.0000000  4.411765e+00  3.6764706    2.1714685         1
## 900   0.0000000 -7.105427e-15 16.6666667    3.6264498         1
## 5524  0.0000000  2.173913e+01  0.0000000    0.9589841         1
## 1311  0.0000000  2.816901e+00  0.0000000    0.9589841         1
## 88    2.1978022  5.494505e+00  2.1978022    2.1021837         1
## 1333  0.0000000  1.282051e+00  1.2820513    2.2927170         1
## 4616  0.0000000  5.102041e+00  0.0000000    0.9589841         1
## 4915  0.0000000  3.333333e+00  0.0000000    0.9589841         1
## 2358  0.0000000  7.526882e+00  0.0000000    0.9589841         1
## 3550  0.0000000 -9.769963e-15  5.6737589    3.6264498         1
## 5532  0.0000000  7.021277e+01  0.0000000    0.9589841         1
## 3744  0.0000000  4.273504e+00  2.5641026    1.9592838         1
## 347   0.0000000  2.564103e+00  0.0000000    0.9589841         1
## 1631  0.0000000  2.040816e+00  6.1224490    2.9595834         1
## 1448  0.0000000  4.098361e+00  0.0000000    0.9589841         1
## 2919 45.0000000  5.500000e+01  5.0000000    2.1815726         1
## 4453  0.0000000  1.342282e+00  6.7114094    3.1818722         1
## 5258  0.0000000  9.278351e+00  6.1855670    2.0259704         1
## 558   0.0000000  3.546099e+00  0.0000000    0.9589841         1
## 2075  0.0000000  1.666667e+01 11.1111111    2.0259704         1
## 3929  0.0000000  5.263158e+00  2.6315789    1.8481394         1
## 1248  0.0000000  2.994012e+00  2.9940120    2.2927170         1
## 3290  0.0000000  1.351351e+00  8.1081081    3.2453833         1
## 4256  0.0000000  4.705882e+00  4.7058824    2.2927170         1
## 98    0.0000000 -8.881784e-16  4.2016807    3.6264498         1
## 266   0.0000000  2.631579e+00  2.6315789    2.2927170         1
```

```
## 548   2.5316456  1.012658e+01  0.6329114    1.4297134         1
## 6237  0.0000000  1.000000e+01  0.0000000    0.9589841         0
## 974   0.0000000  3.333333e+01  6.6666667    1.4035617         1
## 4843  0.0000000  9.103829e-15  1.3157895    3.6264498         1
## 5451  0.0000000  7.692308e+00  7.6923077    2.2927170         1
## 1919  0.0000000 -7.327472e-15  1.4084507    3.6264498         1
## 1320  1.1111111  2.222222e+00 12.2222222    3.3186653         1
## 6934  0.0000000  9.090909e+00  4.5454545    1.8481394         0
## 1508  0.0000000  9.009009e-01  0.0000000    0.9589841         1
## 5004  0.0000000  1.030928e+00  1.0309278    2.2927170         1
## 4271  0.0000000 -1.065814e-14 12.7659574    3.6264498         1
## 871   0.0000000  2.028986e+01  2.8985507    1.2924173         1
## 1518  0.0000000  8.620690e-01  3.4482759    3.0929567         1
## 1143  0.0000000  1.341463e+01  0.0000000    0.9589841         1
## 5507  0.0000000  4.153846e+01 10.7692308    1.5081682         1
## 5015  0.0000000  4.166667e+00  0.0000000    0.9589841         1
## 4285  1.5151515  4.545455e+00  1.5151515    1.9592838         1
## 21    0.0000000  6.122449e+00  6.1224490    2.2927170         1
## 2242  0.0000000  3.774758e-15  1.3698630    3.6264498         1
## 4969  0.0000000  8.659740e-15  1.5873016    3.6264498         1
## 6446  0.0000000  4.347826e+00  0.0000000    0.9589841         0
## 3394  0.0000000  1.086957e+01  2.1739130    1.4035617         1
## 5406  0.0000000  4.938272e+00  4.9382716    2.2927170         1
## 3609  0.0000000  2.666667e+00  0.6666667    1.4924773         1
## 993   0.0000000  1.388889e+00  1.3888889    2.2927170         1
## 3246  0.0000000  5.882353e+00  3.5294118    1.9592838         1
## 4568  0.0000000  3.030303e+00  1.0101010    1.6258506         1
## 4941  0.0000000  2.777778e+00  0.0000000    0.9589841         1
## 1102  0.0000000  7.993606e-15  5.8823529    3.6264498         1
## 6233  0.0000000  2.903226e+01  0.0000000    0.9589841         0
## 4802  0.0000000  1.179775e+01  0.0000000    0.9589841         1
## 4054  0.0000000  5.000000e+00  5.0000000    2.2927170         1
## 2081  0.0000000  1.282051e+00  0.0000000    0.9589841         1
## 5297  0.0000000  5.747126e+00  1.1494253    1.4035617         1
## 4250  0.0000000  1.063830e+01  0.0000000    0.9589841         1
## 2691  0.0000000  2.727273e+01  0.0000000    0.9589841         1
```

```
cor(m_sample[,c('dptMiss', 'polMiss', 'mmrMiss', 'hepMiss', 'varMiss')])
```

```
##           dptMiss   polMiss   mmrMiss   hepMiss   varMiss
## dptMiss 1.0000000 0.9822570 0.9519832 0.8640924 0.8594114
## polMiss 0.9822570 1.0000000 0.9609197 0.8788175 0.8743893
## mmrMiss 0.9519832 0.9609197 1.0000000 0.8665106 0.8763631
## hepMiss 0.8640924 0.8788175 0.8665106 1.0000000 0.9602906
## varMiss 0.8594114 0.8743893 0.8763631 0.9602906 1.0000000
```

These are not linear and will need logistic transformation

Modeling with Multivariate Linear Regression

```
con_lm <- lm(formula = conditional_t ~ dptMiss*varMiss*mmrMiss + polMiss +hepMiss, data = m_sample)
summary(con_lm)
```

```
##
## Call:
## lm(formula = conditional_t ~ dptMiss * varMiss * mmrMiss + polMiss +
```

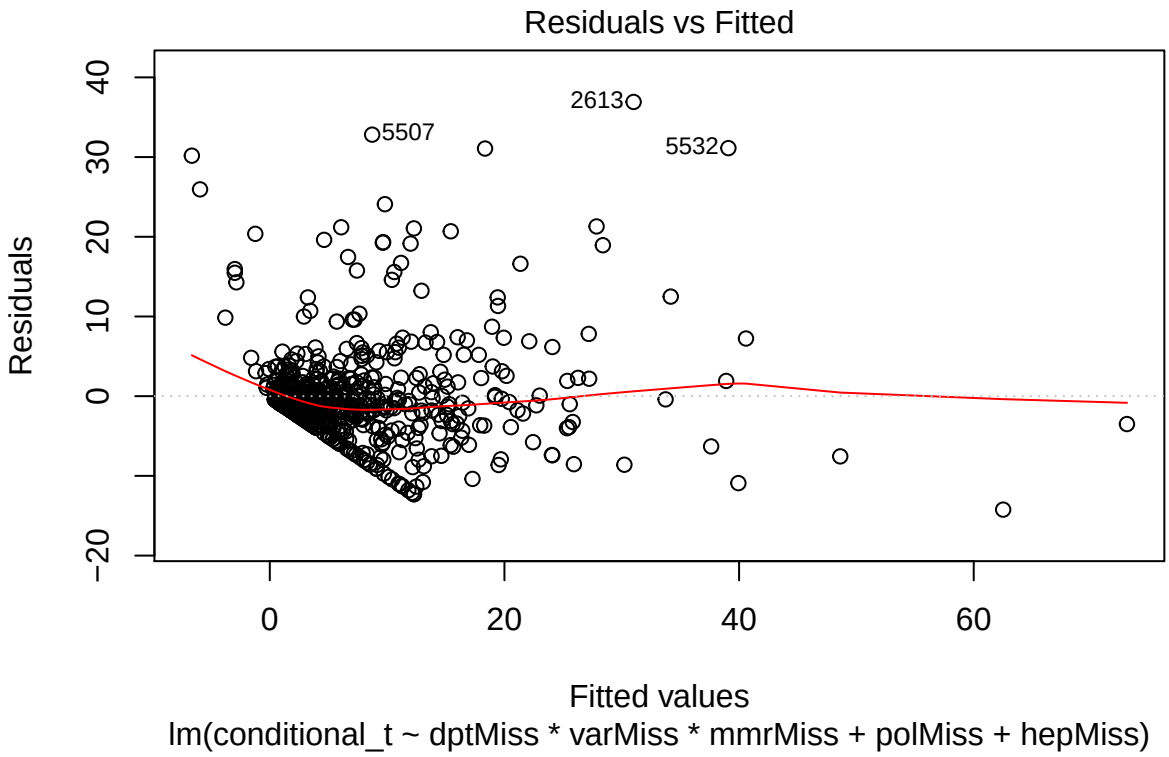
```
##     hepMiss, data = m_sample)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -14.234  -2.515  -0.772   1.249  36.914
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)               8.243e-02  4.746e-01   0.174  0.86215
## dptMiss                   9.661e-01  1.406e-01   6.871 1.61e-11 ***
## varMiss                  -6.392e-01  1.202e-01  -5.316 1.50e-07 ***
## mmrMiss                   1.654e-01  1.056e-01   1.566  0.11776
## polMiss                   3.805e-01  1.238e-01   3.073  0.00222 **
## hepMiss                  -2.592e-01  8.750e-02  -2.962  0.00318 **
## dptMiss:varMiss          -2.231e-02  6.104e-03  -3.655  0.00028 ***
## dptMiss:mmrMiss          -4.534e-03  1.653e-03  -2.743  0.00626 **
## varMiss:mmrMiss           1.829e-02  6.254e-03   2.924  0.00358 **
## dptMiss:varMiss:mmrMiss  2.094e-05  3.710e-05   0.565  0.57257
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.163 on 598 degrees of freedom
## Multiple R-squared:  0.6243, Adjusted R-squared:  0.6186
## F-statistic: 110.4 on 9 and 598 DF,  p-value: < 2.2e-16
```

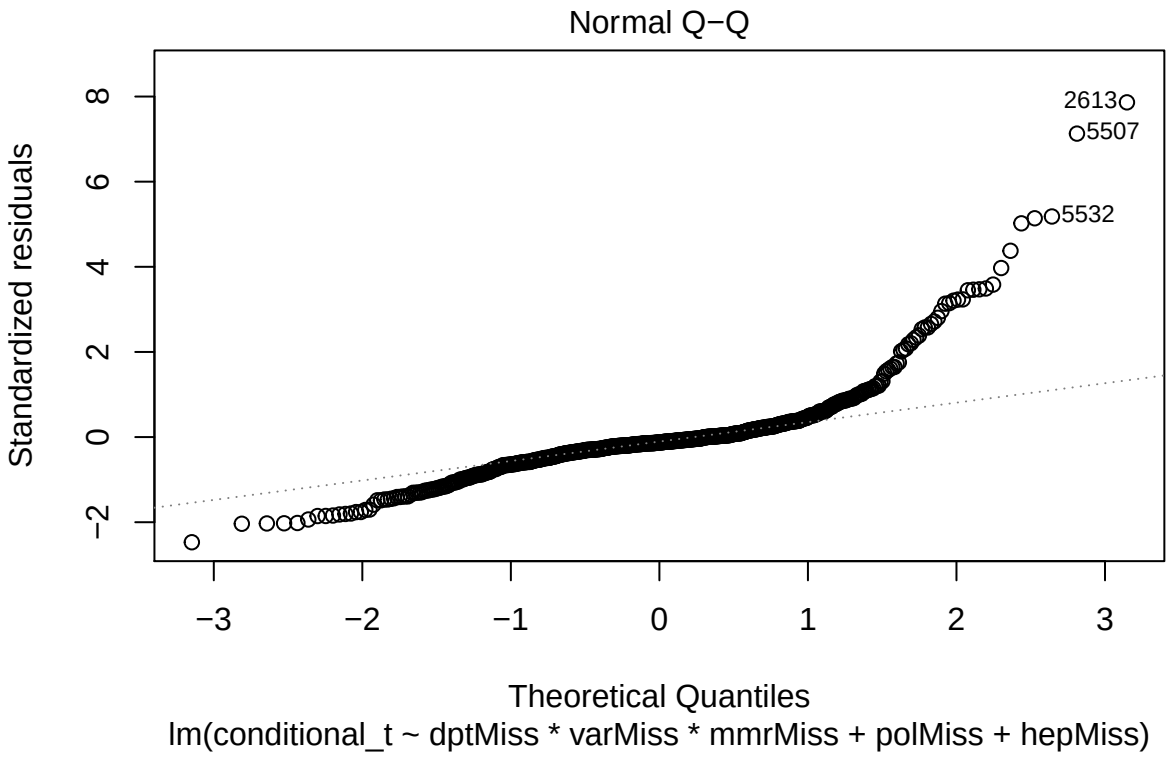
```
summary(residuals(con_lm))
```

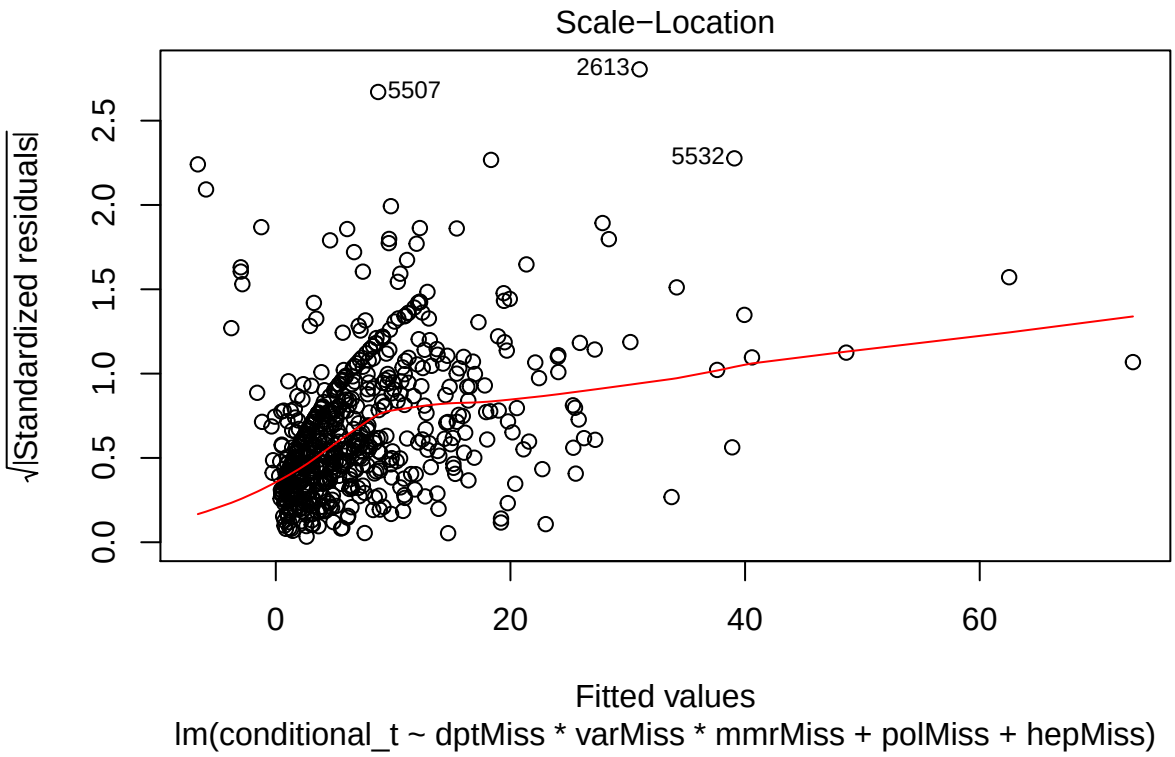
```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -14.2342  -2.5147  -0.7716   0.0000   1.2492  36.9145
```

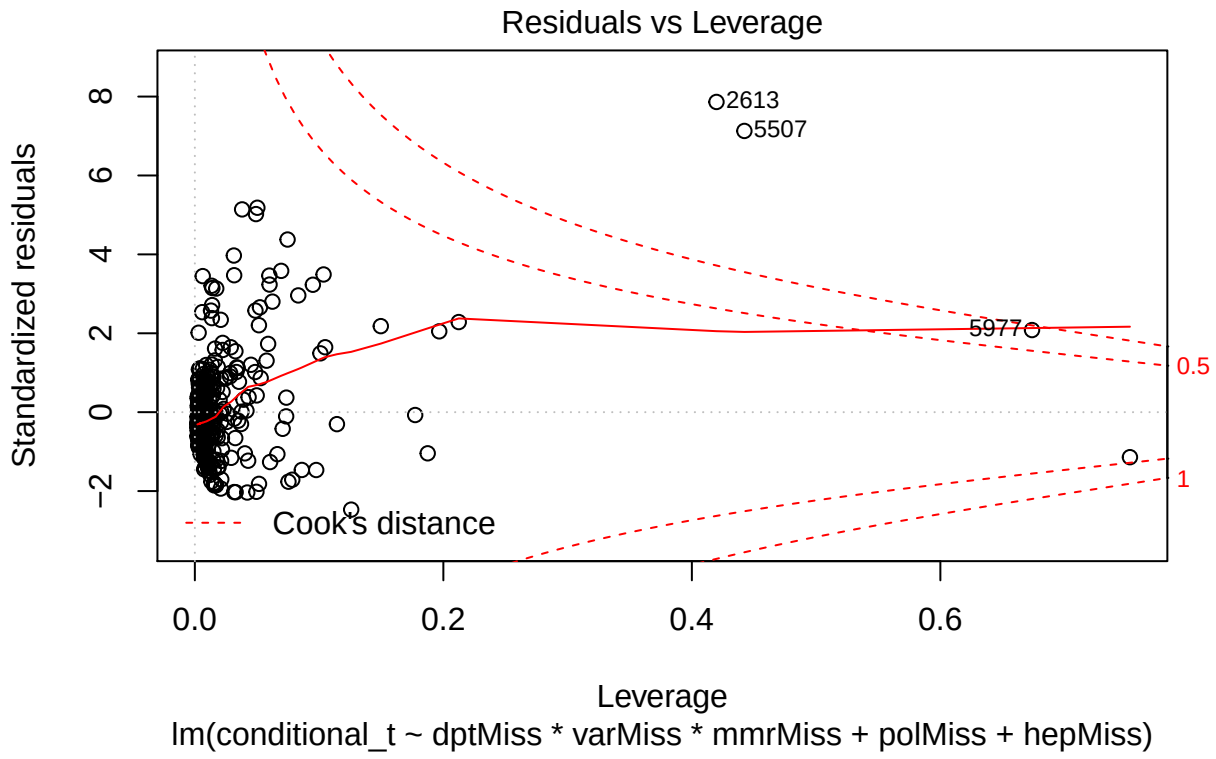
Great Results #### Diagnostics

```
plot(con_lm)
```


Residuals vs Fitted
Residuals
Fitted values
lm(conditional_t ~ dptMiss * varMiss * mmrMiss + polMiss + hepMiss)
2613
5507
5532
40
30
20
10
0
−20
0
20
40
60


Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(conditional_t ~ dptMiss * varMiss * mmrMiss + polMiss + hepMiss)
2613
5507
5532
−2
0
2
4
6
8
−3
−2
−1
0
1
2
3


Scale−Location
2613
5507
5532
√|Standardized residuals|
0.0
0.5
1.0
1.5
2.0
2.5
0
20
40
60
Fitted values
lm(conditional_t ~ dptMiss * varMiss * mmrMiss + polMiss + hepMiss)

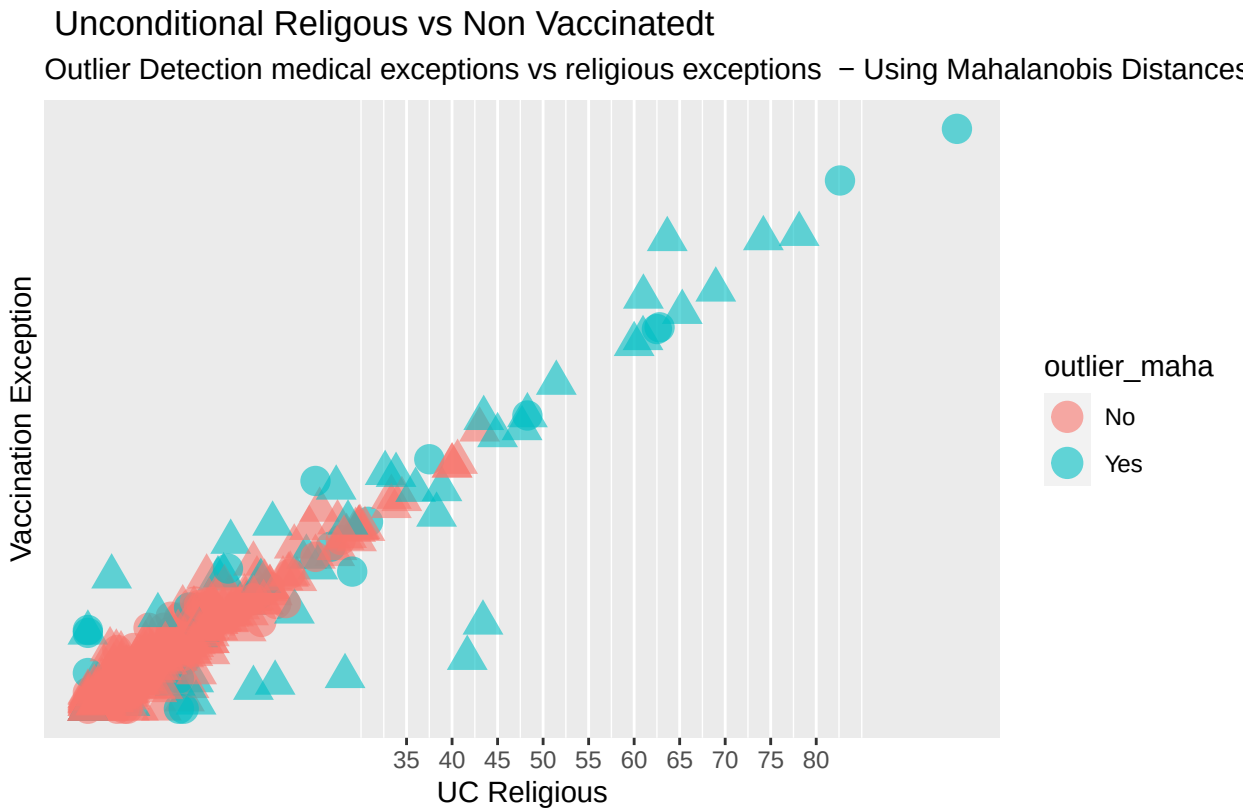



```
m2_sample <- data.frame(m_sample)
# Outlier Detection
# source: https://www.r-bloggers.com/outlier-detection-with-mahalanobis-distance/
m_dist <- mahalanobis(m2_sample[,c('dptMiss', 'polMiss', 'mmrMiss', 'hepMiss', 'varMiss')],
                      colMeans(m_sample[,c('dptMiss', 'polMiss', 'mmrMiss', 'hepMiss', 'varMiss')]),
                      cov(m_sample[,c('dptMiss', 'polMiss', 'mmrMiss', 'hepMiss', 'varMiss')])
)

m2_sample$m_dist <- round(m_dist, 2)

m2_sample$outlier_maha <- "No"
m2_sample$outlier_maha[m2_sample$m_dist > 10] <- "Yes"

ggplot(m2_sample, aes(x = polMiss, y = mmrMiss, color = outlier_maha)) +
      geom_point(size = 5, alpha = 0.6, shape = as.integer(m_sample$pubpriv)+15) +
      labs(title = " Unconditional Religous vs Non Vaccinatedt",
           subtitle = "Outlier Detection medical exceptions vs religious exceptions  - Using Mahalanobis
           caption = "Source: http://wiki.stat.ucla.edu/socr/index.php/SOCR_Data_Dinov_020108_HeightsWe
      ylab("Vaccination Exception") + xlab("UC Religious") +
      scale_y_continuous(breaks = seq(160, 200, 5)) +
      scale_x_continuous(breaks = seq(35, 80, 5))
```



Source: http://wiki.stat.ucla.edu/socr/index.php/SOCR_Data_Dinov_020108_HeightsWeights

```
m2_sample <- m_sample[m2_sample$outlier_maha == "No",]
summary(m2_sample)
```

```
##       code                              name        pubpriv      enrollment
##  Min.   : 100024   WASHINGTON ELEMENTARY:  4   PRIVATE: 67   Min.   : 10.00
##  1st Qu.:6012950   JEFFERSON ELEMENTARY :  3   PUBLIC :477   1st Qu.: 55.00
##  Median :6035848   LINCOLN ELEMENTARY   :  3                 Median : 84.00
##  Mean   :5380194   CABRILLO ELEMENTARY  :  2                 Mean   : 84.03
##  3rd Qu.:6098367   EDISON ELEMENTARY    :  2                 3rd Qu.:110.00
##  Max.   :7104037   FRANKLIN ELEMENTARY  :  2                 Max.   :248.00
##                    (Other)              :528
##     allvaccs      conditional        medical          religious
##  Min.   :50.58   Min.   :0.0000   Min.   :0.00000   Min.   :0.0000
##  1st Qu.:87.02   1st Qu.:0.2107   1st Qu.:0.00000   1st Qu.:0.0000
##  Median :93.00   Median :0.6667   Median :0.00000   Median :0.3333
##  Mean   :90.56   Mean   :0.5806   Mean   :0.03021   Mean   :0.3892
##  3rd Qu.:96.43   3rd Qu.:1.0000   3rd Qu.:0.00000   3rd Qu.:0.6667
##  Max.   :99.47   Max.   :1.0000   Max.   :1.00000   Max.   :1.0000
##
##     dptMiss          polMiss          mmrMiss          hepMiss
##  Min.   : 0.000   Min.   : 0.000   Min.   : 0.000   Min.   : 0.000
##  1st Qu.: 2.778   1st Qu.: 2.346   1st Qu.: 2.357   1st Qu.: 1.370
##  Median : 5.694   Median : 5.141   Median : 5.667   Median : 3.588
##  Mean   : 7.753   Mean   : 7.369   Mean   : 7.755   Mean   : 5.625
##  3rd Qu.:10.468   3rd Qu.:10.000   3rd Qu.:10.526   3rd Qu.: 7.062
##  Max.   :42.442   Max.   :43.023   Max.   :45.930   Max.   :40.606
```

```
##
##     varMiss           nonvax        conditional_t      medical_t
##  Min.   : 0.000   Min.   : 0.5319   Min.   : 0.000   Min.   :0.0000
##  1st Qu.: 1.096   1st Qu.: 3.5651   1st Qu.: 1.061   1st Qu.:0.0000
##  Median : 3.256   Median : 6.9971   Median : 3.315   Median :0.0000
##  Mean   : 5.150   Mean   : 9.4410   Mean   : 5.486   Mean   :0.2341
##  3rd Qu.: 6.563   3rd Qu.:12.9831   3rd Qu.: 7.273   3rd Qu.:0.0000
##  Max.   :40.606   Max.   :49.4186   Max.   :49.419   Max.   :9.0909
##
##      not_r            rel_t         uc_religious.V1     pubpriv_n
##  Min.   : 0.000   Min.   : 0.000   Min.   :0.958984   Min.   :0.0000
##  1st Qu.: 1.231   1st Qu.: 0.000   1st Qu.:0.958984   1st Qu.:1.0000
##  Median : 3.490   Median : 1.695   Median :1.848139   Median :1.0000
##  Mean   : 5.720   Mean   : 3.721   Mean   :2.037519   Mean   :0.8768
##  3rd Qu.: 7.906   3rd Qu.: 5.000   3rd Qu.:2.959583   3rd Qu.:1.0000
##  Max.   :49.419   Max.   :40.606   Max.   :3.626450   Max.   :1.0000
##
```

```
con_lm <- lm(formula = conditional_t ~ dptMiss * polMiss * mmrMiss * hepMiss * varMiss, data = m2_sampl
summary(con_lm)
```

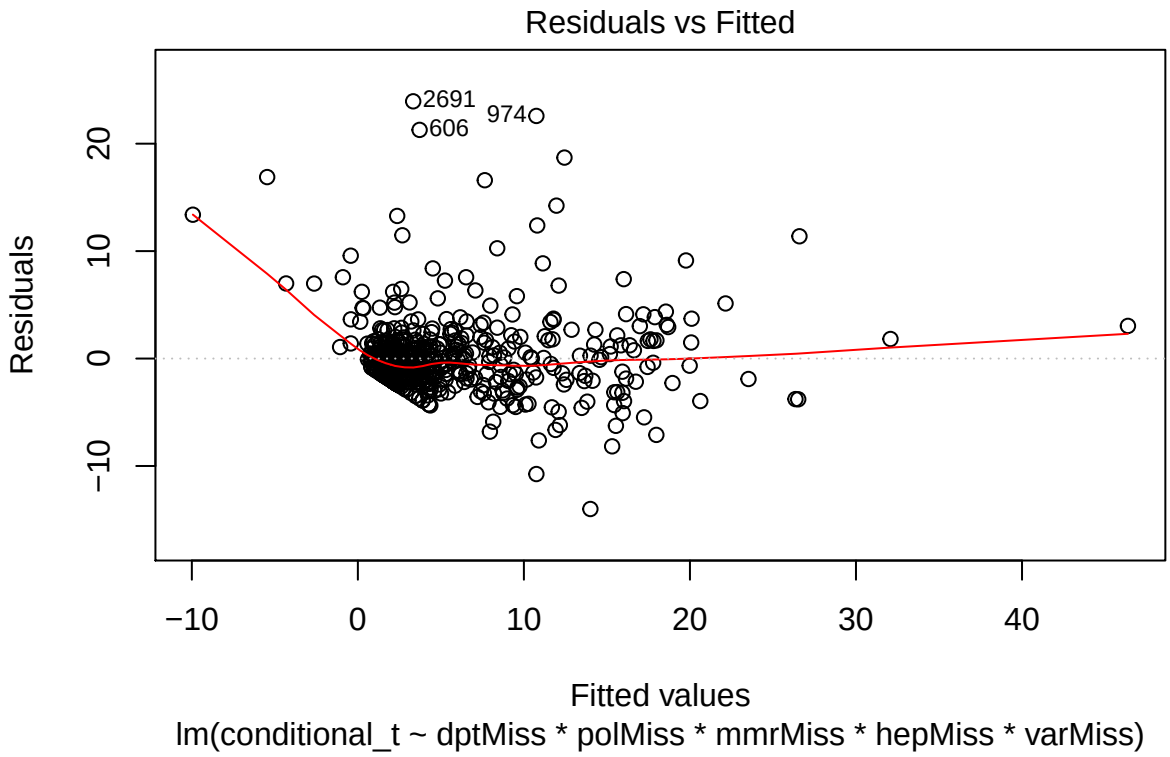
```
##
## Call:
## lm(formula = conditional_t ~ dptMiss * polMiss * mmrMiss * hepMiss *
##     varMiss, data = m2_sample)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -14.0032  -2.0223  -0.5908   1.0607  23.9408
##
## Coefficients:
##                                        Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           2.144e-01  6.149e-01   0.349 0.727525
## dptMiss                               7.530e-01  2.884e-01   2.611 0.009284
## polMiss                              -6.547e-01  3.862e-01  -1.695 0.090614
## mmrMiss                               5.601e-01  2.562e-01   2.187 0.029227
## hepMiss                               4.400e-01  4.209e-01   1.046 0.296264
## varMiss                               1.833e-01  4.058e-01   0.452 0.651603
## dptMiss:polMiss                       1.081e-01  4.564e-02   2.369 0.018211
## dptMiss:mmrMiss                       1.183e-02  3.777e-02   0.313 0.754236
## polMiss:mmrMiss                       3.177e-02  5.477e-02   0.580 0.562110
## dptMiss:hepMiss                      -4.804e-01  1.723e-01  -2.788 0.005507
## polMiss:hepMiss                       4.167e-01  1.864e-01   2.235 0.025820
## mmrMiss:hepMiss                      -7.830e-02  1.196e-01  -0.655 0.513080
## dptMiss:varMiss                       3.750e-02  1.649e-01   0.227 0.820153
## polMiss:varMiss                      -9.418e-02  2.026e-01  -0.465 0.642188
## mmrMiss:varMiss                      -1.906e-02  1.110e-01  -0.172 0.863683
## hepMiss:varMiss                      -1.913e-01  8.522e-02  -2.245 0.025188
## dptMiss:polMiss:mmrMiss              -7.890e-03  1.625e-03  -4.855 1.60e-06
## dptMiss:polMiss:hepMiss               9.124e-03  9.132e-03   0.999 0.318212
## dptMiss:mmrMiss:hepMiss               2.641e-02  1.455e-02   1.815 0.070135
## polMiss:mmrMiss:hepMiss              -2.016e-02  1.218e-02  -1.655 0.098507
## dptMiss:polMiss:varMiss              -1.722e-02  1.195e-02  -1.441 0.150099
## dptMiss:mmrMiss:varMiss              -1.732e-02  1.524e-02  -1.136 0.256328
## polMiss:mmrMiss:varMiss               2.391e-02  1.368e-02   1.748 0.081106
```

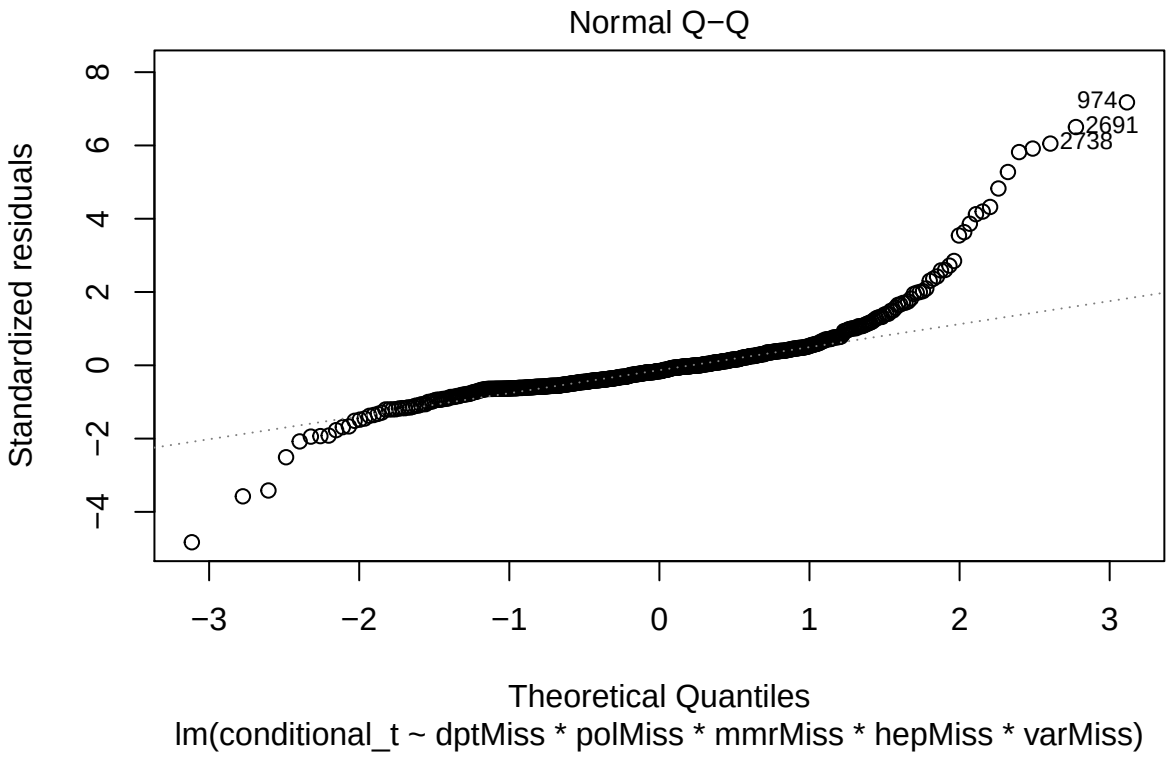
```
## dptMiss:hepMiss:varMiss                  6.348e-02  1.006e-02   6.313 5.95e-10
## polMiss:hepMiss:varMiss                 -5.661e-02  1.027e-02  -5.514 5.59e-08
## mmrMiss:hepMiss:varMiss                  1.733e-02  9.505e-03   1.823 0.068871
## dptMiss:polMiss:mmrMiss:hepMiss         -3.069e-04  2.408e-04  -1.274 0.203068
## dptMiss:polMiss:mmrMiss:varMiss          7.560e-04  3.487e-04   2.168 0.030606
## dptMiss:polMiss:hepMiss:varMiss          3.173e-04  1.865e-04   1.701 0.089496
## dptMiss:mmrMiss:hepMiss:varMiss         -2.363e-03  4.330e-04  -5.457 7.54e-08
## polMiss:mmrMiss:hepMiss:varMiss          8.902e-04  2.617e-04   3.401 0.000723
## dptMiss:polMiss:mmrMiss:hepMiss:varMiss  8.133e-06  2.507e-06   3.244 0.001253
##
## (Intercept)
## dptMiss                                 **
## polMiss                                 .
## mmrMiss                                 *
## hepMiss
## varMiss
## dptMiss:polMiss                         *
## dptMiss:mmrMiss
## polMiss:mmrMiss
## dptMiss:hepMiss                         **
## polMiss:hepMiss                         *
## mmrMiss:hepMiss
## dptMiss:varMiss
## polMiss:varMiss
## mmrMiss:varMiss
## hepMiss:varMiss                         *
## dptMiss:polMiss:mmrMiss                 ***
## dptMiss:polMiss:hepMiss
## dptMiss:mmrMiss:hepMiss                 .
## polMiss:mmrMiss:hepMiss                 .
## dptMiss:polMiss:varMiss
## dptMiss:mmrMiss:varMiss
## polMiss:mmrMiss:varMiss                 .
## dptMiss:hepMiss:varMiss                 ***
## polMiss:hepMiss:varMiss                 ***
## mmrMiss:hepMiss:varMiss                 .
## dptMiss:polMiss:mmrMiss:hepMiss
## dptMiss:polMiss:mmrMiss:varMiss         *
## dptMiss:polMiss:hepMiss:varMiss         .
## dptMiss:mmrMiss:hepMiss:varMiss         ***
## polMiss:mmrMiss:hepMiss:varMiss         ***
## dptMiss:polMiss:mmrMiss:hepMiss:varMiss **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.762 on 512 degrees of freedom
## Multiple R-squared:  0.6932, Adjusted R-squared:  0.6747
## F-statistic: 37.32 on 31 and 512 DF,  p-value: < 2.2e-16
```

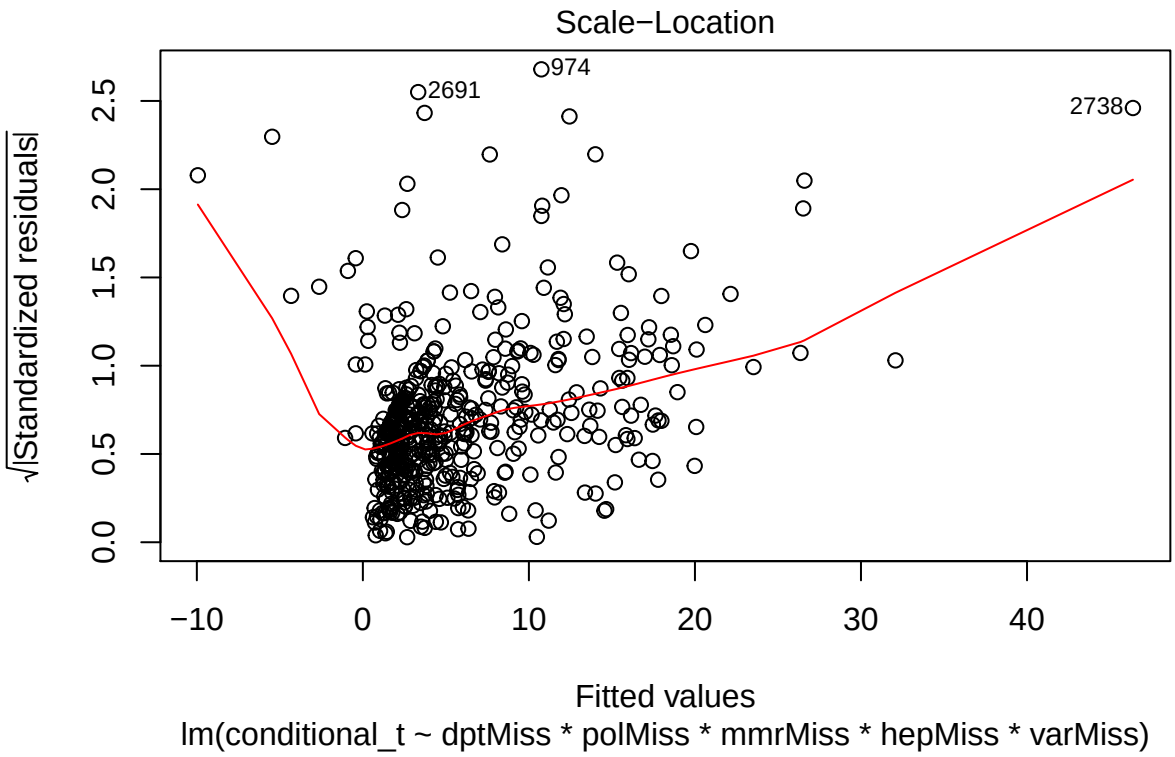
```
summary(residuals(con_lm))
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -14.0032  -2.0223  -0.5908   0.0000   1.0607  23.9408
```

```r
plot(con_lm)
```

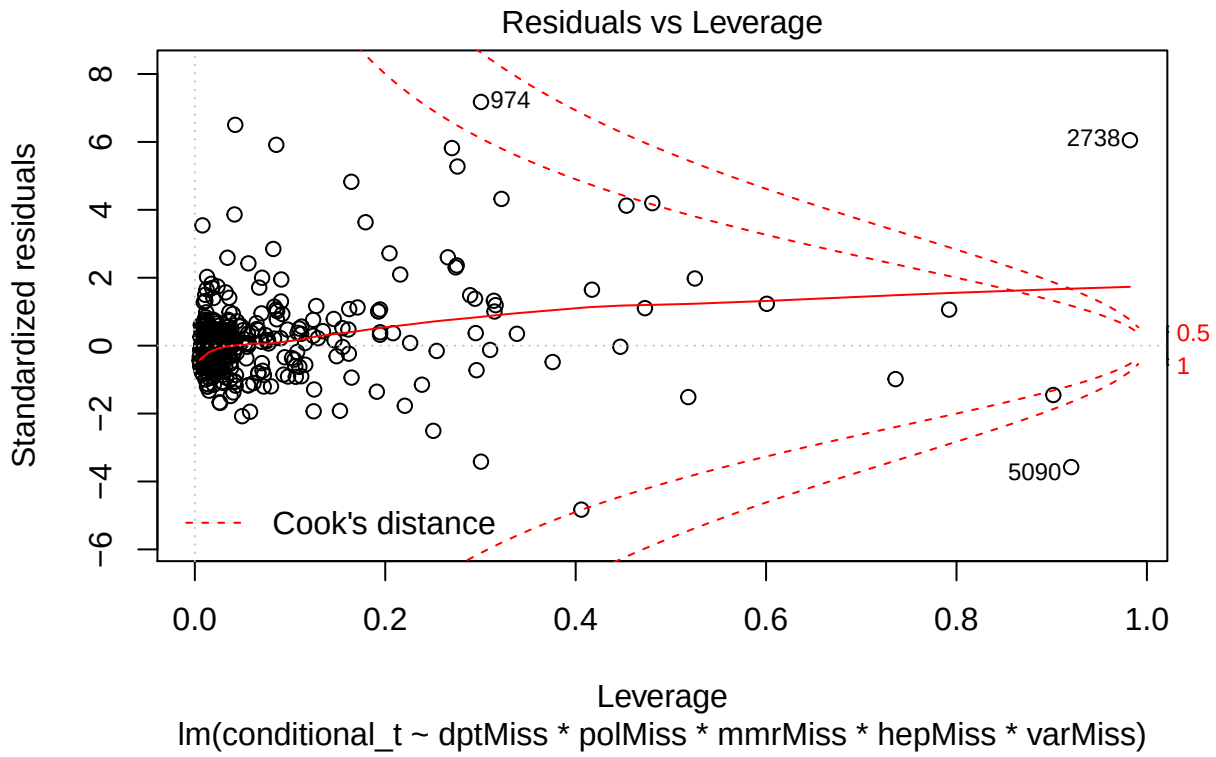

Residuals vs Fitted
2691
974
606
Residuals
20
10
0
−10
−10
0
10
20
30
40
Fitted values
lm(conditional_t ~ dptMiss * polMiss * mmrMiss * hepMiss * varMiss)


Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(conditional_t ~ dptMiss * polMiss * mmrMiss * hepMiss * varMiss)
974
2691
2738
−4
−2
0
2
4
6
8
−3
−2
−1
0
1
2
3




```
## Warning in sqrt(crit * p * (1 - hh)/hh): NaNs produced

## Warning in sqrt(crit * p * (1 - hh)/hh): NaNs produced
```



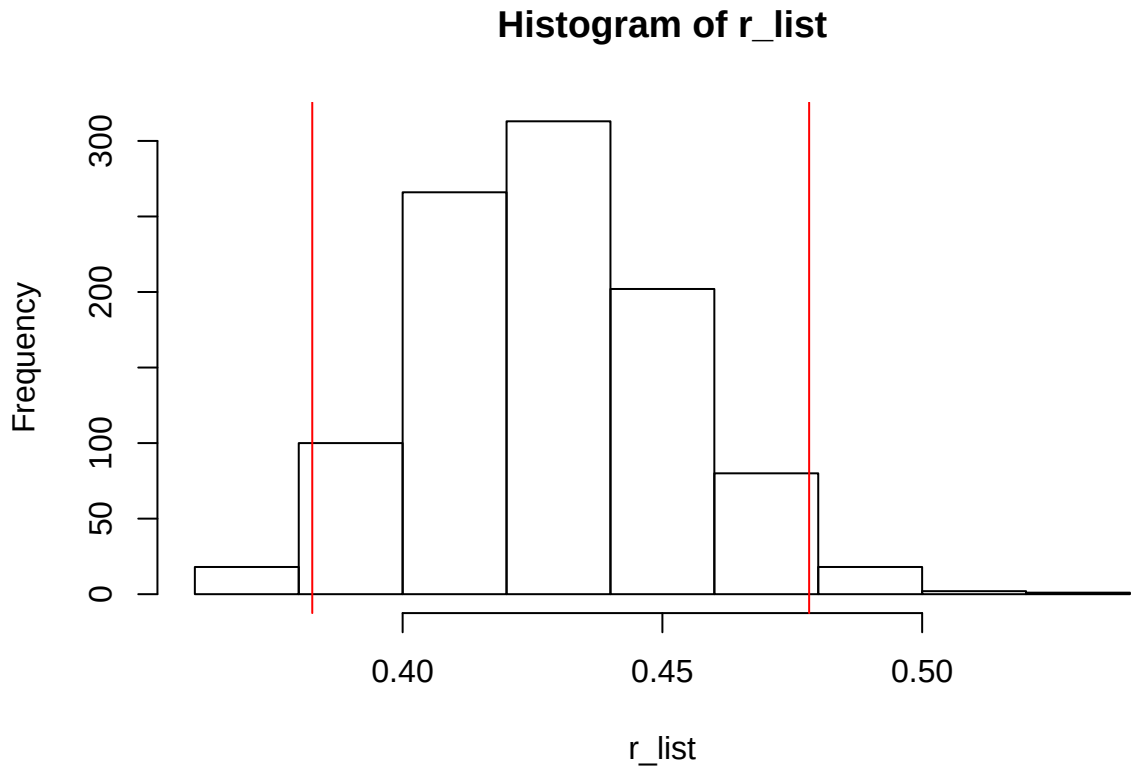
Bayesian Approach

```
con_MCMC <- lmBF(conditional_t ~ dptMiss + polMiss + mmrMiss + hepMiss + varMiss, data = m_sample, poste
summary(con_MCMC)
```

```
##
## Iterations = 1:1000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 1000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##             Mean      SD Naive SE Time-series SE
## mu       7.4256 0.25855 0.008176       0.008608
## dptMiss  0.4957 0.11789 0.003728       0.003728
## polMiss  0.4827 0.13337 0.004217       0.004217
## mmrMiss  0.2473 0.07997 0.002529       0.002529
## hepMiss -0.2190 0.09135 0.002889       0.002889
## varMiss -0.8113 0.09090 0.002874       0.002874
## sig2    42.6260 2.43368 0.076960       0.076960
## g        0.3658 0.32148 0.010166       0.010166
##
## 2. Quantiles for each variable:
##
```

```
##             2.5%     25%     50%     75%    97.5%
## mu       6.90671  7.2575  7.4223  7.5960  7.93081
## dptMiss  0.26966  0.4205  0.4903  0.5725  0.72409
## polMiss  0.21077  0.3892  0.4864  0.5717  0.74515
## mmrMiss  0.09172  0.1950  0.2476  0.3006  0.40014
## hepMiss -0.39344 -0.2826 -0.2175 -0.1566 -0.04101
## varMiss -0.98978 -0.8760 -0.8078 -0.7462 -0.64010
## sig2    38.10504 40.9899 42.5357 44.3516 47.63116
## g        0.09840  0.1820  0.2674  0.4239  1.19523
```

```
r_list <- (con_MCMC[,"sig2"]/var(m_sample$conditional_t))
hist(r_list)
abline(v=quantile(r_list, c(0.025)),col='red')
abline(v=quantile(r_list, c(0.975)),col='red')
```



Though these transformations where able to succesfully influence a more accurate prediction the heterogenuitity of the data made prediction inaccurate.

11. Is it possible to predict medical percentage, based on the percentages of specific vaccines that are missing? If so, what are the specifics?

Modeling with Multivariate Linear Regression

```
med_lm <- lm(formula = medical_t ~ dptMiss + mmrMiss, data = m2_sample)
summary(med_lm)
```

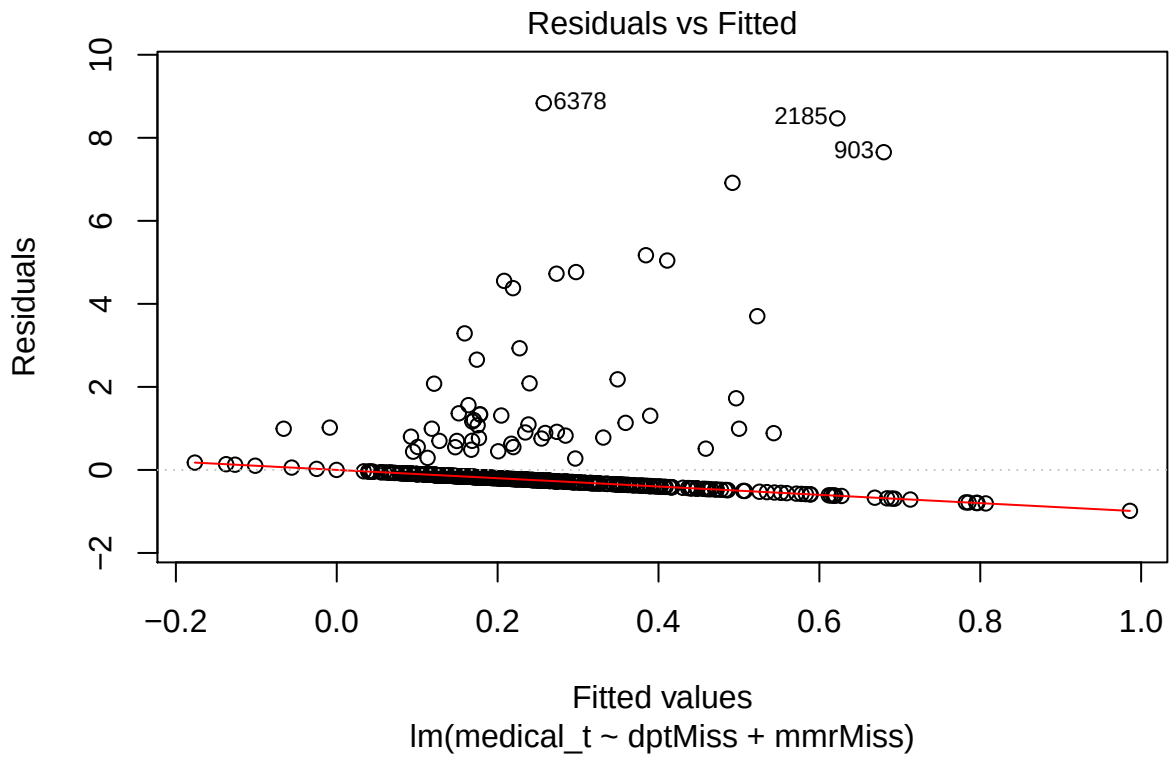
```
##
## Call:
## lm(formula = medical_t ~ dptMiss + mmrMiss, data = m2_sample)
```

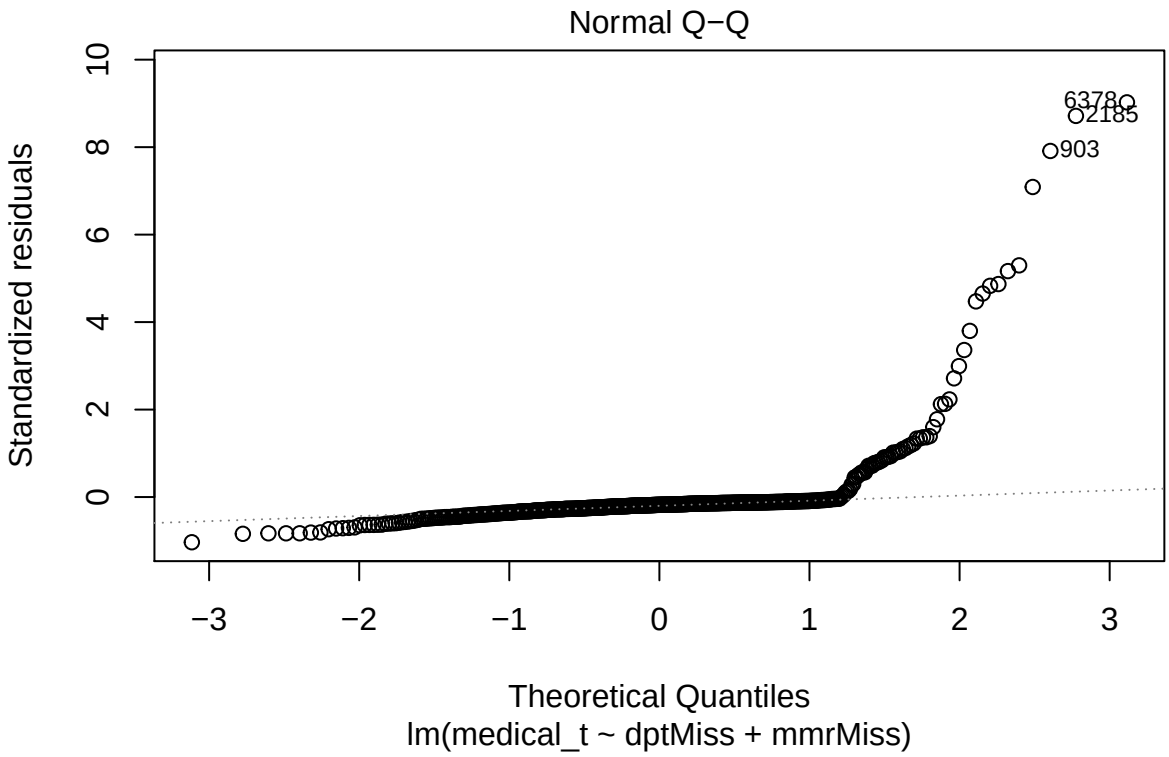
```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9861 -0.2732 -0.1739 -0.1191  8.8336
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.09885    0.06207   1.592   0.1119
## dptMiss     -0.02477    0.02023  -1.225   0.2212
## mmrMiss      0.04221    0.01950   2.164   0.0309 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9798 on 541 degrees of freedom
## Multiple R-squared:  0.02366,    Adjusted R-squared:  0.02005
## F-statistic: 6.555 on 2 and 541 DF,  p-value: 0.001539
```

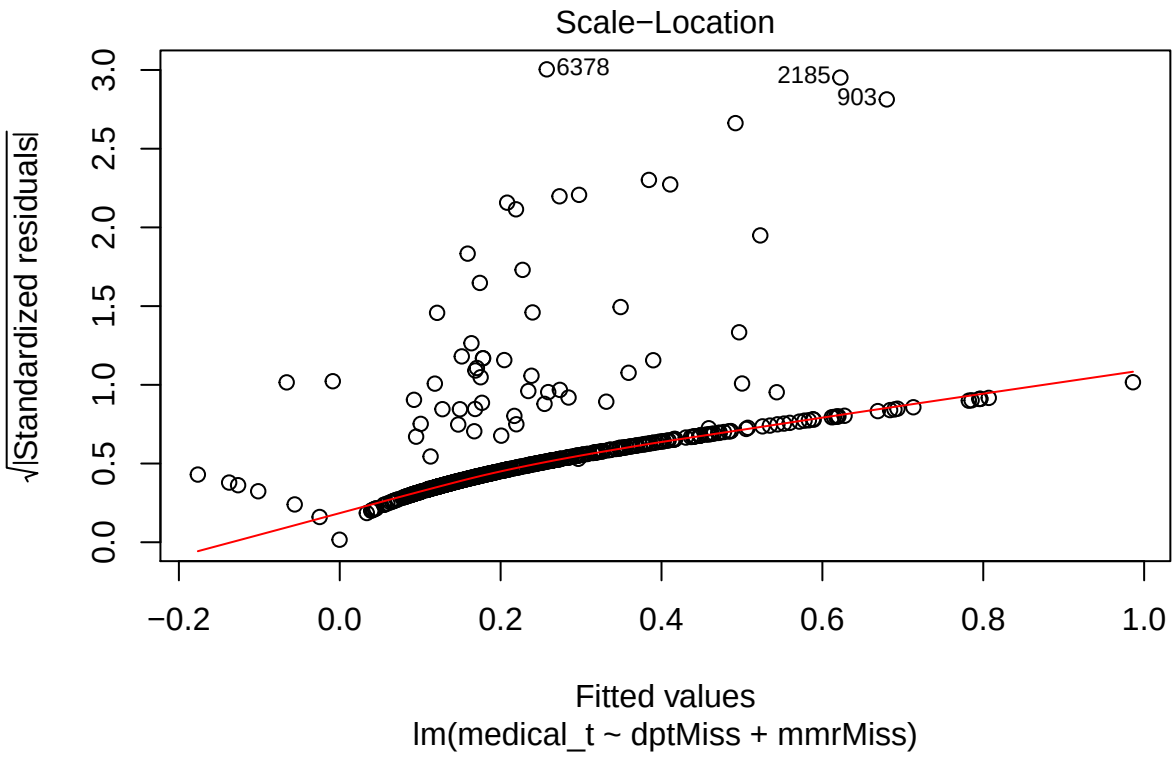
```
summary(residuals(med_lm))
```

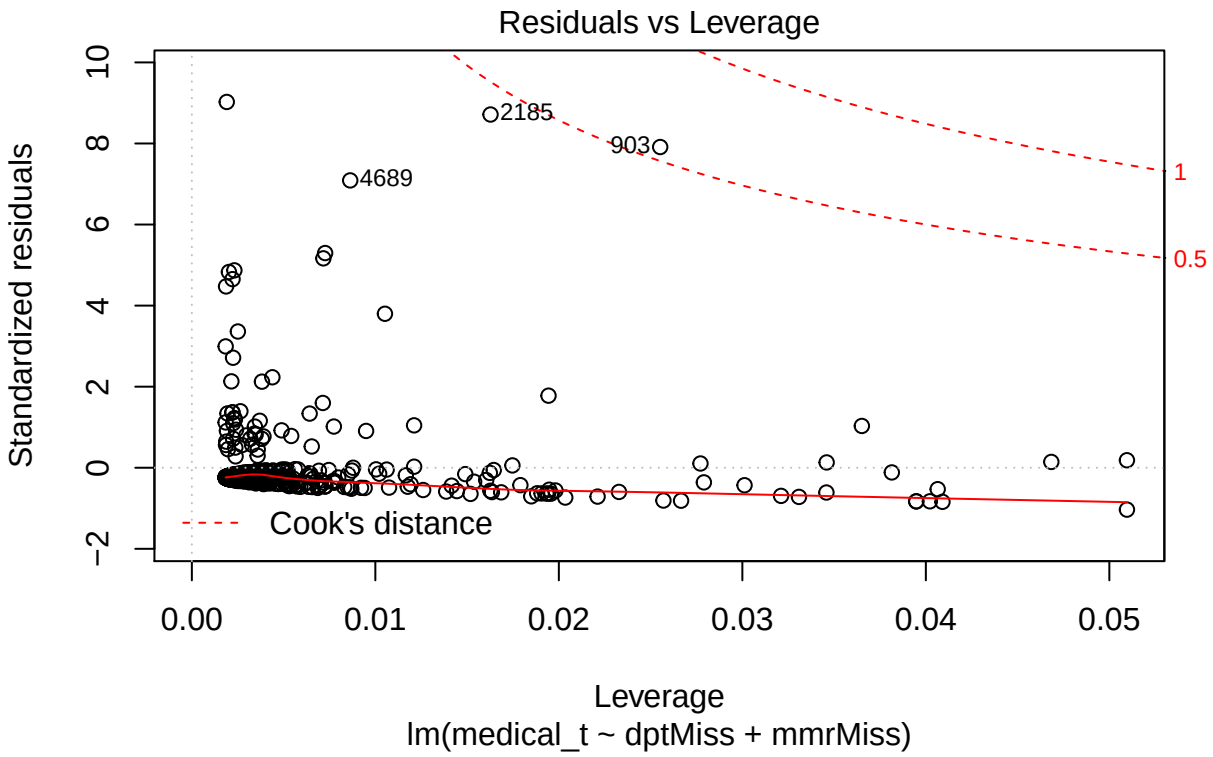
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.9861 -0.2732 -0.1739  0.0000 -0.1191  8.8336
```

```
plot(med_lm)
```




Normal Q−Q
Standardized residuals
0
2
4
6
8
10
6378
2185
903
−3
−2
−1
0
1
2
3
Theoretical Quantiles
lm(medical_t ~ dptMiss + mmrMiss)


Scale−Location
6378
2185
903
√|Standardized residuals|
0.0
0.5
1.0
1.5
2.0
2.5
3.0
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
Fitted values
lm(medical_t ~ dptMiss + mmrMiss)



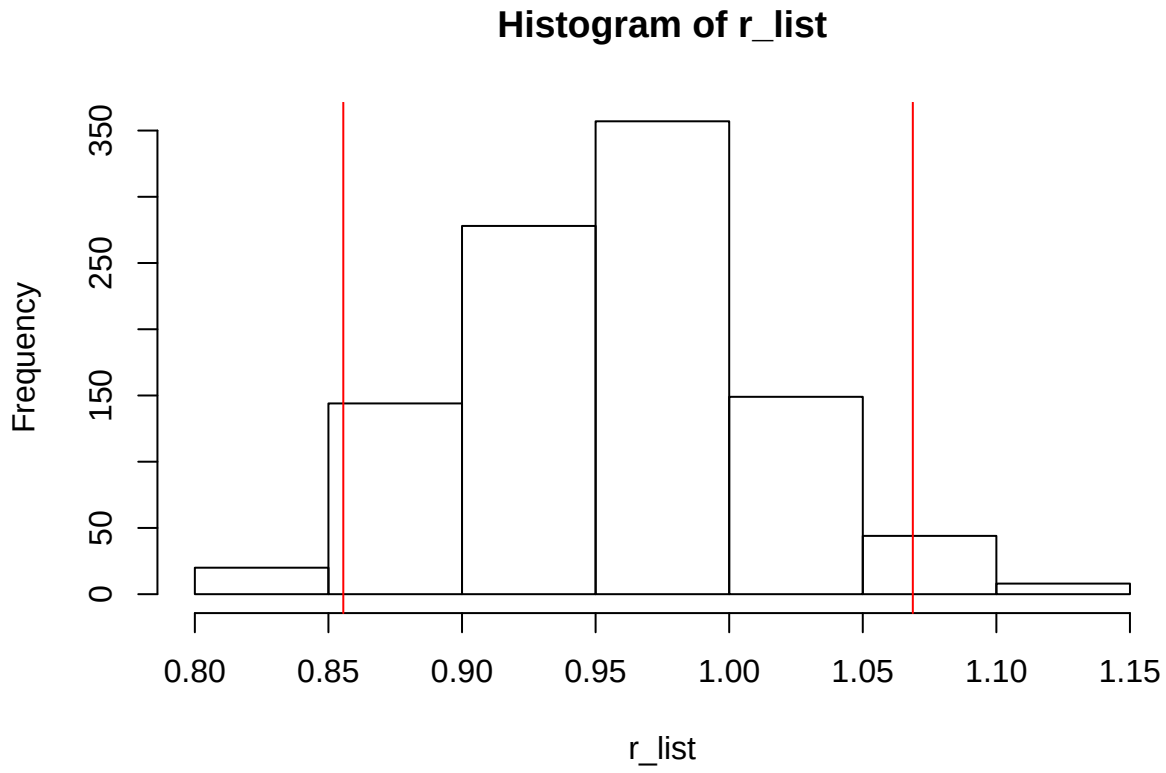
Bayesian Approach

```
med_MCMC <- lmBF(medical_t ~ dptMiss+ varMiss*mmrMiss + hepMiss, data = m_sample, posterior = TRUE, ite
summary(med_MCMC)
```

```
##
## Iterations = 1:1000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 1000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##                          Mean        SD  Naive SE Time-series SE
## mu                  2.870e-01 0.0787127 2.489e-03      2.489e-03
## dptMiss            -1.750e-02 0.0209584 6.628e-04      6.598e-04
## varMiss             3.955e-02 0.0305017 9.645e-04      9.645e-04
## mmrMiss            -2.761e-03 0.0219684 6.947e-04      6.094e-04
## hepMiss             2.116e-02 0.0269050 8.508e-04      8.508e-04
## varMiss.&.mmrMiss -4.775e-05 0.0002932 9.273e-06      9.273e-06
## sig2                4.010e+00 0.2319817 7.336e-03      7.687e-03
## g                   4.473e-02 0.0476246 1.506e-03      1.506e-03
##
## 2. Quantiles for each variable:
##
```

```
##                          2.5%        25%        50%        75%     97.5%
## mu                  0.1431919  0.2335019  2.841e-01  0.3365689 0.4451341
## dptMiss            -0.0596175 -0.0317521 -1.712e-02 -0.0046616 0.0237468
## varMiss            -0.0227240  0.0195580  3.909e-02  0.0594647 0.0971081
## mmrMiss            -0.0446846 -0.0170135 -3.383e-03  0.0117792 0.0429413
## hepMiss            -0.0323308  0.0031891  2.090e-02  0.0391827 0.0741250
## varMiss.&.mmrMiss -0.0006492 -0.0002324 -5.172e-05  0.0001494 0.0005271
## sig2                3.5847033  3.8450482  4.014e+00  4.1572969 4.4778497
## g                   0.0120966  0.0224148  3.256e-02  0.0510038 0.1382327
```

```
r_list <- (med_MCMC[,"sig2"]/var(m_sample$medical_t))
hist(r_list)
abline(v=quantile(r_list, c(0.025)),col='red')
abline(v=quantile(r_list, c(0.975)),col='red')
```



This is an effective model with a high R squared. The bayes density of Rs shows this as well.

12. Is it possible to predict religious percentage, based on the percentages of specific vaccines that are missing? If so, what are the specifics?

```
rel_lm <- lm(formula = rel_t ~ dptMiss+ varMiss*mmrMiss +hepMiss, data = m_sample)
summary(rel_lm)
```

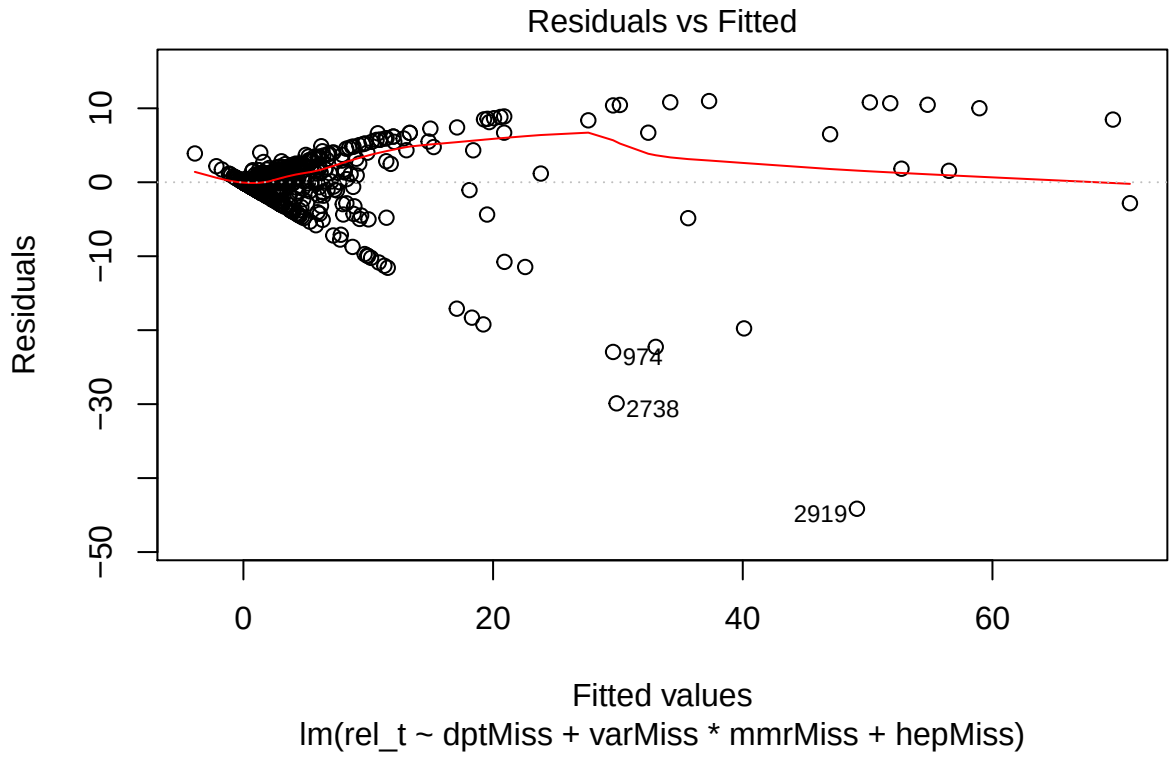
```
##
## Call:
## lm(formula = rel_t ~ dptMiss + varMiss * mmrMiss + hepMiss, data = m_sample)
##
## Residuals:
```

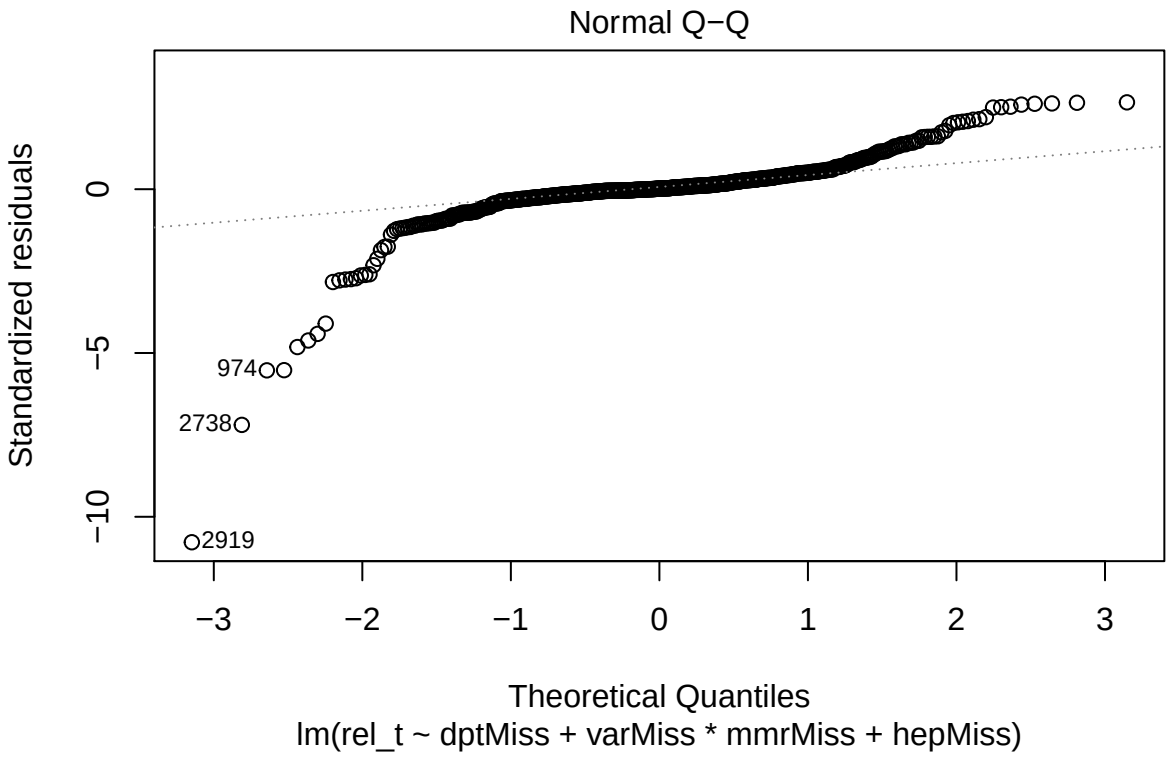
```
##     Min      1Q  Median      3Q     Max
## -44.145  -0.737   0.083   1.313  10.975
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.285208   0.266818   1.069   0.2855
## dptMiss         -0.077340   0.045521  -1.699   0.0898 .
## varMiss          0.274482   0.064002   4.289 2.09e-05 ***
## mmrMiss         -0.009174   0.047334  -0.194   0.8464
## hepMiss          0.382889   0.057637   6.643 6.88e-11 ***
## varMiss:mmrMiss  0.004058   0.000625   6.492 1.77e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.194 on 602 degrees of freedom
## Multiple R-squared:  0.8154, Adjusted R-squared:  0.8139
## F-statistic: 531.8 on 5 and 602 DF,  p-value: < 2.2e-16
```

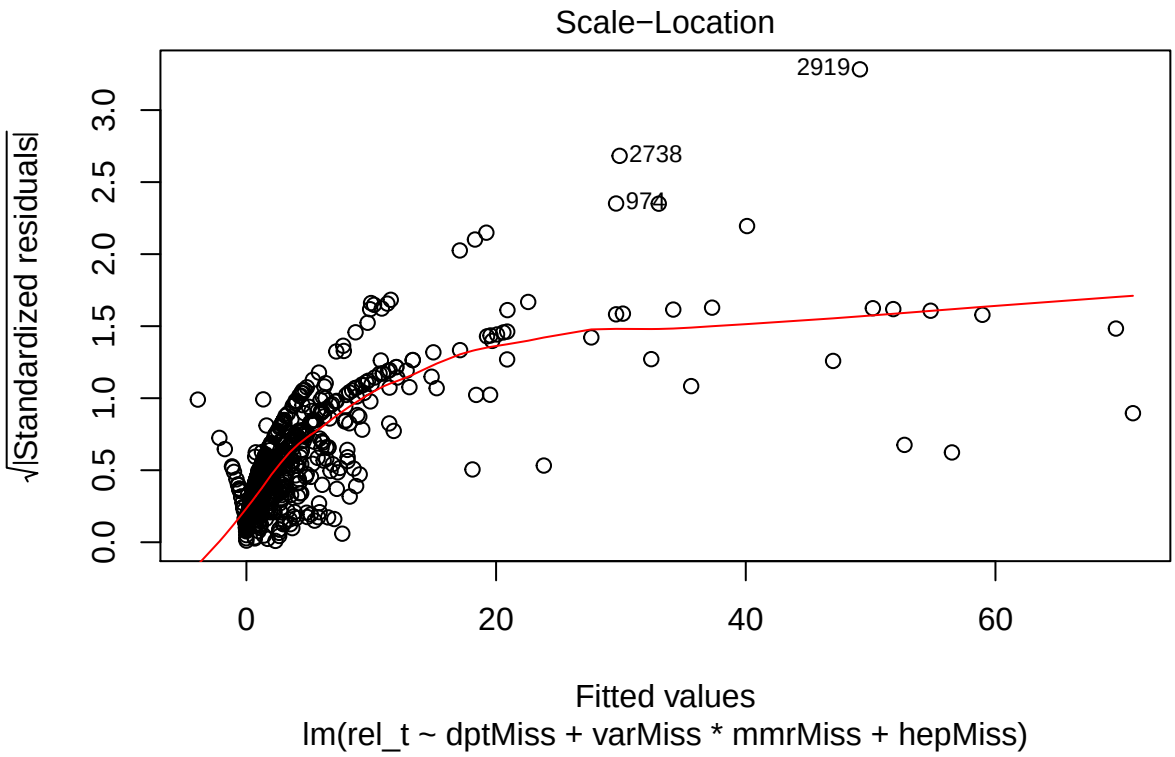
```
summary(residuals(rel_lm))
```

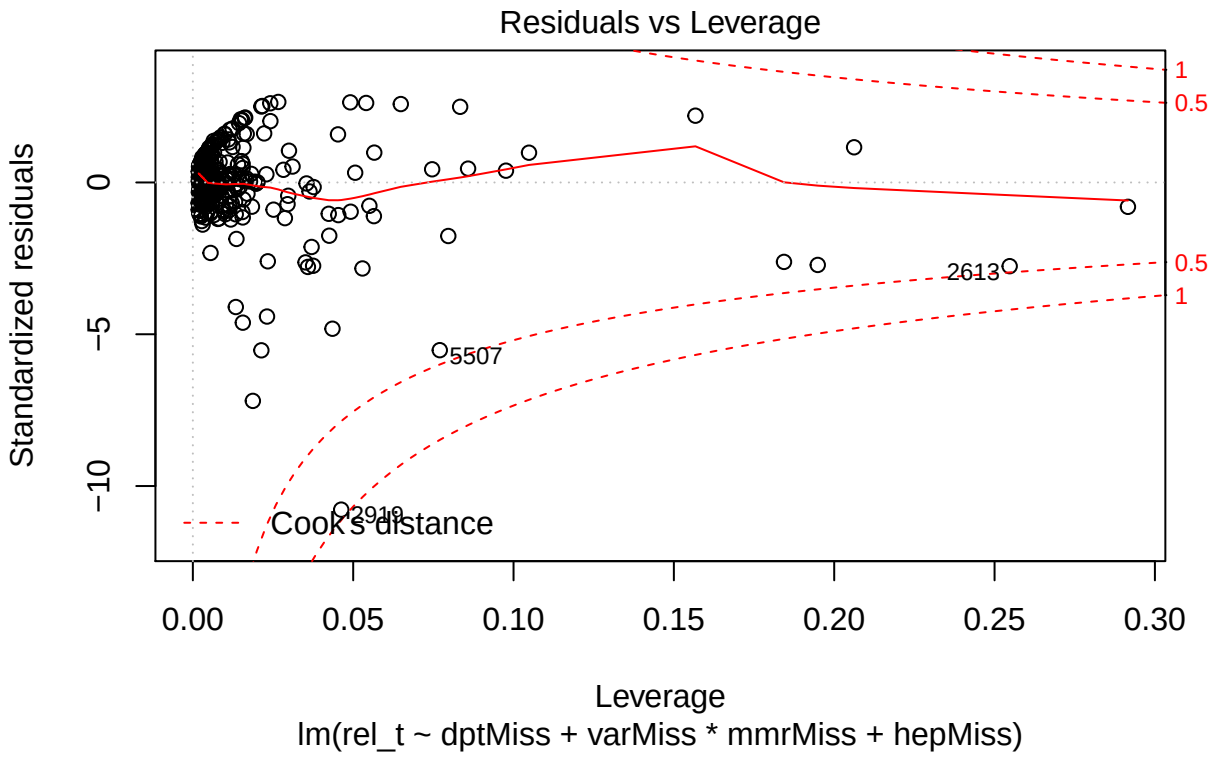
```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -44.14501  -0.73702   0.08279   0.00000   1.31315  10.97491
```

```
plot(rel_lm)
```




Normal Q−Q
Standardized residuals
0
−5
−10
974
2738
2919
−3
−2
−1
0
1
2
3
Theoretical Quantiles
lm(rel_t ~ dptMiss + varMiss * mmrMiss + hepMiss)


Scale−Location
2919
2738
974
√|Standardized residuals|
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
20
40
60
Fitted values
lm(rel_t ~ dptMiss + varMiss * mmrMiss + hepMiss)



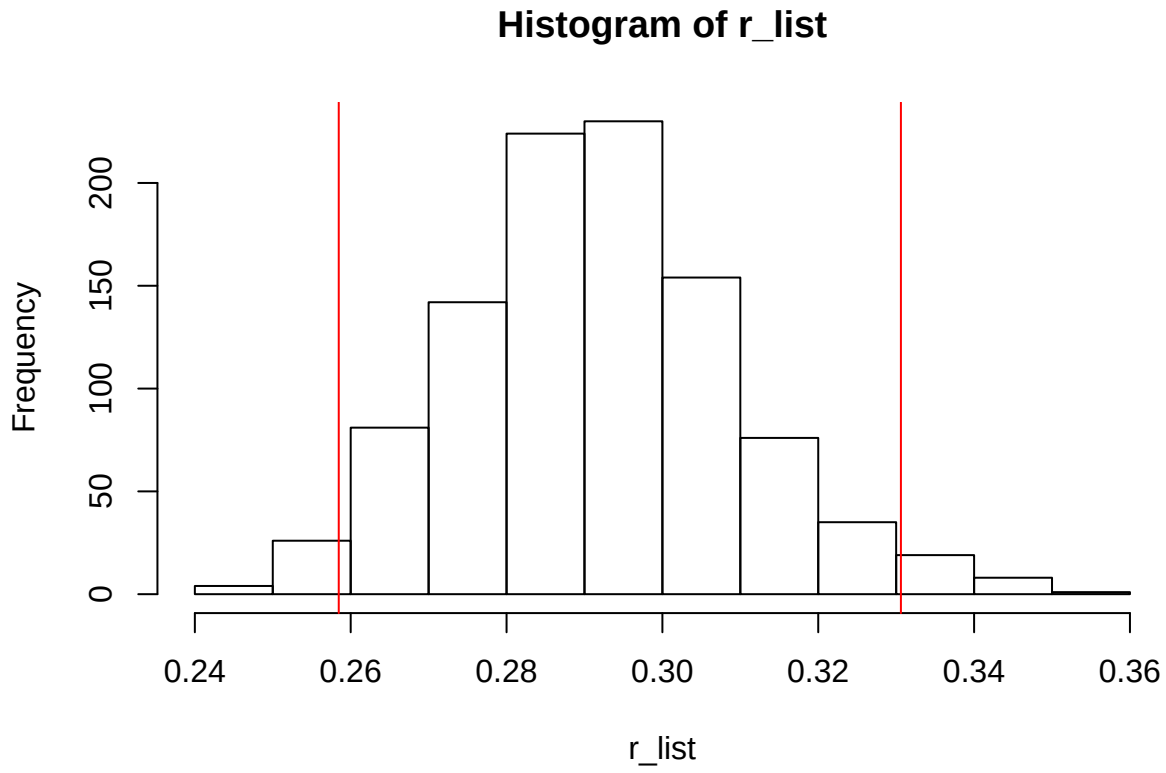
Bayesian Approach

```
rel_MCMC <- lmBF(rel_t ~  dptMiss+ varMiss*mmrMiss +hepMiss, data = m2_sample, posterior = TRUE, iterati
summary(rel_MCMC)
```

```
##
## Iterations = 1:1000
## Thinning interval = 1
## Number of chains = 1
## Sample size per chain = 1000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##                          Mean       SD  Naive SE Time-series SE
## mu                   3.720080 0.129850 0.0041062      0.0041062
## dptMiss             -0.085057 0.065768 0.0020798      0.0020798
## varMiss              0.564048 0.091297 0.0028871      0.0028871
## mmrMiss              0.015746 0.061663 0.0019499      0.0019499
## hepMiss              0.416660 0.086092 0.0027225      0.0027153
## varMiss.&.mmrMiss -0.006689 0.001704 0.0000539      0.0000539
## sig2                 9.298321 0.566947 0.0179284      0.0179284
## g                    0.633182 0.600937 0.0190033      0.0190033
##
## 2. Quantiles for each variable:
##
```

```
##                          2.5%       25%       50%       75%     97.5%
## mu                   3.467570  3.625496  3.723626  3.811535  3.968122
## dptMiss             -0.211386 -0.129004 -0.086286 -0.042816  0.048568
## varMiss              0.387617  0.502545  0.562539  0.621746  0.750843
## mmrMiss             -0.113241 -0.026514  0.016726  0.057917  0.134721
## hepMiss              0.248441  0.358693  0.420843  0.477961  0.576446
## varMiss.&.mmrMiss -0.009917 -0.007868 -0.006776 -0.005459 -0.003448
## sig2                 8.242880  8.918373  9.274067  9.641018 10.543607
## g                    0.183931  0.321331  0.480358  0.715395  1.919478
```

```
r_list <- (rel_MCMC[,"sig2"]/var(m2_sample$rel_t))
hist(r_list)
abline(v=quantile(r_list, c(0.025)),col='red')
abline(v=quantile(r_list, c(0.975)),col='red')
```



13. What???s the big picture, based on all of the foregoing analyses?

We can draw a few key takeaways from this analysis. First, is that private schools are less likely to report their vaccination data than public schools. This means that the data we are looking at is skewed towards public schools. Second, we can see that as vaccination for different diseases has been changed in both recommendations and combination, vaccination rates have had a corresponding increase or decrease. In our sample of schools we are able to see we are more likely to see religious or personal belief exemptions from private schools. There is also a wider degree variability in the private school vaccination set. This causes some non homogenity when modeling is attempted. While we can make some staticically significant predictions for the conditionial exemptions based on the specific vaccinations missing we cannot make them very accurately. The Medical exemptions are in such a tiny portion that it makes there prediction almost impossible. However, religous exxemptions proved highly predictable.