Data Cleaning

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Package to deal with missing data

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Process of data cleaning

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- Manage outliers

Manage missing data

Identify missing data

```
mdata = read.csv('./Data/Mdata.csv', sep = ';')
head(mdata)
```

```
##   X    crim zn indus chas   nox    rm  age    dis rad tax ptratio      b lstat
## 1 1      NA 18  2.31    0 0.538 6.575 65.2 4.0900   1 296    15.3 396.90  4.98
## 2 2 0.02731  0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90  9.14
## 3 3 0.02729  0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83  4.03
## 4 4 0.03237  0    NA    0 0.458 6.998 45.8 6.0622   3 222    18.7 394.63  2.94
## 5 5 0.06905  0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90  5.33
## 6 6      NA  0  2.18    0 0.458 6.430 58.7 6.0622   3 222    18.7 394.12  5.21
##   medv
## 1 24.0
## 2 21.6
## 3 34.7
## 4 33.4
## 5 36.2
## 6 28.7
```

```
library(mice)
```

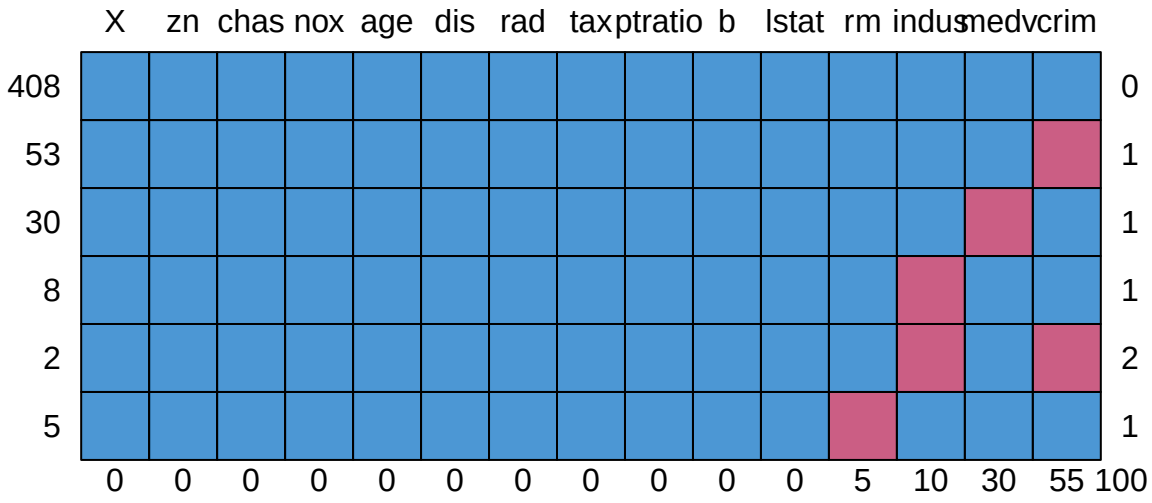
```
## Warning: package 'mice' was built under R version 4.4.2
```

```
##
## Attaching package: 'mice'
```

```
## The following object is masked from 'package:stats':
##
##     filter
```

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

```
md.pattern(mdata)
```




```
##     X zn chas nox age dis rad tax ptratio b lstat rm indus medv crim
## 408 1  1    1   1   1   1   1   1       1 1     1  1     1    1    1    0
## 53  1  1    1   1   1   1   1   1       1 1     1  1     1    1    0    1
## 30  1  1    1   1   1   1   1   1       1 1     1  1     1    0    1    1
## 8   1  1    1   1   1   1   1   1       1 1     1  1     0    1    1    1
## 2   1  1    1   1   1   1   1   1       1 1     1  1     0    1    0    2
## 5   1  1    1   1   1   1   1   1       1 1     1  0     1    1    1    1
##     0  0    0   0   0   0   0   0       0 0     0  5    10   30   55  100
```

Remove missing data

This technique might only be appropriate when the number of missing value is small. However, if the number of missing value is large, we might try to impute the data. However, some missing data might not suitable of be estimated according to domain knowledge.

```
head(na.omit(mdata))
```

```
##     X    crim   zn indus chas   nox    rm  age    dis rad tax ptratio      b
## 2   2 0.02731  0.0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90
## 3   3 0.02729  0.0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83
## 5   5 0.06905  0.0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90
## 7   7 0.08829 12.5  7.87    0 0.524 6.012 66.6 5.5605   5 311    15.2 395.60
## 11 11 0.22489 12.5  7.87    0 0.524 6.377 94.3 6.3467   5 311    15.2 392.52
## 12 12 0.11747 12.5  7.87    0 0.524 6.009 82.9 6.2267   5 311    15.2 396.90
##    lstat medv
## 2   9.14 21.6
## 3   4.03 34.7
## 5   5.33 36.2
## 7  12.43 22.9
## 11 20.45 15.0
## 12 13.27 18.9
```

```
# alternative way to filter only data without any missing value
head(mdata[complete.cases(mdata), ])
```

```
##     X    crim   zn indus chas   nox    rm  age    dis rad tax ptratio      b
## 2   2 0.02731  0.0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90
## 3   3 0.02729  0.0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83
## 5   5 0.06905  0.0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90
## 7   7 0.08829 12.5  7.87    0 0.524 6.012 66.6 5.5605   5 311    15.2 395.60
## 11 11 0.22489 12.5  7.87    0 0.524 6.377 94.3 6.3467   5 311    15.2 392.52
## 12 12 0.11747 12.5  7.87    0 0.524 6.009 82.9 6.2267   5 311    15.2 396.90
##    lstat medv
## 2   9.14 21.6
## 3   4.03 34.7
## 5   5.33 36.2
## 7  12.43 22.9
## 11 20.45 15.0
## 12 13.27 18.9
```

```
# see all rows of data with missing value in at least one of its attribute
head(mdata[!complete.cases(mdata), ])
```

```
##     X    crim   zn indus chas   nox    rm   age    dis rad tax ptratio      b
## 1   1      NA 18.0  2.31    0 0.538 6.575  65.2 4.0900   1 296    15.3 396.90
## 4   4 0.03237  0.0    NA    0 0.458 6.998  45.8 6.0622   3 222    18.7 394.63
## 6   6      NA  0.0  2.18    0 0.458 6.430  58.7 6.0622   3 222    18.7 394.12
## 8   8 0.14455 12.5  7.87    0 0.524 6.172  96.1 5.9505   5 311    15.2 396.90
## 9   9      NA 12.5  7.87    0 0.524 5.631 100.0 6.0821   5 311    15.2 386.63
## 10 10 0.17004 12.5  7.87    0 0.524 6.004  85.9 6.5921   5 311    15.2 386.71
##    lstat medv
```

```
## 1   4.98 24.0
## 4   2.94 33.4
## 6   5.21 28.7
## 8  19.15   NA
## 9  29.93 16.5
## 10 17.10   NA
```

Fill in manually

This technique also require domain knowledge

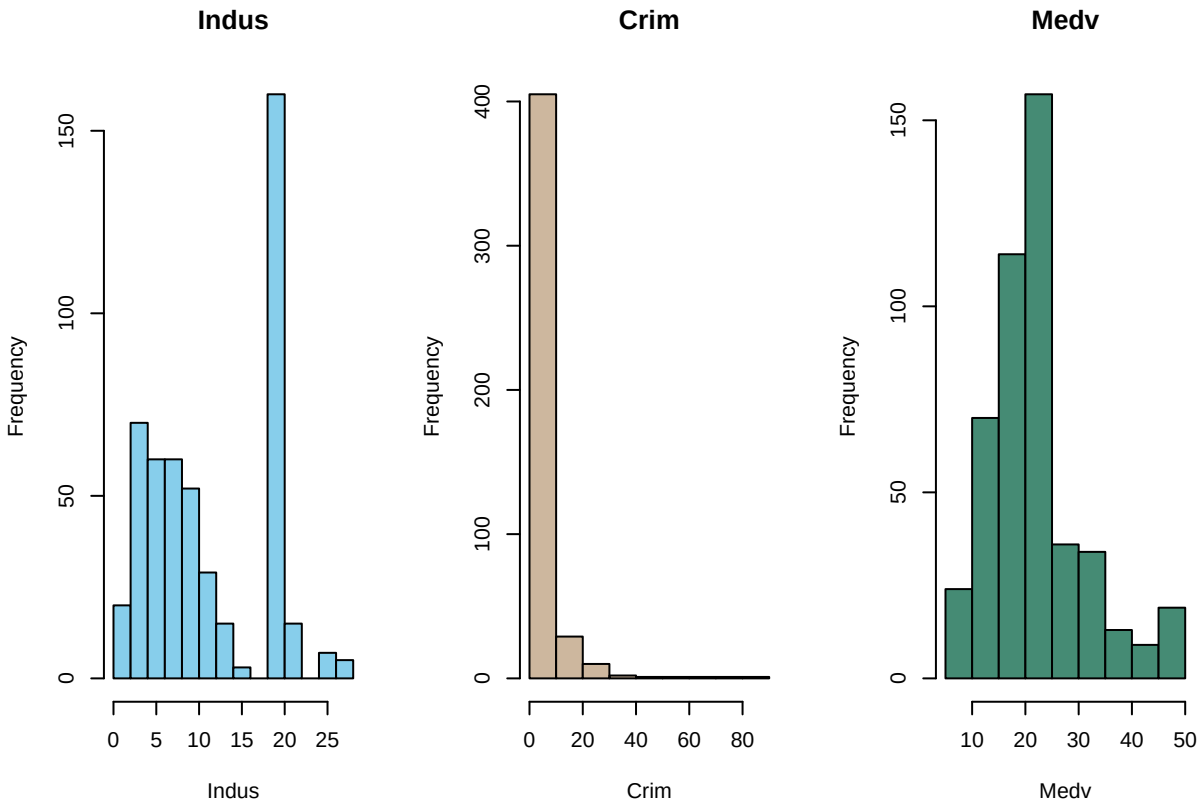
```
head(edit(mdata))
```

```
##   X    crim zn indus chas   nox    rm  age    dis rad tax ptratio      b lstat
## 1 1      NA 18  2.31    0 0.538 6.575 65.2 4.0900   1 296    15.3 396.90  4.98
## 2 2 0.02731  0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90  9.14
## 3 3 0.02729  0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83  4.03
## 4 4 0.03237  0    NA    0 0.458 6.998 45.8 6.0622   3 222    18.7 394.63  2.94
## 5 5 0.06905  0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90  5.33
## 6 6      NA  0  2.18    0 0.458 6.430 58.7 6.0622   3 222    18.7 394.12  5.21
##   medv
## 1 24.0
## 2 21.6
## 3 34.7
## 4 33.4
## 5 36.2
## 6 28.7
```

Impute using centralized metric

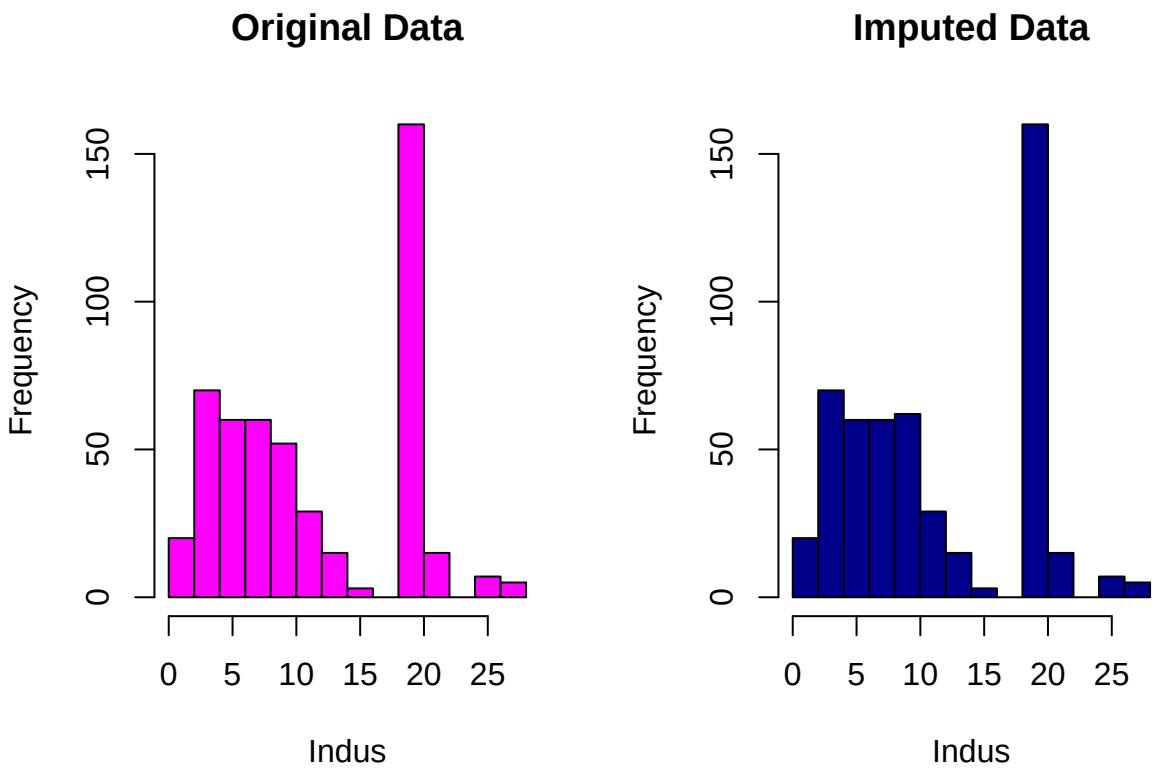
- mean : normal data
- median : skewed data
- mode : categorical data

```
par(mfrow=c(1,3))
hist(mdata$indus, col = 'skyblue', main = 'Indus', xlab = 'Indus')
hist(mdata$crim, col = 'bisque3', main = 'Crim', xlab = 'Crim')
hist(mdata$medv, col = 'aquamarine4', main = 'Medv', xlab = 'Medv')
```




```
# imputate using median of the centralized metric
indus_imp = ifelse(is.na(mdata$indus), median(mdata$indus, na.rm = T), mdata$indus)

# compare the data distribution before and after imputation
par(mfrow=c(1,2))
hist(mdata$indus, col = 'magenta', main = 'Original Data', xlab = 'Indus')
hist(indus_imp, col = 'darkblue', main = 'Imputed Data', xlab = 'Indus')
```



k-nearest neighbor

```
iris.mis1 = read.csv('./Data/iris.mis1.csv')
head(iris.mis1)
```

```
##   X Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1 1           NA         3.5          1.4         0.2
## 2 2          4.9         3.0          1.4         0.2
## 3 3          4.7          NA          1.3         0.2
## 4 4          4.6         3.1          1.5          NA
## 5 5          5.0         3.6          1.4         0.2
## 6 6          5.4         3.9          1.7         0.4
```

```
library(multiUS)
```

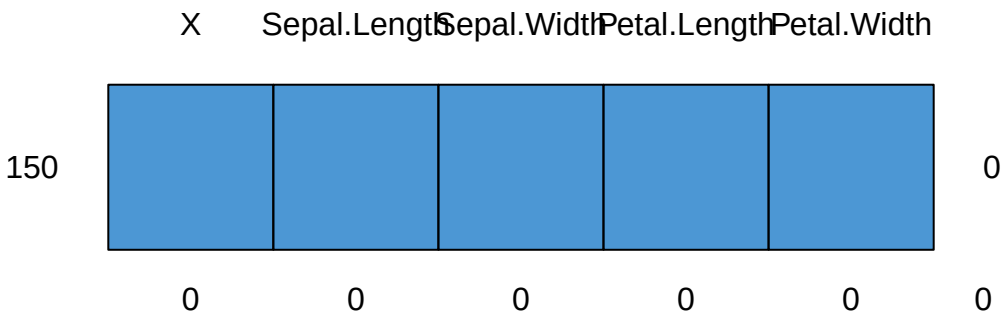
```
## Warning: package 'multiUS' was built under R version 4.4.2
```

```
iris_knn = KNNimp(iris.mis1, k = 10)

md.pattern(iris_knn)
```

```
##  /\     /\
```

```
## {  '---'  }
## {  O   O  }
## ==>  V <==  No need for mice. This data set is completely observed.
##  \  \|/  /
##   '-----'
```




```
##     X Sepal.Length Sepal.Width Petal.Length Petal.Width
## 150 1            1           1            1           1 0
##     0            0           0            0           0 0
```

Statistical imputation

```
airquality = read.table('./Data/airquality.txt')
head(airquality)
```

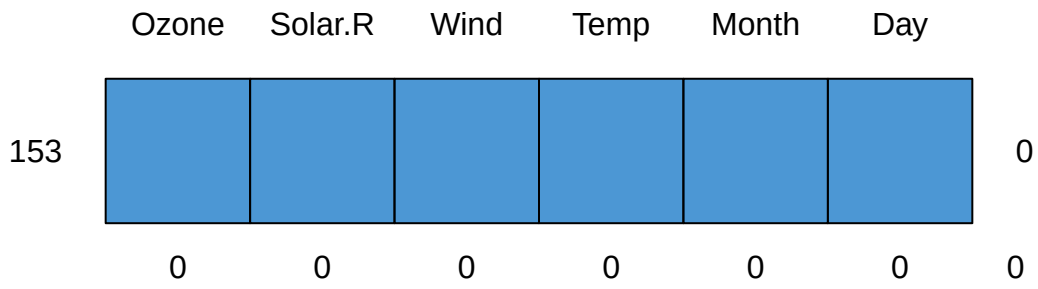
```
##   Ozone Solar.R Wind Temp Month Day
## 1    41     190  7.4   67     5   1
## 2    36     118  8.0   72     5   2
## 3    12     149 12.6   74     5   3
## 4    18     313 11.5   62     5   4
## 5    NA      NA 14.3   56     5   5
## 6    28      NA 14.9   66     5   6
```

```r
# predictive mean matching
air.pmm = mice(airquality, m = 5, meth = 'pmm')
```

```
##
##  iter imp variable
##   1   1  Ozone  Solar.R
##   1   2  Ozone  Solar.R
##   1   3  Ozone  Solar.R
##   1   4  Ozone  Solar.R
##   1   5  Ozone  Solar.R
##   2   1  Ozone  Solar.R
##   2   2  Ozone  Solar.R
##   2   3  Ozone  Solar.R
##   2   4  Ozone  Solar.R
##   2   5  Ozone  Solar.R
##   3   1  Ozone  Solar.R
##   3   2  Ozone  Solar.R
##   3   3  Ozone  Solar.R
##   3   4  Ozone  Solar.R
##   3   5  Ozone  Solar.R
##   4   1  Ozone  Solar.R
##   4   2  Ozone  Solar.R
##   4   3  Ozone  Solar.R
##   4   4  Ozone  Solar.R
##   4   5  Ozone  Solar.R
##   5   1  Ozone  Solar.R
##   5   2  Ozone  Solar.R
##   5   3  Ozone  Solar.R
##   5   4  Ozone  Solar.R
##   5   5  Ozone  Solar.R
```

```r
md.pattern(complete(air.pmm))
```

```
##  /\     /\
## {  `---'  }
## {  O   O  }
## ==>  V <==  No need for mice. This data set is completely observed.
##  \  \|/  /
##   `-----'
```




```
##     Ozone Solar.R Wind Temp Month Day
## 153     1       1    1    1     1   1 0
##         0       0    0    0     0   0 0
```

```
data2 = read.csv('./Data/dat2.csv')
data2 = data2[-1, ]

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
```

```
dat = data2 %>%
  mutate(Smoking = as.factor(Smoking)) %>%
  mutate(Education = factor(Education,
                            levels = c('Low', 'Medium', 'High'),
```

```
                            ordered = T)) %>%
  mutate(Gender = as.factor(Gender))

init = mice(dat, maxit = 0)
meth = init$method
predM = init$predictorMatrix

meth[c('Age')] = 'pmm'
meth[c('Cholesterol')] = 'pmm'
meth[c('SystolicBP')] = 'pmm'
meth[c('BMI')] = 'pmm'
meth[c('Gender')] = 'pmm'
meth[c('Gender')] = 'logreg'
meth[c('Smoking')] = 'logreg'
meth[c('Education')] = 'polyreg'

ImputedData = mice(dat, method = meth, predictorMatrix = predM)
```

```
##
##  iter imp variable
##   1   1  Age  Cholesterol  BMI  Smoking  Education
##   1   2  Age  Cholesterol  BMI  Smoking  Education
##   1   3  Age  Cholesterol  BMI  Smoking  Education
##   1   4  Age  Cholesterol  BMI  Smoking  Education
##   1   5  Age  Cholesterol  BMI  Smoking  Education
##   2   1  Age  Cholesterol  BMI  Smoking  Education
##   2   2  Age  Cholesterol  BMI  Smoking  Education
##   2   3  Age  Cholesterol  BMI  Smoking  Education
##   2   4  Age  Cholesterol  BMI  Smoking  Education
##   2   5  Age  Cholesterol  BMI  Smoking  Education
##   3   1  Age  Cholesterol  BMI  Smoking  Education
##   3   2  Age  Cholesterol  BMI  Smoking  Education
##   3   3  Age  Cholesterol  BMI  Smoking  Education
##   3   4  Age  Cholesterol  BMI  Smoking  Education
##   3   5  Age  Cholesterol  BMI  Smoking  Education
##   4   1  Age  Cholesterol  BMI  Smoking  Education
##   4   2  Age  Cholesterol  BMI  Smoking  Education
##   4   3  Age  Cholesterol  BMI  Smoking  Education
##   4   4  Age  Cholesterol  BMI  Smoking  Education
##   4   5  Age  Cholesterol  BMI  Smoking  Education
##   5   1  Age  Cholesterol  BMI  Smoking  Education
##   5   2  Age  Cholesterol  BMI  Smoking  Education
##   5   3  Age  Cholesterol  BMI  Smoking  Education
##   5   4  Age  Cholesterol  BMI  Smoking  Education
##   5   5  Age  Cholesterol  BMI  Smoking  Education
```

```
CompletedData = complete(ImputedData)
md.pattern(CompletedData)
```

```
##  /\     /\
## {  `---'  }
## {  O   O  }
```

```
## ==>  V <==  No need for mice. This data set is completely observed.
##  \  \|/  /
##   '-----'
```


```
##     X Age Gender Cholesterol SystolicBP BMI Smoking Education
## 249 1   1      1           1          1   1       1         1 0
##     0   0      0           0          0   0       0         0 0
```

Manage inconsistent data

Identify inconsistent data

Domain knowledge

Manage outliers

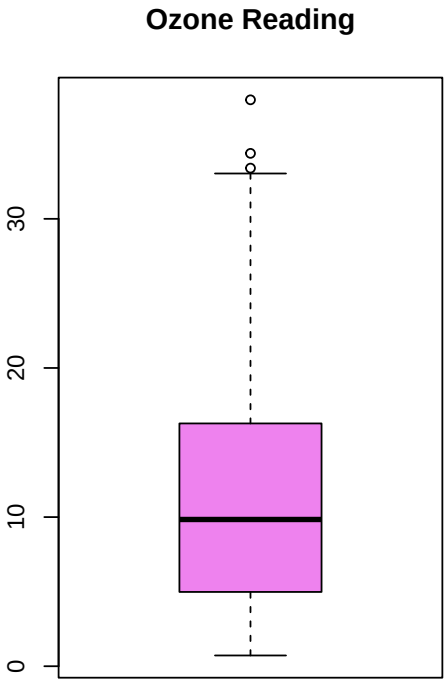
Detect outliers

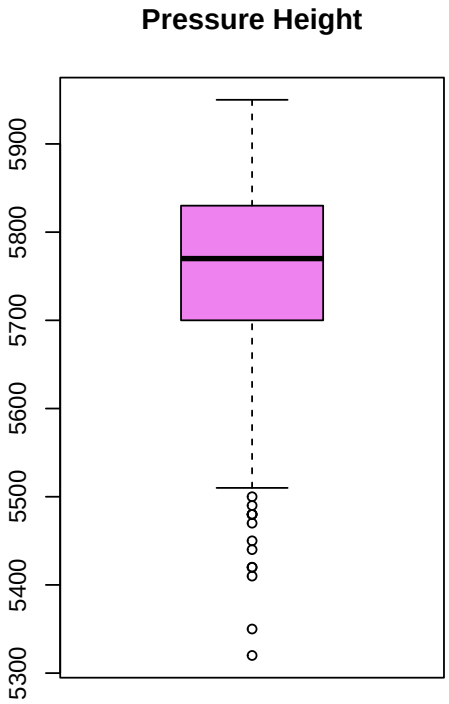
Univariate

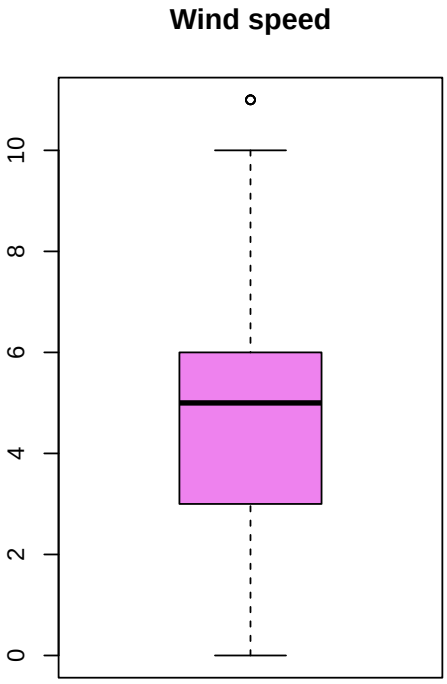
```r
ozone3 = read.csv('./Data/ozone3.csv')
head(ozone3)
```

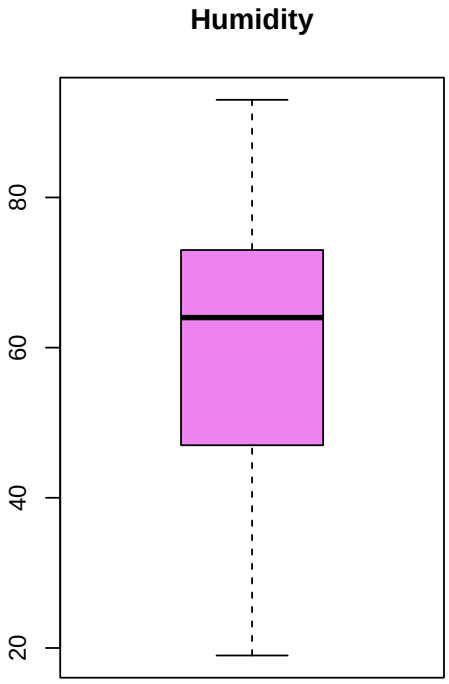
```
##   Month Day_of_month Day_of_week ozone_reading pressure_height Wind_speed
## 1     1            1           4          3.01            5480          8
## 2     1            2           5          3.20            5660          6
## 3     1            3           6          2.70            5710          4
## 4     1            4           7          5.18            5700          3
## 5     1            5           1          5.34            5760          3
## 6     1            6           2          5.77            5720          4
##   Humidity Temperature_Sandburg Temperature_ElMonte Inversion_base_height
## 1       20                   30               32.54                 5000
## 2       32                   38               41.36                 1601
## 3       28                   40               38.12                 2693
## 4       37                   45               47.12                  590
## 5       51                   54               45.32                 1450
## 6       69                   35               49.64                 1568
##   Pressure_gradient Inversion_temperature Visibility
## 1               -15                30.56        200
## 2               -14                46.94        300
## 3               -25                47.66        250
## 4               -24                55.04        100
## 5                25                57.02         60
## 6                15                53.78         60
```

```r
par(mfrow=c(2,2))
boxplot(ozone3$ozone_reading, main = 'Ozone Reading', col = 'violet')
boxplot(ozone3$pressure_height, main = 'Pressure Height', col = 'violet')
boxplot(ozone3$Wind_speed, main = 'Wind speed', col = 'violet')
boxplot(ozone3$Humidity, main = 'Humidity', col = 'violet')
```


Ozone Reading
0
10
20
30


Pressure Height
5300
5400
5500
5600
5700
5800
5900


Wind speed
0
2
4
6
8
10


Humidity
20
40
60
80

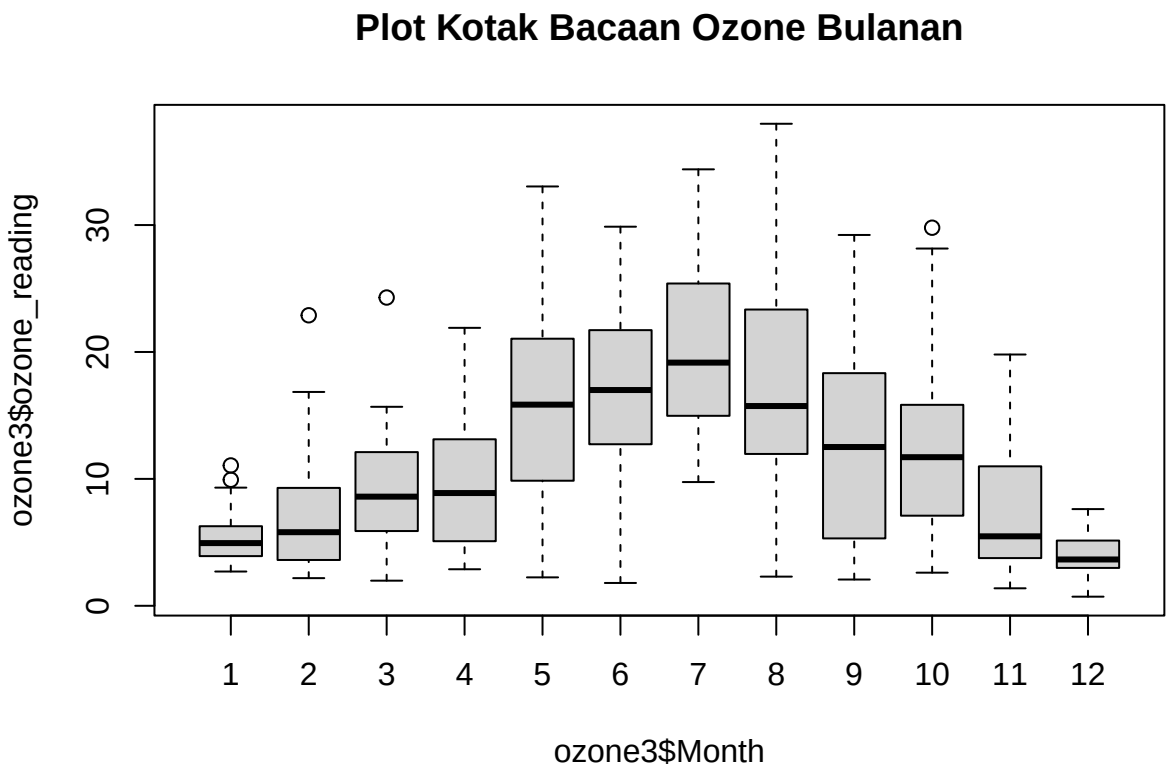
```r
# list out all the outlier
boxplot.stats(ozone3$ozone_reading)$out
```

```
## [1] 34.39 33.40 37.98
```

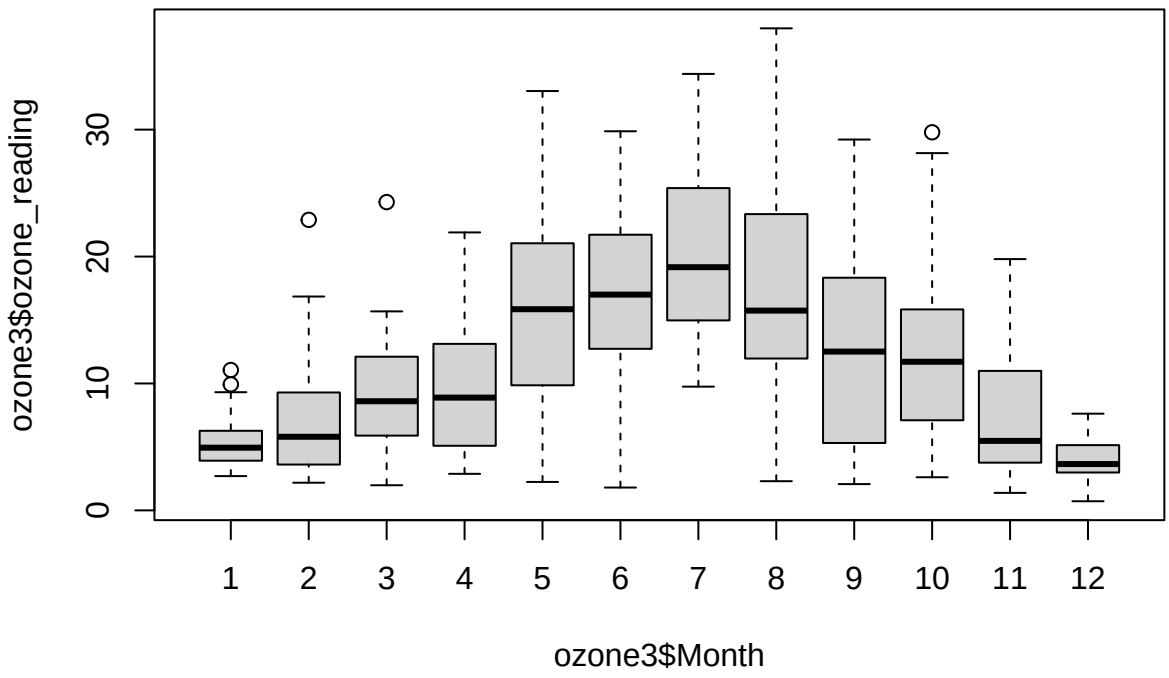
```r
# find the row index for data that contain outlier
out = which(ozone3$ozone_reading %in% boxplot.stats(ozone3$ozone_reading)$out)
```

Bivariate

```r
boxplot(ozone3$ozone_reading~ozone3$Month,
        main = "Plot Kotak Bacaan Ozone Bulanan")
```




```r
boxplot(ozone3$ozone_reading~ozone3$Month)$out
```




```
## [1] 11.06  9.93 22.89 24.29 29.79
```

Multivariate (supervised)

Cook's distance

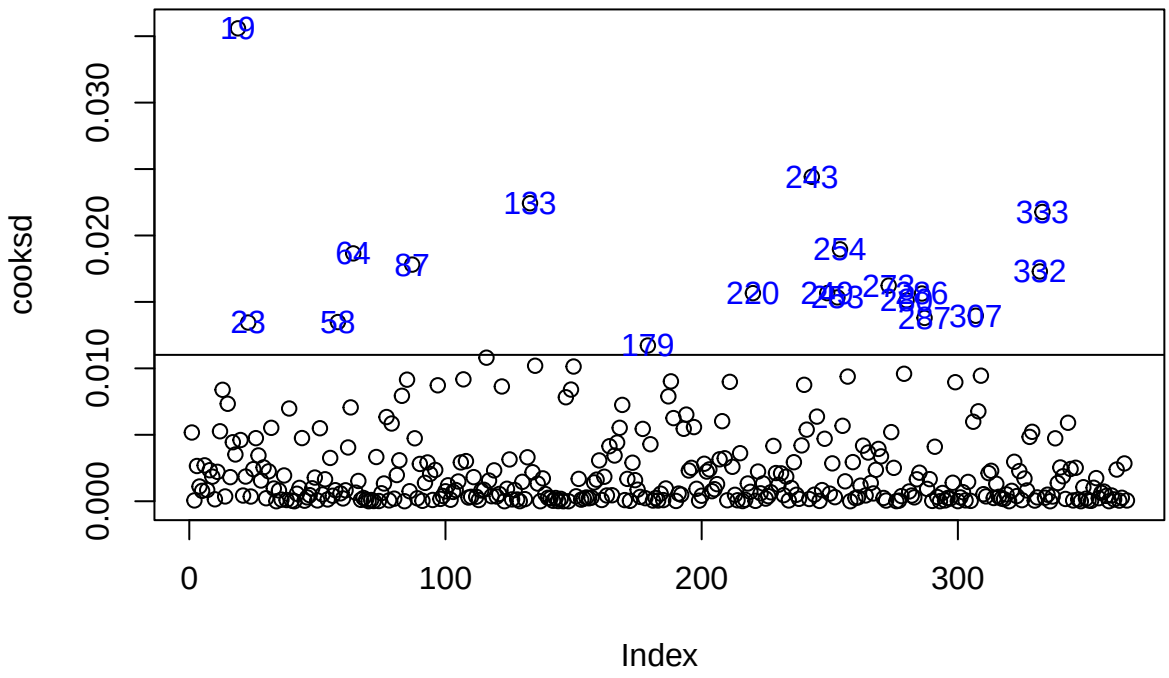
```
model = lm(ozone_reading~., data = ozone3)

cooksd = cooks.distance(model)

plot(cooksd)

min.cook = 4 * mean(cooksd)

abline(h=min.cook)
text(x=1:length(cooksd), y = cooksd, labels = ifelse(cooksd > min.cook,
                                                     names(cooksd), ''),
      col = 'blue')
```



Mahalanobis

```
datamus = read.csv('./Data/dataMus.csv')
head(datamus)
```

```
##         x1        x2        x3
## 1 6.370958 12.401931  8.997212
## 2 4.435302 12.089502 16.001332
## 3 5.363128  7.993583 18.513975
## 4 5.632863 13.696964 21.178618
## 5 5.404268  8.666453 10.869415
## 6 4.893875 10.211028 11.547433
```

```
mahalanobis(datamus, colMeans(datamus), cov(datamus))
```

```
##   [1]  6.6613197  1.9376688  2.8841248  4.3272708  1.4937202  1.1645305
##   [7]  1.8975290  0.7746887  2.4258948  0.1120629  2.1181384  5.1201061
##  [13]  1.0707656  0.1273856  3.0873265  0.3716272  0.1220753 16.8756814
##  [19]  2.9788606  2.3718872  2.2753179  1.9602572  0.3473106  2.6001648
##  [25]  1.8075732  0.1154253  0.6850105  3.1947572  1.5310273  1.7723285
##  [31]  0.5422669  1.5005142  1.7623100  2.7551368  2.4316280  1.4581411
##  [37]  2.1736195  2.9769254  3.2471266  0.6581468  0.3930833  1.9864225
##  [43]  2.0762697  1.8585489  1.8399259  3.2239560  1.6791342  1.4535708
##  [49]  1.2073039  1.6596203  0.9777444  1.8755226  3.9749969  0.3304041
```

```
##  [55]  1.9192245  1.5733724  0.6594109  0.5468030  4.6491092  2.2435083
##  [61]  0.8866919  2.4759963  0.1968560  3.9142876  1.2045114  1.8864418
##  [67]  2.0446587  0.6076744  6.5999883  0.8140921  1.0834970  0.9893252
##  [73]  3.7180556  4.7897579  1.8301339  1.6152388  3.3115055  2.2450332
##  [79]  2.5609819  2.2589389  1.3241417  1.9367423  0.5978505  0.4737662
##  [85]  0.8125560  2.5341391  4.8180660  1.3477468  4.0640007  3.6355903
##  [91]  1.3970220  0.4559532  0.8904617  8.8071737  0.8332572  3.0479471
##  [97]  1.4808214  2.9483067  3.6562729  2.5057120 44.2446681 19.6542772
## [103] 19.6542772
```

Multivariate (unsupervised)

Treating outliers

Error

Actual data

Data Cleaning

Data cleaning involves in dealing with:

1. Missing data
2. Inconsistent data
3. Outlier

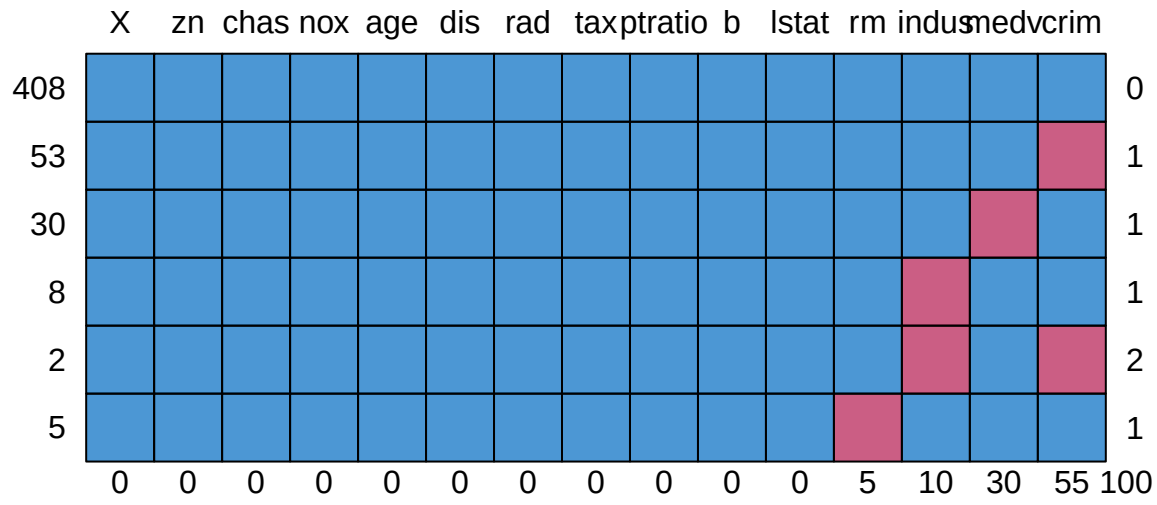
There are several method to deal with missing data such as:

1. Identify pattern
2. Remove missing data
3. Fill manually
4. Use centralized metric
5. K-Nearest Neighbor
6. Statistical imputation

```
library(mice)
mdata = read.csv('./Data/MData.csv', sep=';')
head(mdata)
```

```
##   X    crim zn indus chas   nox    rm  age    dis rad tax ptratio      b lstat
## 1 1      NA 18  2.31    0 0.538 6.575 65.2 4.0900   1 296    15.3 396.90  4.98
## 2 2 0.02731  0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90  9.14
## 3 3 0.02729  0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83  4.03
## 4 4 0.03237  0    NA    0 0.458 6.998 45.8 6.0622   3 222    18.7 394.63  2.94
## 5 5 0.06905  0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90  5.33
## 6 6      NA  0  2.18    0 0.458 6.430 58.7 6.0622   3 222    18.7 394.12  5.21
##   medv
## 1 24.0
## 2 21.6
## 3 34.7
## 4 33.4
## 5 36.2
## 6 28.7
```

```
md.pattern(mdata)
```




```
##     X zn chas nox age dis rad tax ptratio b lstat rm indus medv crim
## 408 1  1    1   1   1   1   1   1       1 1     1  1     1    1    1    0
## 53  1  1    1   1   1   1   1   1       1 1     1  1     1    1    0    1
## 30  1  1    1   1   1   1   1   1       1 1     1  1     1    0    1    1
## 8   1  1    1   1   1   1   1   1       1 1     1  1     0    1    1    1
## 2   1  1    1   1   1   1   1   1       1 1     1  1     0    1    0    2
## 5   1  1    1   1   1   1   1   1       1 1     1  0     1    1    1    1
##     0  0    0   0   0   0   0   0       0 0     0  5    10   30   55  100
```

Remove rows that contain missing value.

```
mdata2 = mdata[complete.cases(mdata),]
mdata[!complete.cases(mdata),]
```

```
##       X     crim   zn indus chas    nox    rm   age     dis rad tax ptratio
## 1     1       NA 18.0  2.31    0 0.5380 6.575  65.2  4.0900   1 296    15.3
## 4     4  0.03237  0.0    NA    0 0.4580 6.998  45.8  6.0622   3 222    18.7
## 6     6       NA  0.0  2.18    0 0.4580 6.430  58.7  6.0622   3 222    18.7
## 8     8  0.14455 12.5  7.87    0 0.5240 6.172  96.1  5.9505   5 311    15.2
## 9     9       NA 12.5  7.87    0 0.5240 5.631 100.0  6.0821   5 311    15.2
## 10   10  0.17004 12.5  7.87    0 0.5240 6.004  85.9  6.5921   5 311    15.2
## 14   14       NA  0.0  8.14    0 0.5380 5.949  61.8  4.7075   4 307    21.0
```

```
## 22   22       NA  0.0  8.14    0 0.5380 5.965  89.2  4.0123   4 307    21.0
## 24   24  0.98843  0.0  8.14    0 0.5380 5.813 100.0  4.0952   4 307    21.0
## 36   36       NA  0.0  5.96    0 0.4990 5.933  68.2  3.3603   5 279    19.2
## 41   41  0.03359 75.0  2.95    0 0.4280 7.024  15.8  5.4011   3 252    18.3
## 47   47  0.18836  0.0  6.91    0 0.4480 5.786  33.3  5.1004   3 233    17.9
## 48   48  0.22927  0.0  6.91    0 0.4480    NA  85.5  5.6894   3 233    17.9
## 55   55       NA 75.0  4.00    0 0.4100 5.888  47.6  7.3197   3 469    21.1
## 56   56  0.01311 90.0  1.22    0 0.4030 7.249  21.9  8.6966   5 226    17.9
## 59   59  0.15445 25.0  5.13    0 0.4530 6.145  29.2  7.8148   8 284    19.7
## 61   61       NA 25.0  5.13    0 0.4530 5.741  66.2  7.2254   8 284    19.7
## 66   66  0.03584 80.0    NA    0 0.3980 6.290  17.8  6.6115   4 337    16.1
## 70   70       NA 12.5  6.07    0 0.4090 5.885  33.0  6.4980   4 345    18.9
## 82   82       NA 25.0  4.86    0 0.4260 6.619  70.4  5.4007   4 281    19.0
## 84   84       NA 25.0  4.86    0 0.4260 6.167  46.7  5.4007   4 281    19.0
## 87   87  0.05188  0.0  4.49    0 0.4490 6.015  45.1  4.4272   3 247    18.5
## 88   88  0.07151  0.0  4.49    0 0.4490 6.121  56.8  3.7476   3 247    18.5
## 94   94       NA 28.0 15.04    0 0.4640 6.211  28.9  3.6659   4 270    18.2
## 96   96       NA  0.0  2.89    0 0.4450 6.625  57.8  3.4952   2 276    18.0
## 102 102  0.11432  0.0  8.56    0 0.5200 6.781  71.3  2.8561   5 384    20.9
## 103 103       NA  0.0  8.56    0 0.5200 6.405  85.4  2.7147   5 384    20.9
## 104 104       NA  0.0  8.56    0 0.5200 6.137  87.4  2.7147   5 384    20.9
## 106 106       NA  0.0  8.56    0 0.5200 5.851  96.7  2.1069   5 384    20.9
## 107 107  0.17120  0.0    NA    0 0.5200 5.836  91.9  2.2110   5 384    20.9
## 120 120  0.14476  0.0 10.01    0 0.5470 5.731  65.2  2.7592   6 432    17.8
## 124 124       NA  0.0 25.65    0 0.5810 5.856  97.0  1.9444   2 188    19.1
## 129 129       NA  0.0 21.89    0 0.6240 6.431  98.8  1.8125   4 437    21.2
## 130 130       NA  0.0 21.89    0 0.6240 5.637  94.7  1.9799   4 437    21.2
## 133 133       NA  0.0 21.89    0 0.6240 6.372  97.9  2.3274   4 437    21.2
## 135 135       NA  0.0 21.89    0 0.6240 5.757  98.4  2.3460   4 437    21.2
## 150 150       NA  0.0 19.58    0 0.8710 5.597  94.9  1.5257   5 403    14.7
## 152 152       NA  0.0 19.58    0 0.8710 5.404 100.0  1.5916   5 403    14.7
## 157 157       NA  0.0 19.58    0 0.8710 5.272  94.0  1.7364   5 403    14.7
## 159 159  1.34284  0.0 19.58    0 0.6050    NA 100.0  1.7573   5 403    14.7
## 160 160       NA  0.0 19.58    0 0.8710 6.510 100.0  1.7659   5 403    14.7
## 161 161  1.27346  0.0 19.58    1 0.6050 6.250  92.6  1.7984   5 403    14.7
## 163 163       NA  0.0 19.58    1 0.6050 7.802  98.2  2.0407   5 403    14.7
## 164 164  1.51902  0.0 19.58    1 0.6050 8.375  93.9  2.1620   5 403    14.7
## 171 171       NA  0.0 19.58    0 0.6050 5.875  94.6  2.4259   5 403    14.7
## 174 174       NA  0.0  4.05    0 0.5100 6.416  84.1  2.6463   5 296    16.6
## 181 181       NA  0.0  2.46    0 0.4880 7.765  83.3  2.7410   3 193    17.8
## 182 182  0.06888  0.0  2.46    0 0.4880 6.144  62.2  2.5979   3 193    17.8
## 187 187  0.05602  0.0    NA    0 0.4880 7.831  53.6  3.1992   3 193    17.8
## 196 196  0.01381 80.0  0.46    0 0.4220 7.875  32.0  5.6484   4 255    14.4
## 201 201       NA 95.0  1.47    0 0.4030 7.135  13.9  7.6534   3 402    17.0
## 207 207       NA  0.0 10.59    0 0.4890 6.326  52.5  4.3549   4 277    18.6
## 224 224  0.61470  0.0    NA    0 0.5070 6.618  80.8  3.2721   8 307    17.4
## 225 225       NA  0.0  6.20    0 0.5040 8.266  78.3  2.8944   8 307    17.4
## 243 243  0.10290 30.0    NA    0 0.4280 6.358  52.9  7.0355   6 300    16.6
## 250 250  0.19073 22.0  5.86    0 0.4310 6.718  17.5  7.8265   7 330    19.1
## 258 258       NA 20.0  3.97    0 0.6470 8.704  86.9  1.8010   5 264    13.0
## 266 266  0.76162 20.0  3.97    0 0.6470 5.560  62.8  1.9865   5 264    13.0
## 284 284  0.01501 90.0  1.21    1 0.4010 7.923  24.8  5.8850   1 198    13.6
## 289 289  0.04590 52.5    NA    0 0.4050 6.315  45.6  7.3172   6 293    16.6
## 292 292  0.07886 80.0  4.95    0 0.4110 7.148  27.7  5.1167   4 245    19.2
```

```
## 295 295       NA  0.0 13.92    0 0.4370 6.009  42.3  5.5027   4 289    16.0
## 305 305  0.05515 33.0  2.18    0 0.4720 7.236  41.1  4.0220   7 222    18.4
## 310 310       NA  0.0  9.90    0 0.5440 5.972  76.7  3.1025   4 304    18.4
## 311 311       NA  0.0  9.90    0 0.5440 4.973  37.8  2.5194   4 304    18.4
## 319 319  0.40202  0.0  9.90    0 0.5440 6.382  67.2  3.5325   4 304    18.4
## 331 331  0.04544  0.0  3.24    0 0.4600 6.144  32.2  5.8736   4 430    16.9
## 333 333       NA 35.0    NA    0 0.4379 6.031  23.3  6.6407   1 304    16.9
## 334 334       NA  0.0  5.19    0 0.5150 6.316  38.1  6.4584   5 224    20.2
## 336 336  0.03961  0.0  5.19    0 0.5150 6.037  34.5  5.9853   5 224    20.2
## 347 347       NA  0.0  4.39    0 0.4420 5.898  52.3  8.0136   3 352    18.8
## 349 349       NA 80.0  2.01    0 0.4350 6.635  29.7  8.3440   4 280    17.0
## 354 354  0.01709 90.0  2.02    0 0.4100 6.728  36.1 12.1265   5 187    17.0
## 364 364       NA  0.0 18.10    1 0.7700 5.803  89.0  1.9047  24 666    20.2
## 365 365       NA  0.0 18.10    1 0.7180 8.780  82.9  1.9047  24 666    20.2
## 366 366       NA  0.0 18.10    0 0.7180 3.561  87.9  1.6132  24 666    20.2
## 368 368 13.52220  0.0 18.10    0 0.6310 3.863 100.0  1.5106  24 666    20.2
## 372 372  9.23230  0.0 18.10    0 0.6310    NA 100.0  1.1691  24 666    20.2
## 383 383       NA  0.0 18.10    0 0.7000 5.536 100.0  1.5804  24 666    20.2
## 400 400  9.91655  0.0 18.10    0 0.6930    NA  77.8  1.5004  24 666    20.2
## 402 402       NA  0.0 18.10    0 0.6930 6.343 100.0  1.5741  24 666    20.2
## 413 413 18.81100  0.0    NA    0 0.5970 4.628 100.0  1.5539  24 666    20.2
## 415 415       NA  0.0 18.10    0 0.6930 4.519 100.0  1.6582  24 666    20.2
## 418 418 25.94060  0.0 18.10    0 0.6790 5.304  89.1  1.6475  24 666    20.2
## 421 421       NA  0.0 18.10    0 0.7180 6.411 100.0  1.8589  24 666    20.2
## 423 423       NA  0.0 18.10    0 0.6140 5.648  87.6  1.9512  24 666    20.2
## 425 425  8.79212  0.0 18.10    0 0.5840    NA  70.6  2.0635  24 666    20.2
## 435 435       NA  0.0    NA    0 0.7130 6.208  95.0  2.2222  24 666    20.2
## 437 437       NA  0.0 18.10    0 0.7400 6.461  93.3  2.0026  24 666    20.2
## 438 438       NA  0.0 18.10    0 0.7400 6.152 100.0  1.9142  24 666    20.2
## 445 445       NA  0.0 18.10    0 0.7400 5.854  96.6  1.8956  24 666    20.2
## 453 453       NA  0.0 18.10    0 0.7130 6.297  91.8  2.3682  24 666    20.2
## 476 476  6.39312  0.0 18.10    0 0.5840 6.162  97.4  2.2060  24 666    20.2
## 492 492       NA  0.0 27.74    0 0.6090 5.983  98.8  1.8681   4 711    20.1
## 496 496  0.17899  0.0  9.69    0 0.5850 5.670  28.8  2.7986   6 391    19.2
## 497 497       NA  0.0  9.69    0 0.5850 5.390  72.9  2.7986   6 391    19.2
## 499 499  0.23912  0.0  9.69    0 0.5850 6.019  65.3  2.4091   6 391    19.2
## 503 503  0.04527  0.0 11.93    0 0.5730 6.120  76.7  2.2875   1 273    21.0
##          b lstat medv
## 1   396.90  4.98 24.0
## 4   394.63  2.94 33.4
## 6   394.12  5.21 28.7
## 8   396.90 19.15   NA
## 9   386.63 29.93 16.5
## 10  386.71 17.10   NA
## 14  396.90  8.26 20.4
## 22  392.53 13.83 19.6
## 24  394.54 19.88   NA
## 36  396.90  9.68 18.9
## 41  395.62  1.98   NA
## 47  396.90 14.15   NA
## 48  392.74 18.80 16.6
## 55  396.90 14.80 18.9
## 56  395.93  4.81   NA
## 59  390.68  6.86   NA
```

```
## 61  395.11 13.15 18.7
## 66  396.90  4.67 23.5
## 70  396.90  8.79 20.9
## 82  395.63  7.22 23.9
## 84  390.64  7.51 22.9
## 87  395.99 12.86   NA
## 88  395.15  8.44   NA
## 94  396.33  6.21 25.0
## 96  357.98  6.65 28.4
## 102 395.58  7.67   NA
## 103  70.80 10.63 18.6
## 104 394.47 13.44 19.3
## 106 394.05 16.47 19.5
## 107 395.67 18.66 19.5
## 120 391.50 13.61   NA
## 124 370.31 25.41 17.3
## 129 396.90 15.39 18.0
## 130 396.90 18.34 14.3
## 133 385.76 11.12 23.0
## 135 262.76 17.31 15.6
## 150 351.85 21.45 15.4
## 152 341.60 13.28 19.6
## 157  88.63 16.14 13.1
## 159 353.89  6.43 24.3
## 160 364.31  7.39 23.3
## 161 338.92  5.50   NA
## 163 389.61  1.92 50.0
## 164 388.45  3.32   NA
## 171 292.29 14.43 17.4
## 174 395.50  9.04 23.6
## 181 395.56  7.56 39.8
## 182 396.90  9.45   NA
## 187 392.63  4.45 50.0
## 196 394.23  2.97   NA
## 201 384.30  4.45 32.9
## 207 394.87 10.97 24.4
## 224 396.90  7.60 30.1
## 225 385.05  4.14 44.8
## 243 372.75 11.22 22.2
## 250 393.74  6.56   NA
## 258 389.70  5.12 50.0
## 266 392.40 10.45   NA
## 284 395.52  3.16   NA
## 289 396.90  7.60 22.3
## 292 396.90  3.56   NA
## 295 396.90 10.40 21.7
## 305 393.68  6.93   NA
## 310 396.24  9.97 20.3
## 311 350.45 12.64 16.1
## 319 395.21 10.36   NA
## 331 368.57  9.09   NA
## 333 362.25  7.83 19.4
## 334 389.71  5.68 22.2
## 336 396.90  8.01   NA
```

```
## 347 364.61 12.67 17.2
## 349 390.94  5.99 24.5
## 354 384.46  4.50   NA
## 364 353.04 14.64 16.8
## 365 354.55  5.29 21.9
## 366 354.70  7.12 27.5
## 368 131.42 13.33   NA
## 372 366.15  9.53 50.0
## 383 396.90 23.60 11.3
## 400 338.16 29.97  6.3
## 402 396.90 20.32  7.2
## 413  28.79 34.37 17.9
## 415  88.27 36.98  7.0
## 418 127.36 26.64   NA
## 421 318.75 15.02 16.7
## 423 291.55 14.10 20.8
## 425   3.65 17.16 11.7
## 435 100.63 15.17 11.7
## 437  27.49 18.05  9.6
## 438   9.32 26.45  8.7
## 445 240.52 23.79 10.8
## 453 385.09 17.27 16.1
## 476 302.76 24.10   NA
## 492 390.11 18.07 13.6
## 496 393.29 17.60   NA
## 497 396.90 21.14 19.7
## 499 396.90 12.92   NA
## 503 396.90  9.08   NA
```

```
mdata$indus
```

```
##   [1]  2.31  7.07  7.07    NA  2.18  2.18  7.87  7.87  7.87  7.87  7.87  7.87
##  [13]  7.87  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14
##  [25]  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  8.14  5.96
##  [37]  5.96  5.96  5.96  2.95  2.95  6.91  6.91  6.91  6.91  6.91  6.91  6.91
##  [49]  6.91  6.91  5.64  5.64  5.64  5.64  4.00  1.22  0.74  1.32  5.13  5.13
##  [61]  5.13  5.13  5.13  5.13  1.38    NA  3.37  6.07  6.07  6.07 10.81 10.81
##  [73] 10.81 10.81 12.83 12.83 12.83 12.83 12.83 12.83  4.86  4.86  4.86  4.86
##  [85]  4.49  4.49  4.49  4.49  3.41  3.41  3.41  3.41 15.04 15.04 15.04  2.89
##  [97]  2.89  2.89  2.89  2.89  8.56  8.56  8.56  8.56  8.56  8.56    NA  8.56
## [109]  8.56  8.56  8.56 10.01 10.01 10.01 10.01 10.01 10.01 10.01 10.01 10.01
## [121] 25.65 25.65 25.65 25.65 25.65 25.65 25.65 21.89 21.89 21.89 21.89 21.89
## [133] 21.89 21.89 21.89 21.89 21.89 21.89 21.89 21.89 21.89 21.89 19.58 19.58
## [145] 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58
## [157] 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58 19.58
## [169] 19.58 19.58 19.58 19.58  4.05  4.05  4.05  4.05  4.05  4.05  4.05  2.46
## [181]  2.46  2.46  2.46  2.46  2.46  2.46    NA  3.44  3.44  3.44  3.44  3.44
## [193]  3.44  2.93  2.93  0.46  1.52  1.52  1.52  1.47  1.47  2.03  2.03  2.68
## [205]  2.68 10.59 10.59 10.59 10.59 10.59 10.59 10.59 10.59 10.59 10.59 10.59
## [217] 13.89 13.89 13.89 13.89  6.20  6.20  6.20    NA  6.20  6.20  6.20  6.20
## [229]  6.20  6.20  6.20  6.20  6.20  6.20  6.20  6.20  6.20  6.20  4.93  4.93
## [241]  4.93  4.93    NA  4.93  5.86  5.86  5.86  5.86  5.86  5.86  5.86  5.86
## [253]  5.86  5.86  3.64  3.64  3.75  3.97  3.97  3.97  3.97  3.97  3.97  3.97
## [265]  3.97  3.97  3.97  3.97  3.97  6.96  6.96  6.96  6.96  6.96  6.41  6.41
```

```
## [277]  6.41  6.41  6.41  3.33  3.33  3.33  3.33  1.21  2.97  2.25  1.76  5.32
## [289]    NA  5.32  4.95  4.95  4.95 13.92 13.92 13.92 13.92 13.92  2.24  2.24
## [301]  2.24  6.09  6.09  6.09  2.18  2.18  2.18  2.18  9.90  9.90  9.90  9.90
## [313]  9.90  9.90  9.90  9.90  9.90  9.90  9.90  9.90  7.38  7.38  7.38  7.38
## [325]  7.38  7.38  7.38  7.38  3.24  3.24  3.24  6.06    NA  5.19  5.19  5.19
## [337]  5.19  5.19  5.19  5.19  5.19  1.52  1.89  3.78  3.78  4.39  4.39  4.15
## [349]  2.01  1.25  1.25  1.69  1.69  2.02  1.91  1.91 18.10 18.10 18.10 18.10
## [361] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [373] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [385] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [397] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [409] 18.10 18.10 18.10 18.10    NA 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [421] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [433] 18.10 18.10    NA 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [445] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [457] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [469] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10
## [481] 18.10 18.10 18.10 18.10 18.10 18.10 18.10 18.10 27.74 27.74 27.74 27.74
## [493] 27.74  9.69  9.69  9.69  9.69  9.69  9.69  9.69  9.69 11.93 11.93 11.93
## [505] 11.93 11.93
```

```
#edit(mdata$indus)
mdata
```

```
##       X     crim    zn indus chas    nox    rm   age     dis rad tax ptratio
## 1     1       NA  18.0  2.31    0 0.5380 6.575  65.2  4.0900   1 296    15.3
## 2     2  0.02731   0.0  7.07    0 0.4690 6.421  78.9  4.9671   2 242    17.8
## 3     3  0.02729   0.0  7.07    0 0.4690 7.185  61.1  4.9671   2 242    17.8
## 4     4  0.03237   0.0    NA    0 0.4580 6.998  45.8  6.0622   3 222    18.7
## 5     5  0.06905   0.0  2.18    0 0.4580 7.147  54.2  6.0622   3 222    18.7
## 6     6       NA   0.0  2.18    0 0.4580 6.430  58.7  6.0622   3 222    18.7
## 7     7  0.08829  12.5  7.87    0 0.5240 6.012  66.6  5.5605   5 311    15.2
## 8     8  0.14455  12.5  7.87    0 0.5240 6.172  96.1  5.9505   5 311    15.2
## 9     9       NA  12.5  7.87    0 0.5240 5.631 100.0  6.0821   5 311    15.2
## 10   10  0.17004  12.5  7.87    0 0.5240 6.004  85.9  6.5921   5 311    15.2
## 11   11  0.22489  12.5  7.87    0 0.5240 6.377  94.3  6.3467   5 311    15.2
## 12   12  0.11747  12.5  7.87    0 0.5240 6.009  82.9  6.2267   5 311    15.2
## 13   13  0.09378  12.5  7.87    0 0.5240 5.889  39.0  5.4509   5 311    15.2
## 14   14       NA   0.0  8.14    0 0.5380 5.949  61.8  4.7075   4 307    21.0
## 15   15  0.63796   0.0  8.14    0 0.5380 6.096  84.5  4.4619   4 307    21.0
## 16   16  0.62739   0.0  8.14    0 0.5380 5.834  56.5  4.4986   4 307    21.0
## 17   17  1.05393   0.0  8.14    0 0.5380 5.935  29.3  4.4986   4 307    21.0
## 18   18  0.78420   0.0  8.14    0 0.5380 5.990  81.7  4.2579   4 307    21.0
## 19   19  0.80271   0.0  8.14    0 0.5380 5.456  36.6  3.7965   4 307    21.0
## 20   20  0.72580   0.0  8.14    0 0.5380 5.727  69.5  3.7965   4 307    21.0
## 21   21  1.25179   0.0  8.14    0 0.5380 5.570  98.1  3.7979   4 307    21.0
## 22   22       NA   0.0  8.14    0 0.5380 5.965  89.2  4.0123   4 307    21.0
## 23   23  1.23247   0.0  8.14    0 0.5380 6.142  91.7  3.9769   4 307    21.0
## 24   24  0.98843   0.0  8.14    0 0.5380 5.813 100.0  4.0952   4 307    21.0
## 25   25  0.75026   0.0  8.14    0 0.5380 5.924  94.1  4.3996   4 307    21.0
## 26   26  0.84054   0.0  8.14    0 0.5380 5.599  85.7  4.4546   4 307    21.0
## 27   27  0.67191   0.0  8.14    0 0.5380 5.813  90.3  4.6820   4 307    21.0
## 28   28  0.95577   0.0  8.14    0 0.5380 6.047  88.8  4.4534   4 307    21.0
## 29   29  0.77299   0.0  8.14    0 0.5380 6.495  94.4  4.4547   4 307    21.0
```

```
## 30   30  1.00245   0.0  8.14    0 0.5380 6.674  87.3  4.2390   4 307    21.0
## 31   31  1.13081   0.0  8.14    0 0.5380 5.713  94.1  4.2330   4 307    21.0
## 32   32  1.35472   0.0  8.14    0 0.5380 6.072 100.0  4.1750   4 307    21.0
## 33   33  1.38799   0.0  8.14    0 0.5380 5.950  82.0  3.9900   4 307    21.0
## 34   34  1.15172   0.0  8.14    0 0.5380 5.701  95.0  3.7872   4 307    21.0
## 35   35  1.61282   0.0  8.14    0 0.5380 6.096  96.9  3.7598   4 307    21.0
## 36   36       NA   0.0  5.96    0 0.4990 5.933  68.2  3.3603   5 279    19.2
## 37   37  0.09744   0.0  5.96    0 0.4990 5.841  61.4  3.3779   5 279    19.2
## 38   38  0.08014   0.0  5.96    0 0.4990 5.850  41.5  3.9342   5 279    19.2
## 39   39  0.17505   0.0  5.96    0 0.4990 5.966  30.2  3.8473   5 279    19.2
## 40   40  0.02763  75.0  2.95    0 0.4280 6.595  21.8  5.4011   3 252    18.3
## 41   41  0.03359  75.0  2.95    0 0.4280 7.024  15.8  5.4011   3 252    18.3
## 42   42  0.12744   0.0  6.91    0 0.4480 6.770   2.9  5.7209   3 233    17.9
## 43   43  0.14150   0.0  6.91    0 0.4480 6.169   6.6  5.7209   3 233    17.9
## 44   44  0.15936   0.0  6.91    0 0.4480 6.211   6.5  5.7209   3 233    17.9
## 45   45  0.12269   0.0  6.91    0 0.4480 6.069  40.0  5.7209   3 233    17.9
## 46   46  0.17142   0.0  6.91    0 0.4480 5.682  33.8  5.1004   3 233    17.9
## 47   47  0.18836   0.0  6.91    0 0.4480 5.786  33.3  5.1004   3 233    17.9
## 48   48  0.22927   0.0  6.91    0 0.4480    NA  85.5  5.6894   3 233    17.9
## 49   49  0.25387   0.0  6.91    0 0.4480 5.399  95.3  5.8700   3 233    17.9
## 50   50  0.21977   0.0  6.91    0 0.4480 5.602  62.0  6.0877   3 233    17.9
## 51   51  0.08873  21.0  5.64    0 0.4390 5.963  45.7  6.8147   4 243    16.8
## 52   52  0.04337  21.0  5.64    0 0.4390 6.115  63.0  6.8147   4 243    16.8
## 53   53  0.05360  21.0  5.64    0 0.4390 6.511  21.1  6.8147   4 243    16.8
## 54   54  0.04981  21.0  5.64    0 0.4390 5.998  21.4  6.8147   4 243    16.8
## 55   55       NA  75.0  4.00    0 0.4100 5.888  47.6  7.3197   3 469    21.1
## 56   56  0.01311  90.0  1.22    0 0.4030 7.249  21.9  8.6966   5 226    17.9
## 57   57  0.02055  85.0  0.74    0 0.4100 6.383  35.7  9.1876   2 313    17.3
## 58   58  0.01432 100.0  1.32    0 0.4110 6.816  40.5  8.3248   5 256    15.1
## 59   59  0.15445  25.0  5.13    0 0.4530 6.145  29.2  7.8148   8 284    19.7
## 60   60  0.10328  25.0  5.13    0 0.4530 5.927  47.2  6.9320   8 284    19.7
## 61   61       NA  25.0  5.13    0 0.4530 5.741  66.2  7.2254   8 284    19.7
## 62   62  0.17171  25.0  5.13    0 0.4530 5.966  93.4  6.8185   8 284    19.7
## 63   63  0.11027  25.0  5.13    0 0.4530 6.456  67.8  7.2255   8 284    19.7
## 64   64  0.12650  25.0  5.13    0 0.4530 6.762  43.4  7.9809   8 284    19.7
## 65   65  0.01951  17.5  1.38    0 0.4161 7.104  59.5  9.2229   3 216    18.6
## 66   66  0.03584  80.0    NA    0 0.3980 6.290  17.8  6.6115   4 337    16.1
## 67   67  0.04379  80.0  3.37    0 0.3980 5.787  31.1  6.6115   4 337    16.1
## 68   68  0.05789  12.5  6.07    0 0.4090 5.878  21.4  6.4980   4 345    18.9
## 69   69  0.13554  12.5  6.07    0 0.4090 5.594  36.8  6.4980   4 345    18.9
## 70   70       NA  12.5  6.07    0 0.4090 5.885  33.0  6.4980   4 345    18.9
## 71   71  0.08826   0.0 10.81    0 0.4130 6.417   6.6  5.2873   4 305    19.2
## 72   72  0.15876   0.0 10.81    0 0.4130 5.961  17.5  5.2873   4 305    19.2
## 73   73  0.09164   0.0 10.81    0 0.4130 6.065   7.8  5.2873   4 305    19.2
## 74   74  0.19539   0.0 10.81    0 0.4130 6.245   6.2  5.2873   4 305    19.2
## 75   75  0.07896   0.0 12.83    0 0.4370 6.273   6.0  4.2515   5 398    18.7
## 76   76  0.09512   0.0 12.83    0 0.4370 6.286  45.0  4.5026   5 398    18.7
## 77   77  0.10153   0.0 12.83    0 0.4370 6.279  74.5  4.0522   5 398    18.7
## 78   78  0.08707   0.0 12.83    0 0.4370 6.140  45.8  4.0905   5 398    18.7
## 79   79  0.05646   0.0 12.83    0 0.4370 6.232  53.7  5.0141   5 398    18.7
## 80   80  0.08387   0.0 12.83    0 0.4370 5.874  36.6  4.5026   5 398    18.7
## 81   81  0.04113  25.0  4.86    0 0.4260 6.727  33.5  5.4007   4 281    19.0
## 82   82       NA  25.0  4.86    0 0.4260 6.619  70.4  5.4007   4 281    19.0
## 83   83  0.03659  25.0  4.86    0 0.4260 6.302  32.2  5.4007   4 281    19.0
```

```
##  84   84       NA  25.0  4.86    0 0.4260 6.167  46.7  5.4007   4 281    19.0
##  85   85  0.05059   0.0  4.49    0 0.4490 6.389  48.0  4.7794   3 247    18.5
##  86   86  0.05735   0.0  4.49    0 0.4490 6.630  56.1  4.4377   3 247    18.5
##  87   87  0.05188   0.0  4.49    0 0.4490 6.015  45.1  4.4272   3 247    18.5
##  88   88  0.07151   0.0  4.49    0 0.4490 6.121  56.8  3.7476   3 247    18.5
##  89   89  0.05660   0.0  3.41    0 0.4890 7.007  86.3  3.4217   2 270    17.8
##  90   90  0.05302   0.0  3.41    0 0.4890 7.079  63.1  3.4145   2 270    17.8
##  91   91  0.04684   0.0  3.41    0 0.4890 6.417  66.1  3.0923   2 270    17.8
##  92   92  0.03932   0.0  3.41    0 0.4890 6.405  73.9  3.0921   2 270    17.8
##  93   93  0.04203  28.0 15.04    0 0.4640 6.442  53.6  3.6659   4 270    18.2
##  94   94       NA  28.0 15.04    0 0.4640 6.211  28.9  3.6659   4 270    18.2
##  95   95  0.04294  28.0 15.04    0 0.4640 6.249  77.3  3.6150   4 270    18.2
##  96   96       NA   0.0  2.89    0 0.4450 6.625  57.8  3.4952   2 276    18.0
##  97   97  0.11504   0.0  2.89    0 0.4450 6.163  69.6  3.4952   2 276    18.0
##  98   98  0.12083   0.0  2.89    0 0.4450 8.069  76.0  3.4952   2 276    18.0
##  99   99  0.08187   0.0  2.89    0 0.4450 7.820  36.9  3.4952   2 276    18.0
## 100  100  0.06860   0.0  2.89    0 0.4450 7.416  62.5  3.4952   2 276    18.0
## 101  101  0.14866   0.0  8.56    0 0.5200 6.727  79.9  2.7778   5 384    20.9
## 102  102  0.11432   0.0  8.56    0 0.5200 6.781  71.3  2.8561   5 384    20.9
## 103  103       NA   0.0  8.56    0 0.5200 6.405  85.4  2.7147   5 384    20.9
## 104  104       NA   0.0  8.56    0 0.5200 6.137  87.4  2.7147   5 384    20.9
## 105  105  0.13960   0.0  8.56    0 0.5200 6.167  90.0  2.4210   5 384    20.9
## 106  106       NA   0.0  8.56    0 0.5200 5.851  96.7  2.1069   5 384    20.9
## 107  107  0.17120   0.0    NA    0 0.5200 5.836  91.9  2.2110   5 384    20.9
## 108  108  0.13117   0.0  8.56    0 0.5200 6.127  85.2  2.1224   5 384    20.9
## 109  109  0.12802   0.0  8.56    0 0.5200 6.474  97.1  2.4329   5 384    20.9
## 110  110  0.26363   0.0  8.56    0 0.5200 6.229  91.2  2.5451   5 384    20.9
## 111  111  0.10793   0.0  8.56    0 0.5200 6.195  54.4  2.7778   5 384    20.9
## 112  112  0.10084   0.0 10.01    0 0.5470 6.715  81.6  2.6775   6 432    17.8
## 113  113  0.12329   0.0 10.01    0 0.5470 5.913  92.9  2.3534   6 432    17.8
## 114  114  0.22212   0.0 10.01    0 0.5470 6.092  95.4  2.5480   6 432    17.8
## 115  115  0.14231   0.0 10.01    0 0.5470 6.254  84.2  2.2565   6 432    17.8
## 116  116  0.17134   0.0 10.01    0 0.5470 5.928  88.2  2.4631   6 432    17.8
## 117  117  0.13158   0.0 10.01    0 0.5470 6.176  72.5  2.7301   6 432    17.8
## 118  118  0.15098   0.0 10.01    0 0.5470 6.021  82.6  2.7474   6 432    17.8
## 119  119  0.13058   0.0 10.01    0 0.5470 5.872  73.1  2.4775   6 432    17.8
## 120  120  0.14476   0.0 10.01    0 0.5470 5.731  65.2  2.7592   6 432    17.8
## 121  121  0.06899   0.0 25.65    0 0.5810 5.870  69.7  2.2577   2 188    19.1
## 122  122  0.07165   0.0 25.65    0 0.5810 6.004  84.1  2.1974   2 188    19.1
## 123  123  0.09299   0.0 25.65    0 0.5810 5.961  92.9  2.0869   2 188    19.1
## 124  124       NA   0.0 25.65    0 0.5810 5.856  97.0  1.9444   2 188    19.1
## 125  125  0.09849   0.0 25.65    0 0.5810 5.879  95.8  2.0063   2 188    19.1
## 126  126  0.16902   0.0 25.65    0 0.5810 5.986  88.4  1.9929   2 188    19.1
## 127  127  0.38735   0.0 25.65    0 0.5810 5.613  95.6  1.7572   2 188    19.1
## 128  128  0.25915   0.0 21.89    0 0.6240 5.693  96.0  1.7883   4 437    21.2
## 129  129       NA   0.0 21.89    0 0.6240 6.431  98.8  1.8125   4 437    21.2
## 130  130       NA   0.0 21.89    0 0.6240 5.637  94.7  1.9799   4 437    21.2
## 131  131  0.34006   0.0 21.89    0 0.6240 6.458  98.9  2.1185   4 437    21.2
## 132  132  1.19294   0.0 21.89    0 0.6240 6.326  97.7  2.2710   4 437    21.2
## 133  133       NA   0.0 21.89    0 0.6240 6.372  97.9  2.3274   4 437    21.2
## 134  134  0.32982   0.0 21.89    0 0.6240 5.822  95.4  2.4699   4 437    21.2
## 135  135       NA   0.0 21.89    0 0.6240 5.757  98.4  2.3460   4 437    21.2
## 136  136  0.55778   0.0 21.89    0 0.6240 6.335  98.2  2.1107   4 437    21.2
## 137  137  0.32264   0.0 21.89    0 0.6240 5.942  93.5  1.9669   4 437    21.2
```

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## 138 138  0.35233   0.0 21.89    0 0.6240 6.454  98.4  1.8498   4 437    21.2
## 139 139  0.24980   0.0 21.89    0 0.6240 5.857  98.2  1.6686   4 437    21.2
## 140 140  0.54452   0.0 21.89    0 0.6240 6.151  97.9  1.6687   4 437    21.2
## 141 141  0.29090   0.0 21.89    0 0.6240 6.174  93.6  1.6119   4 437    21.2
## 142 142  1.62864   0.0 21.89    0 0.6240 5.019 100.0  1.4394   4 437    21.2
## 143 143  3.32105   0.0 19.58    1 0.8710 5.403 100.0  1.3216   5 403    14.7
## 144 144  4.09740   0.0 19.58    0 0.8710 5.468 100.0  1.4118   5 403    14.7
## 145 145  2.77974   0.0 19.58    0 0.8710 4.903  97.8  1.3459   5 403    14.7
## 146 146  2.37934   0.0 19.58    0 0.8710 6.130 100.0  1.4191   5 403    14.7
## 147 147  2.15505   0.0 19.58    0 0.8710 5.628 100.0  1.5166   5 403    14.7
## 148 148  2.36862   0.0 19.58    0 0.8710 4.926  95.7  1.4608   5 403    14.7
## 149 149  2.33099   0.0 19.58    0 0.8710 5.186  93.8  1.5296   5 403    14.7
## 150 150       NA   0.0 19.58    0 0.8710 5.597  94.9  1.5257   5 403    14.7
## 151 151  1.65660   0.0 19.58    0 0.8710 6.122  97.3  1.6180   5 403    14.7
## 152 152       NA   0.0 19.58    0 0.8710 5.404 100.0  1.5916   5 403    14.7
## 153 153  1.12658   0.0 19.58    1 0.8710 5.012  88.0  1.6102   5 403    14.7
## 154 154  2.14918   0.0 19.58    0 0.8710 5.709  98.5  1.6232   5 403    14.7
## 155 155  1.41385   0.0 19.58    1 0.8710 6.129  96.0  1.7494   5 403    14.7
## 156 156  3.53501   0.0 19.58    1 0.8710 6.152  82.6  1.7455   5 403    14.7
## 157 157       NA   0.0 19.58    0 0.8710 5.272  94.0  1.7364   5 403    14.7
## 158 158  1.22358   0.0 19.58    0 0.6050 6.943  97.4  1.8773   5 403    14.7
## 159 159  1.34284   0.0 19.58    0 0.6050    NA 100.0  1.7573   5 403    14.7
## 160 160       NA   0.0 19.58    0 0.8710 6.510 100.0  1.7659   5 403    14.7
## 161 161  1.27346   0.0 19.58    1 0.6050 6.250  92.6  1.7984   5 403    14.7
## 162 162  1.46336   0.0 19.58    0 0.6050 7.489  90.8  1.9709   5 403    14.7
## 163 163       NA   0.0 19.58    1 0.6050 7.802  98.2  2.0407   5 403    14.7
## 164 164  1.51902   0.0 19.58    1 0.6050 8.375  93.9  2.1620   5 403    14.7
## 165 165  2.24236   0.0 19.58    0 0.6050 5.854  91.8  2.4220   5 403    14.7
## 166 166  2.92400   0.0 19.58    0 0.6050 6.101  93.0  2.2834   5 403    14.7
## 167 167  2.01019   0.0 19.58    0 0.6050 7.929  96.2  2.0459   5 403    14.7
## 168 168  1.80028   0.0 19.58    0 0.6050 5.877  79.2  2.4259   5 403    14.7
## 169 169  2.30040   0.0 19.58    0 0.6050 6.319  96.1  2.1000   5 403    14.7
## 170 170  2.44953   0.0 19.58    0 0.6050 6.402  95.2  2.2625   5 403    14.7
## 171 171       NA   0.0 19.58    0 0.6050 5.875  94.6  2.4259   5 403    14.7
## 172 172  2.31390   0.0 19.58    0 0.6050 5.880  97.3  2.3887   5 403    14.7
## 173 173  0.13914   0.0  4.05    0 0.5100 5.572  88.5  2.5961   5 296    16.6
## 174 174       NA   0.0  4.05    0 0.5100 6.416  84.1  2.6463   5 296    16.6
## 175 175  0.08447   0.0  4.05    0 0.5100 5.859  68.7  2.7019   5 296    16.6
## 176 176  0.06664   0.0  4.05    0 0.5100 6.546  33.1  3.1323   5 296    16.6
## 177 177  0.07022   0.0  4.05    0 0.5100 6.020  47.2  3.5549   5 296    16.6
## 178 178  0.05425   0.0  4.05    0 0.5100 6.315  73.4  3.3175   5 296    16.6
## 179 179  0.06642   0.0  4.05    0 0.5100 6.860  74.4  2.9153   5 296    16.6
## 180 180  0.05780   0.0  2.46    0 0.4880 6.980  58.4  2.8290   3 193    17.8
## 181 181       NA   0.0  2.46    0 0.4880 7.765  83.3  2.7410   3 193    17.8
## 182 182  0.06888   0.0  2.46    0 0.4880 6.144  62.2  2.5979   3 193    17.8
## 183 183  0.09103   0.0  2.46    0 0.4880 7.155  92.2  2.7006   3 193    17.8
## 184 184  0.10008   0.0  2.46    0 0.4880 6.563  95.6  2.8470   3 193    17.8
## 185 185  0.08308   0.0  2.46    0 0.4880 5.604  89.8  2.9879   3 193    17.8
## 186 186  0.06047   0.0  2.46    0 0.4880 6.153  68.8  3.2797   3 193    17.8
## 187 187  0.05602   0.0    NA    0 0.4880 7.831  53.6  3.1992   3 193    17.8
## 188 188  0.07875  45.0  3.44    0 0.4370 6.782  41.1  3.7886   5 398    15.2
## 189 189  0.12579  45.0  3.44    0 0.4370 6.556  29.1  4.5667   5 398    15.2
## 190 190  0.08370  45.0  3.44    0 0.4370 7.185  38.9  4.5667   5 398    15.2
## 191 191  0.09068  45.0  3.44    0 0.4370 6.951  21.5  6.4798   5 398    15.2
```

```
## 192 192  0.06911  45.0  3.44    0 0.4370 6.739  30.8  6.4798   5 398    15.2
## 193 193  0.08664  45.0  3.44    0 0.4370 7.178  26.3  6.4798   5 398    15.2
## 194 194  0.02187  60.0  2.93    0 0.4010 6.800   9.9  6.2196   1 265    15.6
## 195 195  0.01439  60.0  2.93    0 0.4010 6.604  18.8  6.2196   1 265    15.6
## 196 196  0.01381  80.0  0.46    0 0.4220 7.875  32.0  5.6484   4 255    14.4
## 197 197  0.04011  80.0  1.52    0 0.4040 7.287  34.1  7.3090   2 329    12.6
## 198 198  0.04666  80.0  1.52    0 0.4040 7.107  36.6  7.3090   2 329    12.6
## 199 199  0.03768  80.0  1.52    0 0.4040 7.274  38.3  7.3090   2 329    12.6
## 200 200  0.03150  95.0  1.47    0 0.4030 6.975  15.3  7.6534   3 402    17.0
## 201 201       NA  95.0  1.47    0 0.4030 7.135  13.9  7.6534   3 402    17.0
## 202 202  0.03445  82.5  2.03    0 0.4150 6.162  38.4  6.2700   2 348    14.7
## 203 203  0.02177  82.5  2.03    0 0.4150 7.610  15.7  6.2700   2 348    14.7
## 204 204  0.03510  95.0  2.68    0 0.4161 7.853  33.2  5.1180   4 224    14.7
## 205 205  0.02009  95.0  2.68    0 0.4161 8.034  31.9  5.1180   4 224    14.7
## 206 206  0.13642   0.0 10.59    0 0.4890 5.891  22.3  3.9454   4 277    18.6
## 207 207       NA   0.0 10.59    0 0.4890 6.326  52.5  4.3549   4 277    18.6
## 208 208  0.25199   0.0 10.59    0 0.4890 5.783  72.7  4.3549   4 277    18.6
## 209 209  0.13587   0.0 10.59    1 0.4890 6.064  59.1  4.2392   4 277    18.6
## 210 210  0.43571   0.0 10.59    1 0.4890 5.344 100.0  3.8750   4 277    18.6
## 211 211  0.17446   0.0 10.59    1 0.4890 5.960  92.1  3.8771   4 277    18.6
## 212 212  0.37578   0.0 10.59    1 0.4890 5.404  88.6  3.6650   4 277    18.6
## 213 213  0.21719   0.0 10.59    1 0.4890 5.807  53.8  3.6526   4 277    18.6
## 214 214  0.14052   0.0 10.59    0 0.4890 6.375  32.3  3.9454   4 277    18.6
## 215 215  0.28955   0.0 10.59    0 0.4890 5.412   9.8  3.5875   4 277    18.6
## 216 216  0.19802   0.0 10.59    0 0.4890 6.182  42.4  3.9454   4 277    18.6
## 217 217  0.04560   0.0 13.89    1 0.5500 5.888  56.0  3.1121   5 276    16.4
## 218 218  0.07013   0.0 13.89    0 0.5500 6.642  85.1  3.4211   5 276    16.4
## 219 219  0.11069   0.0 13.89    1 0.5500 5.951  93.8  2.8893   5 276    16.4
## 220 220  0.11425   0.0 13.89    1 0.5500 6.373  92.4  3.3633   5 276    16.4
## 221 221  0.35809   0.0  6.20    1 0.5070 6.951  88.5  2.8617   8 307    17.4
## 222 222  0.40771   0.0  6.20    1 0.5070 6.164  91.3  3.0480   8 307    17.4
## 223 223  0.62356   0.0  6.20    1 0.5070 6.879  77.7  3.2721   8 307    17.4
## 224 224  0.61470   0.0    NA    0 0.5070 6.618  80.8  3.2721   8 307    17.4
## 225 225       NA   0.0  6.20    0 0.5040 8.266  78.3  2.8944   8 307    17.4
## 226 226  0.52693   0.0  6.20    0 0.5040 8.725  83.0  2.8944   8 307    17.4
## 227 227  0.38214   0.0  6.20    0 0.5040 8.040  86.5  3.2157   8 307    17.4
## 228 228  0.41238   0.0  6.20    0 0.5040 7.163  79.9  3.2157   8 307    17.4
## 229 229  0.29819   0.0  6.20    0 0.5040 7.686  17.0  3.3751   8 307    17.4
## 230 230  0.44178   0.0  6.20    0 0.5040 6.552  21.4  3.3751   8 307    17.4
## 231 231  0.53700   0.0  6.20    0 0.5040 5.981  68.1  3.6715   8 307    17.4
## 232 232  0.46296   0.0  6.20    0 0.5040 7.412  76.9  3.6715   8 307    17.4
## 233 233  0.57529   0.0  6.20    0 0.5070 8.337  73.3  3.8384   8 307    17.4
## 234 234  0.33147   0.0  6.20    0 0.5070 8.247  70.4  3.6519   8 307    17.4
## 235 235  0.44791   0.0  6.20    1 0.5070 6.726  66.5  3.6519   8 307    17.4
## 236 236  0.33045   0.0  6.20    0 0.5070 6.086  61.5  3.6519   8 307    17.4
## 237 237  0.52058   0.0  6.20    1 0.5070 6.631  76.5  4.1480   8 307    17.4
## 238 238  0.51183   0.0  6.20    0 0.5070 7.358  71.6  4.1480   8 307    17.4
## 239 239  0.08244  30.0  4.93    0 0.4280 6.481  18.5  6.1899   6 300    16.6
## 240 240  0.09252  30.0  4.93    0 0.4280 6.606  42.2  6.1899   6 300    16.6
## 241 241  0.11329  30.0  4.93    0 0.4280 6.897  54.3  6.3361   6 300    16.6
## 242 242  0.10612  30.0  4.93    0 0.4280 6.095  65.1  6.3361   6 300    16.6
## 243 243  0.10290  30.0    NA    0 0.4280 6.358  52.9  7.0355   6 300    16.6
## 244 244  0.12757  30.0  4.93    0 0.4280 6.393   7.8  7.0355   6 300    16.6
## 245 245  0.20608  22.0  5.86    0 0.4310 5.593  76.5  7.9549   7 330    19.1
```

```
## 246 246  0.19133  22.0  5.86    0 0.4310 5.605  70.2  7.9549   7 330    19.1
## 247 247  0.33983  22.0  5.86    0 0.4310 6.108  34.9  8.0555   7 330    19.1
## 248 248  0.19657  22.0  5.86    0 0.4310 6.226  79.2  8.0555   7 330    19.1
## 249 249  0.16439  22.0  5.86    0 0.4310 6.433  49.1  7.8265   7 330    19.1
## 250 250  0.19073  22.0  5.86    0 0.4310 6.718  17.5  7.8265   7 330    19.1
## 251 251  0.14030  22.0  5.86    0 0.4310 6.487  13.0  7.3967   7 330    19.1
## 252 252  0.21409  22.0  5.86    0 0.4310 6.438   8.9  7.3967   7 330    19.1
## 253 253  0.08221  22.0  5.86    0 0.4310 6.957   6.8  8.9067   7 330    19.1
## 254 254  0.36894  22.0  5.86    0 0.4310 8.259   8.4  8.9067   7 330    19.1
## 255 255  0.04819  80.0  3.64    0 0.3920 6.108  32.0  9.2203   1 315    16.4
## 256 256  0.03548  80.0  3.64    0 0.3920 5.876  19.1  9.2203   1 315    16.4
## 257 257  0.01538  90.0  3.75    0 0.3940 7.454  34.2  6.3361   3 244    15.9
## 258 258       NA  20.0  3.97    0 0.6470 8.704  86.9  1.8010   5 264    13.0
## 259 259  0.66351  20.0  3.97    0 0.6470 7.333 100.0  1.8946   5 264    13.0
## 260 260  0.65665  20.0  3.97    0 0.6470 6.842 100.0  2.0107   5 264    13.0
## 261 261  0.54011  20.0  3.97    0 0.6470 7.203  81.8  2.1121   5 264    13.0
## 262 262  0.53412  20.0  3.97    0 0.6470 7.520  89.4  2.1398   5 264    13.0
## 263 263  0.52014  20.0  3.97    0 0.6470 8.398  91.5  2.2885   5 264    13.0
## 264 264  0.82526  20.0  3.97    0 0.6470 7.327  94.5  2.0788   5 264    13.0
## 265 265  0.55007  20.0  3.97    0 0.6470 7.206  91.6  1.9301   5 264    13.0
## 266 266  0.76162  20.0  3.97    0 0.6470 5.560  62.8  1.9865   5 264    13.0
## 267 267  0.78570  20.0  3.97    0 0.6470 7.014  84.6  2.1329   5 264    13.0
## 268 268  0.57834  20.0  3.97    0 0.5750 8.297  67.0  2.4216   5 264    13.0
## 269 269  0.54050  20.0  3.97    0 0.5750 7.470  52.6  2.8720   5 264    13.0
## 270 270  0.09065  20.0  6.96    1 0.4640 5.920  61.5  3.9175   3 223    18.6
## 271 271  0.29916  20.0  6.96    0 0.4640 5.856  42.1  4.4290   3 223    18.6
## 272 272  0.16211  20.0  6.96    0 0.4640 6.240  16.3  4.4290   3 223    18.6
## 273 273  0.11460  20.0  6.96    0 0.4640 6.538  58.7  3.9175   3 223    18.6
## 274 274  0.22188  20.0  6.96    1 0.4640 7.691  51.8  4.3665   3 223    18.6
## 275 275  0.05644  40.0  6.41    1 0.4470 6.758  32.9  4.0776   4 254    17.6
## 276 276  0.09604  40.0  6.41    0 0.4470 6.854  42.8  4.2673   4 254    17.6
## 277 277  0.10469  40.0  6.41    1 0.4470 7.267  49.0  4.7872   4 254    17.6
## 278 278  0.06127  40.0  6.41    1 0.4470 6.826  27.6  4.8628   4 254    17.6
## 279 279  0.07978  40.0  6.41    0 0.4470 6.482  32.1  4.1403   4 254    17.6
## 280 280  0.21038  20.0  3.33    0 0.4429 6.812  32.2  4.1007   5 216    14.9
## 281 281  0.03578  20.0  3.33    0 0.4429 7.820  64.5  4.6947   5 216    14.9
## 282 282  0.03705  20.0  3.33    0 0.4429 6.968  37.2  5.2447   5 216    14.9
## 283 283  0.06129  20.0  3.33    1 0.4429 7.645  49.7  5.2119   5 216    14.9
## 284 284  0.01501  90.0  1.21    1 0.4010 7.923  24.8  5.8850   1 198    13.6
## 285 285  0.00906  90.0  2.97    0 0.4000 7.088  20.8  7.3073   1 285    15.3
## 286 286  0.01096  55.0  2.25    0 0.3890 6.453  31.9  7.3073   1 300    15.3
## 287 287  0.01965  80.0  1.76    0 0.3850 6.230  31.5  9.0892   1 241    18.2
## 288 288  0.03871  52.5  5.32    0 0.4050 6.209  31.3  7.3172   6 293    16.6
## 289 289  0.04590  52.5    NA    0 0.4050 6.315  45.6  7.3172   6 293    16.6
## 290 290  0.04297  52.5  5.32    0 0.4050 6.565  22.9  7.3172   6 293    16.6
## 291 291  0.03502  80.0  4.95    0 0.4110 6.861  27.9  5.1167   4 245    19.2
## 292 292  0.07886  80.0  4.95    0 0.4110 7.148  27.7  5.1167   4 245    19.2
## 293 293  0.03615  80.0  4.95    0 0.4110 6.630  23.4  5.1167   4 245    19.2
## 294 294  0.08265   0.0 13.92    0 0.4370 6.127  18.4  5.5027   4 289    16.0
## 295 295       NA   0.0 13.92    0 0.4370 6.009  42.3  5.5027   4 289    16.0
## 296 296  0.12932   0.0 13.92    0 0.4370 6.678  31.1  5.9604   4 289    16.0
## 297 297  0.05372   0.0 13.92    0 0.4370 6.549  51.0  5.9604   4 289    16.0
## 298 298  0.14103   0.0 13.92    0 0.4370 5.790  58.0  6.3200   4 289    16.0
## 299 299  0.06466  70.0  2.24    0 0.4000 6.345  20.1  7.8278   5 358    14.8
```

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## 300 300  0.05561  70.0  2.24    0 0.4000 7.041  10.0  7.8278   5 358    14.8
## 301 301  0.04417  70.0  2.24    0 0.4000 6.871  47.4  7.8278   5 358    14.8
## 302 302  0.03537  34.0  6.09    0 0.4330 6.590  40.4  5.4917   7 329    16.1
## 303 303  0.09266  34.0  6.09    0 0.4330 6.495  18.4  5.4917   7 329    16.1
## 304 304  0.10000  34.0  6.09    0 0.4330 6.982  17.7  5.4917   7 329    16.1
## 305 305  0.05515  33.0  2.18    0 0.4720 7.236  41.1  4.0220   7 222    18.4
## 306 306  0.05479  33.0  2.18    0 0.4720 6.616  58.1  3.3700   7 222    18.4
## 307 307  0.07503  33.0  2.18    0 0.4720 7.420  71.9  3.0992   7 222    18.4
## 308 308  0.04932  33.0  2.18    0 0.4720 6.849  70.3  3.1827   7 222    18.4
## 309 309  0.49298   0.0  9.90    0 0.5440 6.635  82.5  3.3175   4 304    18.4
## 310 310       NA   0.0  9.90    0 0.5440 5.972  76.7  3.1025   4 304    18.4
## 311 311       NA   0.0  9.90    0 0.5440 4.973  37.8  2.5194   4 304    18.4
## 312 312  0.79041   0.0  9.90    0 0.5440 6.122  52.8  2.6403   4 304    18.4
## 313 313  0.26169   0.0  9.90    0 0.5440 6.023  90.4  2.8340   4 304    18.4
## 314 314  0.26938   0.0  9.90    0 0.5440 6.266  82.8  3.2628   4 304    18.4
## 315 315  0.36920   0.0  9.90    0 0.5440 6.567  87.3  3.6023   4 304    18.4
## 316 316  0.25356   0.0  9.90    0 0.5440 5.705  77.7  3.9450   4 304    18.4
## 317 317  0.31827   0.0  9.90    0 0.5440 5.914  83.2  3.9986   4 304    18.4
## 318 318  0.24522   0.0  9.90    0 0.5440 5.782  71.7  4.0317   4 304    18.4
## 319 319  0.40202   0.0  9.90    0 0.5440 6.382  67.2  3.5325   4 304    18.4
## 320 320  0.47547   0.0  9.90    0 0.5440 6.113  58.8  4.0019   4 304    18.4
## 321 321  0.16760   0.0  7.38    0 0.4930 6.426  52.3  4.5404   5 287    19.6
## 322 322  0.18159   0.0  7.38    0 0.4930 6.376  54.3  4.5404   5 287    19.6
## 323 323  0.35114   0.0  7.38    0 0.4930 6.041  49.9  4.7211   5 287    19.6
## 324 324  0.28392   0.0  7.38    0 0.4930 5.708  74.3  4.7211   5 287    19.6
## 325 325  0.34109   0.0  7.38    0 0.4930 6.415  40.1  4.7211   5 287    19.6
## 326 326  0.19186   0.0  7.38    0 0.4930 6.431  14.7  5.4159   5 287    19.6
## 327 327  0.30347   0.0  7.38    0 0.4930 6.312  28.9  5.4159   5 287    19.6
## 328 328  0.24103   0.0  7.38    0 0.4930 6.083  43.7  5.4159   5 287    19.6
## 329 329  0.06617   0.0  3.24    0 0.4600 5.868  25.8  5.2146   4 430    16.9
## 330 330  0.06724   0.0  3.24    0 0.4600 6.333  17.2  5.2146   4 430    16.9
## 331 331  0.04544   0.0  3.24    0 0.4600 6.144  32.2  5.8736   4 430    16.9
## 332 332  0.05023  35.0  6.06    0 0.4379 5.706  28.4  6.6407   1 304    16.9
## 333 333       NA  35.0    NA    0 0.4379 6.031  23.3  6.6407   1 304    16.9
## 334 334       NA   0.0  5.19    0 0.5150 6.316  38.1  6.4584   5 224    20.2
## 335 335  0.03738   0.0  5.19    0 0.5150 6.310  38.5  6.4584   5 224    20.2
## 336 336  0.03961   0.0  5.19    0 0.5150 6.037  34.5  5.9853   5 224    20.2
## 337 337  0.03427   0.0  5.19    0 0.5150 5.869  46.3  5.2311   5 224    20.2
## 338 338  0.03041   0.0  5.19    0 0.5150 5.895  59.6  5.6150   5 224    20.2
## 339 339  0.03306   0.0  5.19    0 0.5150 6.059  37.3  4.8122   5 224    20.2
## 340 340  0.05497   0.0  5.19    0 0.5150 5.985  45.4  4.8122   5 224    20.2
## 341 341  0.06151   0.0  5.19    0 0.5150 5.968  58.5  4.8122   5 224    20.2
## 342 342  0.01301  35.0  1.52    0 0.4420 7.241  49.3  7.0379   1 284    15.5
## 343 343  0.02498   0.0  1.89    0 0.5180 6.540  59.7  6.2669   1 422    15.9
## 344 344  0.02543  55.0  3.78    0 0.4840 6.696  56.4  5.7321   5 370    17.6
## 345 345  0.03049  55.0  3.78    0 0.4840 6.874  28.1  6.4654   5 370    17.6
## 346 346  0.03113   0.0  4.39    0 0.4420 6.014  48.5  8.0136   3 352    18.8
## 347 347       NA   0.0  4.39    0 0.4420 5.898  52.3  8.0136   3 352    18.8
## 348 348  0.01870  85.0  4.15    0 0.4290 6.516  27.7  8.5353   4 351    17.9
## 349 349       NA  80.0  2.01    0 0.4350 6.635  29.7  8.3440   4 280    17.0
## 350 350  0.02899  40.0  1.25    0 0.4290 6.939  34.5  8.7921   1 335    19.7
## 351 351  0.06211  40.0  1.25    0 0.4290 6.490  44.4  8.7921   1 335    19.7
## 352 352  0.07950  60.0  1.69    0 0.4110 6.579  35.9 10.7103   4 411    18.3
## 353 353  0.07244  60.0  1.69    0 0.4110 5.884  18.5 10.7103   4 411    18.3
```

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## 354 354  0.01709  90.0  2.02    0 0.4100 6.728  36.1 12.1265   5 187    17.0
## 355 355  0.04301  80.0  1.91    0 0.4130 5.663  21.9 10.5857   4 334    22.0
## 356 356  0.10659  80.0  1.91    0 0.4130 5.936  19.5 10.5857   4 334    22.0
## 357 357  8.98296   0.0 18.10    1 0.7700 6.212  97.4  2.1222  24 666    20.2
## 358 358  3.84970   0.0 18.10    1 0.7700 6.395  91.0  2.5052  24 666    20.2
## 359 359  5.20177   0.0 18.10    1 0.7700 6.127  83.4  2.7227  24 666    20.2
## 360 360  4.26131   0.0 18.10    0 0.7700 6.112  81.3  2.5091  24 666    20.2
## 361 361  4.54192   0.0 18.10    0 0.7700 6.398  88.0  2.5182  24 666    20.2
## 362 362  3.83684   0.0 18.10    0 0.7700 6.251  91.1  2.2955  24 666    20.2
## 363 363  3.67822   0.0 18.10    0 0.7700 5.362  96.2  2.1036  24 666    20.2
## 364 364       NA   0.0 18.10    1 0.7700 5.803  89.0  1.9047  24 666    20.2
## 365 365       NA   0.0 18.10    1 0.7180 8.780  82.9  1.9047  24 666    20.2
## 366 366       NA   0.0 18.10    0 0.7180 3.561  87.9  1.6132  24 666    20.2
## 367 367  3.69695   0.0 18.10    0 0.7180 4.963  91.4  1.7523  24 666    20.2
## 368 368 13.52220   0.0 18.10    0 0.6310 3.863 100.0  1.5106  24 666    20.2
## 369 369  4.89822   0.0 18.10    0 0.6310 4.970 100.0  1.3325  24 666    20.2
## 370 370  5.66998   0.0 18.10    1 0.6310 6.683  96.8  1.3567  24 666    20.2
## 371 371  6.53876   0.0 18.10    1 0.6310 7.016  97.5  1.2024  24 666    20.2
## 372 372  9.23230   0.0 18.10    0 0.6310    NA 100.0  1.1691  24 666    20.2
## 373 373  8.26725   0.0 18.10    1 0.6680 5.875  89.6  1.1296  24 666    20.2
## 374 374 11.10810   0.0 18.10    0 0.6680 4.906 100.0  1.1742  24 666    20.2
## 375 375 18.49820   0.0 18.10    0 0.6680 4.138 100.0  1.1370  24 666    20.2
## 376 376 19.60910   0.0 18.10    0 0.6710 7.313  97.9  1.3163  24 666    20.2
## 377 377 15.28800   0.0 18.10    0 0.6710 6.649  93.3  1.3449  24 666    20.2
## 378 378  9.82349   0.0 18.10    0 0.6710 6.794  98.8  1.3580  24 666    20.2
## 379 379 23.64820   0.0 18.10    0 0.6710 6.380  96.2  1.3861  24 666    20.2
## 380 380 17.86670   0.0 18.10    0 0.6710 6.223 100.0  1.3861  24 666    20.2
## 381 381 88.97620   0.0 18.10    0 0.6710 6.968  91.9  1.4165  24 666    20.2
## 382 382 15.87440   0.0 18.10    0 0.6710 6.545  99.1  1.5192  24 666    20.2
## 383 383       NA   0.0 18.10    0 0.7000 5.536 100.0  1.5804  24 666    20.2
## 384 384  7.99248   0.0 18.10    0 0.7000 5.520 100.0  1.5331  24 666    20.2
## 385 385 20.08490   0.0 18.10    0 0.7000 4.368  91.2  1.4395  24 666    20.2
## 386 386 16.81180   0.0 18.10    0 0.7000 5.277  98.1  1.4261  24 666    20.2
## 387 387 24.39380   0.0 18.10    0 0.7000 4.652 100.0  1.4672  24 666    20.2
## 388 388 22.59710   0.0 18.10    0 0.7000 5.000  89.5  1.5184  24 666    20.2
## 389 389 14.33370   0.0 18.10    0 0.7000 4.880 100.0  1.5895  24 666    20.2
## 390 390  8.15174   0.0 18.10    0 0.7000 5.390  98.9  1.7281  24 666    20.2
## 391 391  6.96215   0.0 18.10    0 0.7000 5.713  97.0  1.9265  24 666    20.2
## 392 392  5.29305   0.0 18.10    0 0.7000 6.051  82.5  2.1678  24 666    20.2
## 393 393 11.57790   0.0 18.10    0 0.7000 5.036  97.0  1.7700  24 666    20.2
## 394 394  8.64476   0.0 18.10    0 0.6930 6.193  92.6  1.7912  24 666    20.2
## 395 395 13.35980   0.0 18.10    0 0.6930 5.887  94.7  1.7821  24 666    20.2
## 396 396  8.71675   0.0 18.10    0 0.6930 6.471  98.8  1.7257  24 666    20.2
## 397 397  5.87205   0.0 18.10    0 0.6930 6.405  96.0  1.6768  24 666    20.2
## 398 398  7.67202   0.0 18.10    0 0.6930 5.747  98.9  1.6334  24 666    20.2
## 399 399 38.35180   0.0 18.10    0 0.6930 5.453 100.0  1.4896  24 666    20.2
## 400 400  9.91655   0.0 18.10    0 0.6930    NA  77.8  1.5004  24 666    20.2
## 401 401 25.04610   0.0 18.10    0 0.6930 5.987 100.0  1.5888  24 666    20.2
## 402 402       NA   0.0 18.10    0 0.6930 6.343 100.0  1.5741  24 666    20.2
## 403 403  9.59571   0.0 18.10    0 0.6930 6.404 100.0  1.6390  24 666    20.2
## 404 404 24.80170   0.0 18.10    0 0.6930 5.349  96.0  1.7028  24 666    20.2
## 405 405 41.52920   0.0 18.10    0 0.6930 5.531  85.4  1.6074  24 666    20.2
## 406 406 67.92080   0.0 18.10    0 0.6930 5.683 100.0  1.4254  24 666    20.2
## 407 407 20.71620   0.0 18.10    0 0.6590 4.138 100.0  1.1781  24 666    20.2
```

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## 408 408 11.95110   0.0 18.10    0 0.6590 5.608 100.0  1.2852  24 666    20.2
## 409 409  7.40389   0.0 18.10    0 0.5970 5.617  97.9  1.4547  24 666    20.2
## 410 410 14.43830   0.0 18.10    0 0.5970 6.852 100.0  1.4655  24 666    20.2
## 411 411 51.13580   0.0 18.10    0 0.5970 5.757 100.0  1.4130  24 666    20.2
## 412 412 14.05070   0.0 18.10    0 0.5970 6.657 100.0  1.5275  24 666    20.2
## 413 413 18.81100   0.0    NA    0 0.5970 4.628 100.0  1.5539  24 666    20.2
## 414 414 28.65580   0.0 18.10    0 0.5970 5.155 100.0  1.5894  24 666    20.2
## 415 415       NA   0.0 18.10    0 0.6930 4.519 100.0  1.6582  24 666    20.2
## 416 416 18.08460   0.0 18.10    0 0.6790 6.434 100.0  1.8347  24 666    20.2
## 417 417 10.83420   0.0 18.10    0 0.6790 6.782  90.8  1.8195  24 666    20.2
## 418 418 25.94060   0.0 18.10    0 0.6790 5.304  89.1  1.6475  24 666    20.2
## 419 419 73.53410   0.0 18.10    0 0.6790 5.957 100.0  1.8026  24 666    20.2
## 420 420 11.81230   0.0 18.10    0 0.7180 6.824  76.5  1.7940  24 666    20.2
## 421 421       NA   0.0 18.10    0 0.7180 6.411 100.0  1.8589  24 666    20.2
## 422 422  7.02259   0.0 18.10    0 0.7180 6.006  95.3  1.8746  24 666    20.2
## 423 423       NA   0.0 18.10    0 0.6140 5.648  87.6  1.9512  24 666    20.2
## 424 424  7.05042   0.0 18.10    0 0.6140 6.103  85.1  2.0218  24 666    20.2
## 425 425  8.79212   0.0 18.10    0 0.5840    NA  70.6  2.0635  24 666    20.2
## 426 426 15.86030   0.0 18.10    0 0.6790 5.896  95.4  1.9096  24 666    20.2
## 427 427 12.24720   0.0 18.10    0 0.5840 5.837  59.7  1.9976  24 666    20.2
## 428 428 37.66190   0.0 18.10    0 0.6790 6.202  78.7  1.8629  24 666    20.2
## 429 429  7.36711   0.0 18.10    0 0.6790 6.193  78.1  1.9356  24 666    20.2
## 430 430  9.33889   0.0 18.10    0 0.6790 6.380  95.6  1.9682  24 666    20.2
## 431 431  8.49213   0.0 18.10    0 0.5840 6.348  86.1  2.0527  24 666    20.2
## 432 432 10.06230   0.0 18.10    0 0.5840 6.833  94.3  2.0882  24 666    20.2
## 433 433  6.44405   0.0 18.10    0 0.5840 6.425  74.8  2.2004  24 666    20.2
## 434 434  5.58107   0.0 18.10    0 0.7130 6.436  87.9  2.3158  24 666    20.2
## 435 435       NA   0.0    NA    0 0.7130 6.208  95.0  2.2222  24 666    20.2
## 436 436 11.16040   0.0 18.10    0 0.7400 6.629  94.6  2.1247  24 666    20.2
## 437 437       NA   0.0 18.10    0 0.7400 6.461  93.3  2.0026  24 666    20.2
## 438 438       NA   0.0 18.10    0 0.7400 6.152 100.0  1.9142  24 666    20.2
## 439 439 13.67810   0.0 18.10    0 0.7400 5.935  87.9  1.8206  24 666    20.2
## 440 440  9.39063   0.0 18.10    0 0.7400 5.627  93.9  1.8172  24 666    20.2
## 441 441 22.05110   0.0 18.10    0 0.7400 5.818  92.4  1.8662  24 666    20.2
## 442 442  9.72418   0.0 18.10    0 0.7400 6.406  97.2  2.0651  24 666    20.2
## 443 443  5.66637   0.0 18.10    0 0.7400 6.219 100.0  2.0048  24 666    20.2
## 444 444  9.96654   0.0 18.10    0 0.7400 6.485 100.0  1.9784  24 666    20.2
## 445 445       NA   0.0 18.10    0 0.7400 5.854  96.6  1.8956  24 666    20.2
## 446 446 10.67180   0.0 18.10    0 0.7400 6.459  94.8  1.9879  24 666    20.2
## 447 447  6.28807   0.0 18.10    0 0.7400 6.341  96.4  2.0720  24 666    20.2
## 448 448  9.92485   0.0 18.10    0 0.7400 6.251  96.6  2.1980  24 666    20.2
## 449 449  9.32909   0.0 18.10    0 0.7130 6.185  98.7  2.2616  24 666    20.2
## 450 450  7.52601   0.0 18.10    0 0.7130 6.417  98.3  2.1850  24 666    20.2
## 451 451  6.71772   0.0 18.10    0 0.7130 6.749  92.6  2.3236  24 666    20.2
## 452 452  5.44114   0.0 18.10    0 0.7130 6.655  98.2  2.3552  24 666    20.2
## 453 453       NA   0.0 18.10    0 0.7130 6.297  91.8  2.3682  24 666    20.2
## 454 454  8.24809   0.0 18.10    0 0.7130 7.393  99.3  2.4527  24 666    20.2
## 455 455  9.51363   0.0 18.10    0 0.7130 6.728  94.1  2.4961  24 666    20.2
## 456 456  4.75237   0.0 18.10    0 0.7130 6.525  86.5  2.4358  24 666    20.2
## 457 457  4.66883   0.0 18.10    0 0.7130 5.976  87.9  2.5806  24 666    20.2
## 458 458  8.20058   0.0 18.10    0 0.7130 5.936  80.3  2.7792  24 666    20.2
## 459 459  7.75223   0.0 18.10    0 0.7130 6.301  83.7  2.7831  24 666    20.2
## 460 460  6.80117   0.0 18.10    0 0.7130 6.081  84.4  2.7175  24 666    20.2
## 461 461  4.81213   0.0 18.10    0 0.7130 6.701  90.0  2.5975  24 666    20.2
```

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## 462 462  3.69311   0.0 18.10    0 0.7130 6.376  88.4  2.5671  24 666    20.2
## 463 463  6.65492   0.0 18.10    0 0.7130 6.317  83.0  2.7344  24 666    20.2
## 464 464  5.82115   0.0 18.10    0 0.7130 6.513  89.9  2.8016  24 666    20.2
## 465 465  7.83932   0.0 18.10    0 0.6550 6.209  65.4  2.9634  24 666    20.2
## 466 466  3.16360   0.0 18.10    0 0.6550 5.759  48.2  3.0665  24 666    20.2
## 467 467  3.77498   0.0 18.10    0 0.6550 5.952  84.7  2.8715  24 666    20.2
## 468 468  4.42228   0.0 18.10    0 0.5840 6.003  94.5  2.5403  24 666    20.2
## 469 469 15.57570   0.0 18.10    0 0.5800 5.926  71.0  2.9084  24 666    20.2
## 470 470 13.07510   0.0 18.10    0 0.5800 5.713  56.7  2.8237  24 666    20.2
## 471 471  4.34879   0.0 18.10    0 0.5800 6.167  84.0  3.0334  24 666    20.2
## 472 472  4.03841   0.0 18.10    0 0.5320 6.229  90.7  3.0993  24 666    20.2
## 473 473  3.56868   0.0 18.10    0 0.5800 6.437  75.0  2.8965  24 666    20.2
## 474 474  4.64689   0.0 18.10    0 0.6140 6.980  67.6  2.5329  24 666    20.2
## 475 475  8.05579   0.0 18.10    0 0.5840 5.427  95.4  2.4298  24 666    20.2
## 476 476  6.39312   0.0 18.10    0 0.5840 6.162  97.4  2.2060  24 666    20.2
## 477 477  4.87141   0.0 18.10    0 0.6140 6.484  93.6  2.3053  24 666    20.2
## 478 478 15.02340   0.0 18.10    0 0.6140 5.304  97.3  2.1007  24 666    20.2
## 479 479 10.23300   0.0 18.10    0 0.6140 6.185  96.7  2.1705  24 666    20.2
## 480 480 14.33370   0.0 18.10    0 0.6140 6.229  88.0  1.9512  24 666    20.2
## 481 481  5.82401   0.0 18.10    0 0.5320 6.242  64.7  3.4242  24 666    20.2
## 482 482  5.70818   0.0 18.10    0 0.5320 6.750  74.9  3.3317  24 666    20.2
## 483 483  5.73116   0.0 18.10    0 0.5320 7.061  77.0  3.4106  24 666    20.2
## 484 484  2.81838   0.0 18.10    0 0.5320 5.762  40.3  4.0983  24 666    20.2
## 485 485  2.37857   0.0 18.10    0 0.5830 5.871  41.9  3.7240  24 666    20.2
## 486 486  3.67367   0.0 18.10    0 0.5830 6.312  51.9  3.9917  24 666    20.2
## 487 487  5.69175   0.0 18.10    0 0.5830 6.114  79.8  3.5459  24 666    20.2
## 488 488  4.83567   0.0 18.10    0 0.5830 5.905  53.2  3.1523  24 666    20.2
## 489 489  0.15086   0.0 27.74    0 0.6090 5.454  92.7  1.8209   4 711    20.1
## 490 490  0.18337   0.0 27.74    0 0.6090 5.414  98.3  1.7554   4 711    20.1
## 491 491  0.20746   0.0 27.74    0 0.6090 5.093  98.0  1.8226   4 711    20.1
## 492 492       NA   0.0 27.74    0 0.6090 5.983  98.8  1.8681   4 711    20.1
## 493 493  0.11132   0.0 27.74    0 0.6090 5.983  83.5  2.1099   4 711    20.1
## 494 494  0.17331   0.0  9.69    0 0.5850 5.707  54.0  2.3817   6 391    19.2
## 495 495  0.27957   0.0  9.69    0 0.5850 5.926  42.6  2.3817   6 391    19.2
## 496 496  0.17899   0.0  9.69    0 0.5850 5.670  28.8  2.7986   6 391    19.2
## 497 497       NA   0.0  9.69    0 0.5850 5.390  72.9  2.7986   6 391    19.2
## 498 498  0.26838   0.0  9.69    0 0.5850 5.794  70.6  2.8927   6 391    19.2
## 499 499  0.23912   0.0  9.69    0 0.5850 6.019  65.3  2.4091   6 391    19.2
## 500 500  0.17783   0.0  9.69    0 0.5850 5.569  73.5  2.3999   6 391    19.2
## 501 501  0.22438   0.0  9.69    0 0.5850 6.027  79.7  2.4982   6 391    19.2
## 502 502  0.06263   0.0 11.93    0 0.5730 6.593  69.1  2.4786   1 273    21.0
## 503 503  0.04527   0.0 11.93    0 0.5730 6.120  76.7  2.2875   1 273    21.0
## 504 504  0.06076   0.0 11.93    0 0.5730 6.976  91.0  2.1675   1 273    21.0
## 505 505  0.10959   0.0 11.93    0 0.5730 6.794  89.3  2.3889   1 273    21.0
## 506 506  0.04741   0.0 11.93    0 0.5730 6.030  80.8  2.5050   1 273    21.0
##          b lstat medv
## 1   396.90  4.98 24.0
## 2   396.90  9.14 21.6
## 3   392.83  4.03 34.7
## 4   394.63  2.94 33.4
## 5   396.90  5.33 36.2
## 6   394.12  5.21 28.7
## 7   395.60 12.43 22.9
## 8   396.90 19.15   NA
```

```
## 9   386.63 29.93 16.5
## 10  386.71 17.10   NA
## 11  392.52 20.45 15.0
## 12  396.90 13.27 18.9
## 13  390.50 15.71 21.7
## 14  396.90  8.26 20.4
## 15  380.02 10.26 18.2
## 16  395.62  8.47 19.9
## 17  386.85  6.58 23.1
## 18  386.75 14.67 17.5
## 19  288.99 11.69 20.2
## 20  390.95 11.28 18.2
## 21  376.57 21.02 13.6
## 22  392.53 13.83 19.6
## 23  396.90 18.72 15.2
## 24  394.54 19.88   NA
## 25  394.33 16.30 15.6
## 26  303.42 16.51 13.9
## 27  376.88 14.81 16.6
## 28  306.38 17.28 14.8
## 29  387.94 12.80 18.4
## 30  380.23 11.98 21.0
## 31  360.17 22.60 12.7
## 32  376.73 13.04 14.5
## 33  232.60 27.71 13.2
## 34  358.77 18.35 13.1
## 35  248.31 20.34 13.5
## 36  396.90  9.68 18.9
## 37  377.56 11.41 20.0
## 38  396.90  8.77 21.0
## 39  393.43 10.13 24.7
## 40  395.63  4.32 30.8
## 41  395.62  1.98   NA
## 42  385.41  4.84 26.6
## 43  383.37  5.81 25.3
## 44  394.46  7.44 24.7
## 45  389.39  9.55 21.2
## 46  396.90 10.21 19.3
## 47  396.90 14.15   NA
## 48  392.74 18.80 16.6
## 49  396.90 30.81 14.4
## 50  396.90 16.20 19.4
## 51  395.56 13.45 19.7
## 52  393.97  9.43 20.5
## 53  396.90  5.28 25.0
## 54  396.90  8.43 23.4
## 55  396.90 14.80 18.9
## 56  395.93  4.81   NA
## 57  396.90  5.77 24.7
## 58  392.90  3.95 31.6
## 59  390.68  6.86   NA
## 60  396.90  9.22 19.6
## 61  395.11 13.15 18.7
## 62  378.08 14.44 16.0
```

```
## 63  396.90  6.73 22.2
## 64  395.58  9.50 25.0
## 65  393.24  8.05 33.0
## 66  396.90  4.67 23.5
## 67  396.90 10.24 19.4
## 68  396.21  8.10 22.0
## 69  396.90 13.09 17.4
## 70  396.90  8.79 20.9
## 71  383.73  6.72 24.2
## 72  376.94  9.88 21.7
## 73  390.91  5.52 22.8
## 74  377.17  7.54 23.4
## 75  394.92  6.78 24.1
## 76  383.23  8.94 21.4
## 77  373.66 11.97 20.0
## 78  386.96 10.27 20.8
## 79  386.40 12.34 21.2
## 80  396.06  9.10 20.3
## 81  396.90  5.29 28.0
## 82  395.63  7.22 23.9
## 83  396.90  6.72 24.8
## 84  390.64  7.51 22.9
## 85  396.90  9.62 23.9
## 86  392.30  6.53 26.6
## 87  395.99 12.86   NA
## 88  395.15  8.44   NA
## 89  396.90  5.50 23.6
## 90  396.06  5.70 28.7
## 91  392.18  8.81 22.6
## 92  393.55  8.20 22.0
## 93  395.01  8.16 22.9
## 94  396.33  6.21 25.0
## 95  396.90 10.59 20.6
## 96  357.98  6.65 28.4
## 97  391.83 11.34 21.4
## 98  396.90  4.21 38.7
## 99  393.53  3.57 43.8
## 100 396.90  6.19 33.2
## 101 394.76  9.42 27.5
## 102 395.58  7.67   NA
## 103  70.80 10.63 18.6
## 104 394.47 13.44 19.3
## 105 392.69 12.33 20.1
## 106 394.05 16.47 19.5
## 107 395.67 18.66 19.5
## 108 387.69 14.09 20.4
## 109 395.24 12.27 19.8
## 110 391.23 15.55 19.4
## 111 393.49 13.00 21.7
## 112 395.59 10.16 22.8
## 113 394.95 16.21 18.8
## 114 396.90 17.09 18.7
## 115 388.74 10.45 18.5
## 116 344.91 15.76 18.3
```

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## 117 393.30 12.04 21.2
## 118 394.51 10.30 19.2
## 119 338.63 15.37 20.4
## 120 391.50 13.61   NA
## 121 389.15 14.37 22.0
## 122 377.67 14.27 20.3
## 123 378.09 17.93 20.5
## 124 370.31 25.41 17.3
## 125 379.38 17.58 18.8
## 126 385.02 14.81 21.4
## 127 359.29 27.26 15.7
## 128 392.11 17.19 16.2
## 129 396.90 15.39 18.0
## 130 396.90 18.34 14.3
## 131 395.04 12.60 19.2
## 132 396.90 12.26 19.6
## 133 385.76 11.12 23.0
## 134 388.69 15.03 18.4
## 135 262.76 17.31 15.6
## 136 394.67 16.96 18.1
## 137 378.25 16.90 17.4
## 138 394.08 14.59 17.1
## 139 392.04 21.32 13.3
## 140 396.90 18.46 17.8
## 141 388.08 24.16 14.0
## 142 396.90 34.41 14.4
## 143 396.90 26.82 13.4
## 144 396.90 26.42 15.6
## 145 396.90 29.29 11.8
## 146 172.91 27.80 13.8
## 147 169.27 16.65 15.6
## 148 391.71 29.53 14.6
## 149 356.99 28.32 17.8
## 150 351.85 21.45 15.4
## 151 372.80 14.10 21.5
## 152 341.60 13.28 19.6
## 153 343.28 12.12 15.3
## 154 261.95 15.79 19.4
## 155 321.02 15.12 17.0
## 156  88.01 15.02 15.6
## 157  88.63 16.14 13.1
## 158 363.43  4.59 41.3
## 159 353.89  6.43 24.3
## 160 364.31  7.39 23.3
## 161 338.92  5.50   NA
## 162 374.43  1.73 50.0
## 163 389.61  1.92 50.0
## 164 388.45  3.32   NA
## 165 395.11 11.64 22.7
## 166 240.16  9.81 25.0
## 167 369.30  3.70 50.0
## 168 227.61 12.14 23.8
## 169 297.09 11.10 23.8
## 170 330.04 11.32 22.3
```

```
## 171 292.29 14.43 17.4
## 172 348.13 12.03 19.1
## 173 396.90 14.69 23.1
## 174 395.50  9.04 23.6
## 175 393.23  9.64 22.6
## 176 390.96  5.33 29.4
## 177 393.23 10.11 23.2
## 178 395.60  6.29 24.6
## 179 391.27  6.92 29.9
## 180 396.90  5.04 37.2
## 181 395.56  7.56 39.8
## 182 396.90  9.45   NA
## 183 394.12  4.82 37.9
## 184 396.90  5.68 32.5
## 185 391.00 13.98 26.4
## 186 387.11 13.15 29.6
## 187 392.63  4.45 50.0
## 188 393.87  6.68 32.0
## 189 382.84  4.56 29.8
## 190 396.90  5.39 34.9
## 191 377.68  5.10 37.0
## 192 389.71  4.69 30.5
## 193 390.49  2.87 36.4
## 194 393.37  5.03 31.1
## 195 376.70  4.38 29.1
## 196 394.23  2.97   NA
## 197 396.90  4.08 33.3
## 198 354.31  8.61 30.3
## 199 392.20  6.62 34.6
## 200 396.90  4.56 34.9
## 201 384.30  4.45 32.9
## 202 393.77  7.43 24.1
## 203 395.38  3.11 42.3
## 204 392.78  3.81 48.5
## 205 390.55  2.88 50.0
## 206 396.90 10.87 22.6
## 207 394.87 10.97 24.4
## 208 389.43 18.06 22.5
## 209 381.32 14.66 24.4
## 210 396.90 23.09 20.0
## 211 393.25 17.27 21.7
## 212 395.24 23.98 19.3
## 213 390.94 16.03 22.4
## 214 385.81  9.38 28.1
## 215 348.93 29.55 23.7
## 216 393.63  9.47 25.0
## 217 392.80 13.51 23.3
## 218 392.78  9.69 28.7
## 219 396.90 17.92 21.5
## 220 393.74 10.50 23.0
## 221 391.70  9.71 26.7
## 222 395.24 21.46 21.7
## 223 390.39  9.93 27.5
## 224 396.90  7.60 30.1
```

```
## 225 385.05  4.14 44.8
## 226 382.00  4.63 50.0
## 227 387.38  3.13 37.6
## 228 372.08  6.36 31.6
## 229 377.51  3.92 46.7
## 230 380.34  3.76 31.5
## 231 378.35 11.65 24.3
## 232 376.14  5.25 31.7
## 233 385.91  2.47 41.7
## 234 378.95  3.95 48.3
## 235 360.20  8.05 29.0
## 236 376.75 10.88 24.0
## 237 388.45  9.54 25.1
## 238 390.07  4.73 31.5
## 239 379.41  6.36 23.7
## 240 383.78  7.37 23.3
## 241 391.25 11.38 22.0
## 242 394.62 12.40 20.1
## 243 372.75 11.22 22.2
## 244 374.71  5.19 23.7
## 245 372.49 12.50 17.6
## 246 389.13 18.46 18.5
## 247 390.18  9.16 24.3
## 248 376.14 10.15 20.5
## 249 374.71  9.52 24.5
## 250 393.74  6.56   NA
## 251 396.28  5.90 24.4
## 252 377.07  3.59 24.8
## 253 386.09  3.53 29.6
## 254 396.90  3.54 42.8
## 255 392.89  6.57 21.9
## 256 395.18  9.25 20.9
## 257 386.34  3.11 44.0
## 258 389.70  5.12 50.0
## 259 383.29  7.79 36.0
## 260 391.93  6.90 30.1
## 261 392.80  9.59 33.8
## 262 388.37  7.26 43.1
## 263 386.86  5.91 48.8
## 264 393.42 11.25 31.0
## 265 387.89  8.10 36.5
## 266 392.40 10.45   NA
## 267 384.07 14.79 30.7
## 268 384.54  7.44 50.0
## 269 390.30  3.16 43.5
## 270 391.34 13.65 20.7
## 271 388.65 13.00 21.1
## 272 396.90  6.59 25.2
## 273 394.96  7.73 24.4
## 274 390.77  6.58 35.2
## 275 396.90  3.53 32.4
## 276 396.90  2.98 32.0
## 277 389.25  6.05 33.2
## 278 393.45  4.16 33.1
```

```
## 279 396.90  7.19 29.1
## 280 396.90  4.85 35.1
## 281 387.31  3.76 45.4
## 282 392.23  4.59 35.4
## 283 377.07  3.01 46.0
## 284 395.52  3.16   NA
## 285 394.72  7.85 32.2
## 286 394.72  8.23 22.0
## 287 341.60 12.93 20.1
## 288 396.90  7.14 23.2
## 289 396.90  7.60 22.3
## 290 371.72  9.51 24.8
## 291 396.90  3.33 28.5
## 292 396.90  3.56   NA
## 293 396.90  4.70 27.9
## 294 396.90  8.58 23.9
## 295 396.90 10.40 21.7
## 296 396.90  6.27 28.6
## 297 392.85  7.39 27.1
## 298 396.90 15.84 20.3
## 299 368.24  4.97 22.5
## 300 371.58  4.74 29.0
## 301 390.86  6.07 24.8
## 302 395.75  9.50 22.0
## 303 383.61  8.67 26.4
## 304 390.43  4.86 33.1
## 305 393.68  6.93   NA
## 306 393.36  8.93 28.4
## 307 396.90  6.47 33.4
## 308 396.90  7.53 28.2
## 309 396.90  4.54 22.8
## 310 396.24  9.97 20.3
## 311 350.45 12.64 16.1
## 312 396.90  5.98 22.1
## 313 396.30 11.72 19.4
## 314 393.39  7.90 21.6
## 315 395.69  9.28 23.8
## 316 396.42 11.50 16.2
## 317 390.70 18.33 17.8
## 318 396.90 15.94 19.8
## 319 395.21 10.36   NA
## 320 396.23 12.73 21.0
## 321 396.90  7.20 23.8
## 322 396.90  6.87 23.1
## 323 396.90  7.70 20.4
## 324 391.13 11.74 18.5
## 325 396.90  6.12 25.0
## 326 393.68  5.08 24.6
## 327 396.90  6.15 23.0
## 328 396.90 12.79 22.2
## 329 382.44  9.97 19.3
## 330 375.21  7.34 22.6
## 331 368.57  9.09   NA
## 332 394.02 12.43 17.1
```

```
## 333 362.25  7.83 19.4
## 334 389.71  5.68 22.2
## 335 389.40  6.75 20.7
## 336 396.90  8.01   NA
## 337 396.90  9.80 19.5
## 338 394.81 10.56 18.5
## 339 396.14  8.51 20.6
## 340 396.90  9.74 19.0
## 341 396.90  9.29 18.7
## 342 394.74  5.49 32.7
## 343 389.96  8.65 16.5
## 344 396.90  7.18 23.9
## 345 387.97  4.61 31.2
## 346 385.64 10.53 17.5
## 347 364.61 12.67 17.2
## 348 392.43  6.36 23.1
## 349 390.94  5.99 24.5
## 350 389.85  5.89 26.6
## 351 396.90  5.98 22.9
## 352 370.78  5.49 24.1
## 353 392.33  7.79 18.6
## 354 384.46  4.50   NA
## 355 382.80  8.05 18.2
## 356 376.04  5.57 20.6
## 357 377.73 17.60 17.8
## 358 391.34 13.27 21.7
## 359 395.43 11.48 22.7
## 360 390.74 12.67 22.6
## 361 374.56  7.79 25.0
## 362 350.65 14.19 19.9
## 363 380.79 10.19 20.8
## 364 353.04 14.64 16.8
## 365 354.55  5.29 21.9
## 366 354.70  7.12 27.5
## 367 316.03 14.00 21.9
## 368 131.42 13.33   NA
## 369 375.52  3.26 50.0
## 370 375.33  3.73 50.0
## 371 392.05  2.96 50.0
## 372 366.15  9.53 50.0
## 373 347.88  8.88 50.0
## 374 396.90 34.77 13.8
## 375 396.90 37.97 13.8
## 376 396.90 13.44 15.0
## 377 363.02 23.24 13.9
## 378 396.90 21.24 13.3
## 379 396.90 23.69 13.1
## 380 393.74 21.78 10.2
## 381 396.90 17.21 10.4
## 382 396.90 21.08 10.9
## 383 396.90 23.60 11.3
## 384 396.90 24.56 12.3
## 385 285.83 30.63  8.8
## 386 396.90 30.81  7.2
```

```
## 387 396.90 28.28 10.5
## 388 396.90 31.99  7.4
## 389 372.92 30.62 10.2
## 390 396.90 20.85 11.5
## 391 394.43 17.11 15.1
## 392 378.38 18.76 23.2
## 393 396.90 25.68  9.7
## 394 396.90 15.17 13.8
## 395 396.90 16.35 12.7
## 396 391.98 17.12 13.1
## 397 396.90 19.37 12.5
## 398 393.10 19.92  8.5
## 399 396.90 30.59  5.0
## 400 338.16 29.97  6.3
## 401 396.90 26.77  5.6
## 402 396.90 20.32  7.2
## 403 376.11 20.31 12.1
## 404 396.90 19.77  8.3
## 405 329.46 27.38  8.5
## 406 384.97 22.98  5.0
## 407 370.22 23.34 11.9
## 408 332.09 12.13 27.9
## 409 314.64 26.40 17.2
## 410 179.36 19.78 27.5
## 411   2.60 10.11 15.0
## 412  35.05 21.22 17.2
## 413  28.79 34.37 17.9
## 414 210.97 20.08 16.3
## 415  88.27 36.98  7.0
## 416  27.25 29.05  7.2
## 417  21.57 25.79  7.5
## 418 127.36 26.64   NA
## 419  16.45 20.62  8.8
## 420  48.45 22.74  8.4
## 421 318.75 15.02 16.7
## 422 319.98 15.70 14.2
## 423 291.55 14.10 20.8
## 424   2.52 23.29 13.4
## 425   3.65 17.16 11.7
## 426   7.68 24.39  8.3
## 427  24.65 15.69 10.2
## 428  18.82 14.52 10.9
## 429  96.73 21.52 11.0
## 430  60.72 24.08  9.5
## 431  83.45 17.64 14.5
## 432  81.33 19.69 14.1
## 433  97.95 12.03 16.1
## 434 100.19 16.22 14.3
## 435 100.63 15.17 11.7
## 436 109.85 23.27 13.4
## 437  27.49 18.05  9.6
## 438   9.32 26.45  8.7
## 439  68.95 34.02  8.4
## 440 396.90 22.88 12.8
```

```
## 441 391.45 22.11 10.5
## 442 385.96 19.52 17.1
## 443 395.69 16.59 18.4
## 444 386.73 18.85 15.4
## 445 240.52 23.79 10.8
## 446  43.06 23.98 11.8
## 447 318.01 17.79 14.9
## 448 388.52 16.44 12.6
## 449 396.90 18.13 14.1
## 450 304.21 19.31 13.0
## 451   0.32 17.44 13.4
## 452 355.29 17.73 15.2
## 453 385.09 17.27 16.1
## 454 375.87 16.74 17.8
## 455   6.68 18.71 14.9
## 456  50.92 18.13 14.1
## 457  10.48 19.01 12.7
## 458   3.50 16.94 13.5
## 459 272.21 16.23 14.9
## 460 396.90 14.70 20.0
## 461 255.23 16.42 16.4
## 462 391.43 14.65 17.7
## 463 396.90 13.99 19.5
## 464 393.82 10.29 20.2
## 465 396.90 13.22 21.4
## 466 334.40 14.13 19.9
## 467  22.01 17.15 19.0
## 468 331.29 21.32 19.1
## 469 368.74 18.13 19.1
## 470 396.90 14.76 20.1
## 471 396.90 16.29 19.9
## 472 395.33 12.87 19.6
## 473 393.37 14.36 23.2
## 474 374.68 11.66 29.8
## 475 352.58 18.14 13.8
## 476 302.76 24.10   NA
## 477 396.21 18.68 16.7
## 478 349.48 24.91 12.0
## 479 379.70 18.03 14.6
## 480 383.32 13.11 21.4
## 481 396.90 10.74 23.0
## 482 393.07  7.74 23.7
## 483 395.28  7.01 25.0
## 484 392.92 10.42 21.8
## 485 370.73 13.34 20.6
## 486 388.62 10.58 21.2
## 487 392.68 14.98 19.1
## 488 388.22 11.45 20.6
## 489 395.09 18.06 15.2
## 490 344.05 23.97  7.0
## 491 318.43 29.68  8.1
## 492 390.11 18.07 13.6
## 493 396.90 13.35 20.1
## 494 396.90 12.01 21.8
```

```
## 495 396.90 13.59 24.5
## 496 393.29 17.60   NA
## 497 396.90 21.14 19.7
## 498 396.90 14.10 18.3
## 499 396.90 12.92   NA
## 500 395.77 15.10 17.5
## 501 396.90 14.33 16.8
## 502 391.99  9.67 22.4
## 503 396.90  9.08   NA
## 504 396.90  5.64 23.9
## 505 393.45  6.48 22.0
## 506 396.90  7.88 11.9
```

Impute data using Central measure (median)

```
median(mdata$crim, na.rm=T)
```

```
## [1] 0.25199
```

```
mdata$crim = ifelse(is.na(mdata$crim), median(mdata$crim, na.rm=T), mdata$crim)
mdata
```

```
##       X     crim    zn indus chas    nox    rm   age     dis rad tax ptratio
## 1     1  0.25199  18.0  2.31    0 0.5380 6.575  65.2  4.0900   1 296    15.3
## 2     2  0.02731   0.0  7.07    0 0.4690 6.421  78.9  4.9671   2 242    17.8
## 3     3  0.02729   0.0  7.07    0 0.4690 7.185  61.1  4.9671   2 242    17.8
## 4     4  0.03237   0.0    NA    0 0.4580 6.998  45.8  6.0622   3 222    18.7
## 5     5  0.06905   0.0  2.18    0 0.4580 7.147  54.2  6.0622   3 222    18.7
## 6     6  0.25199   0.0  2.18    0 0.4580 6.430  58.7  6.0622   3 222    18.7
## 7     7  0.08829  12.5  7.87    0 0.5240 6.012  66.6  5.5605   5 311    15.2
## 8     8  0.14455  12.5  7.87    0 0.5240 6.172  96.1  5.9505   5 311    15.2
## 9     9  0.25199  12.5  7.87    0 0.5240 5.631 100.0  6.0821   5 311    15.2
## 10   10  0.17004  12.5  7.87    0 0.5240 6.004  85.9  6.5921   5 311    15.2
## 11   11  0.22489  12.5  7.87    0 0.5240 6.377  94.3  6.3467   5 311    15.2
## 12   12  0.11747  12.5  7.87    0 0.5240 6.009  82.9  6.2267   5 311    15.2
## 13   13  0.09378  12.5  7.87    0 0.5240 5.889  39.0  5.4509   5 311    15.2
## 14   14  0.25199   0.0  8.14    0 0.5380 5.949  61.8  4.7075   4 307    21.0
## 15   15  0.63796   0.0  8.14    0 0.5380 6.096  84.5  4.4619   4 307    21.0
## 16   16  0.62739   0.0  8.14    0 0.5380 5.834  56.5  4.4986   4 307    21.0
## 17   17  1.05393   0.0  8.14    0 0.5380 5.935  29.3  4.4986   4 307    21.0
## 18   18  0.78420   0.0  8.14    0 0.5380 5.990  81.7  4.2579   4 307    21.0
## 19   19  0.80271   0.0  8.14    0 0.5380 5.456  36.6  3.7965   4 307    21.0
## 20   20  0.72580   0.0  8.14    0 0.5380 5.727  69.5  3.7965   4 307    21.0
## 21   21  1.25179   0.0  8.14    0 0.5380 5.570  98.1  3.7979   4 307    21.0
## 22   22  0.25199   0.0  8.14    0 0.5380 5.965  89.2  4.0123   4 307    21.0
## 23   23  1.23247   0.0  8.14    0 0.5380 6.142  91.7  3.9769   4 307    21.0
## 24   24  0.98843   0.0  8.14    0 0.5380 5.813 100.0  4.0952   4 307    21.0
## 25   25  0.75026   0.0  8.14    0 0.5380 5.924  94.1  4.3996   4 307    21.0
## 26   26  0.84054   0.0  8.14    0 0.5380 5.599  85.7  4.4546   4 307    21.0
## 27   27  0.67191   0.0  8.14    0 0.5380 5.813  90.3  4.6820   4 307    21.0
## 28   28  0.95577   0.0  8.14    0 0.5380 6.047  88.8  4.4534   4 307    21.0
## 29   29  0.77299   0.0  8.14    0 0.5380 6.495  94.4  4.4547   4 307    21.0
## 30   30  1.00245   0.0  8.14    0 0.5380 6.674  87.3  4.2390   4 307    21.0
```

```
## 31   31  1.13081   0.0  8.14    0 0.5380 5.713  94.1  4.2330   4 307    21.0
## 32   32  1.35472   0.0  8.14    0 0.5380 6.072 100.0  4.1750   4 307    21.0
## 33   33  1.38799   0.0  8.14    0 0.5380 5.950  82.0  3.9900   4 307    21.0
## 34   34  1.15172   0.0  8.14    0 0.5380 5.701  95.0  3.7872   4 307    21.0
## 35   35  1.61282   0.0  8.14    0 0.5380 6.096  96.9  3.7598   4 307    21.0
## 36   36  0.25199   0.0  5.96    0 0.4990 5.933  68.2  3.3603   5 279    19.2
## 37   37  0.09744   0.0  5.96    0 0.4990 5.841  61.4  3.3779   5 279    19.2
## 38   38  0.08014   0.0  5.96    0 0.4990 5.850  41.5  3.9342   5 279    19.2
## 39   39  0.17505   0.0  5.96    0 0.4990 5.966  30.2  3.8473   5 279    19.2
## 40   40  0.02763  75.0  2.95    0 0.4280 6.595  21.8  5.4011   3 252    18.3
## 41   41  0.03359  75.0  2.95    0 0.4280 7.024  15.8  5.4011   3 252    18.3
## 42   42  0.12744   0.0  6.91    0 0.4480 6.770   2.9  5.7209   3 233    17.9
## 43   43  0.14150   0.0  6.91    0 0.4480 6.169   6.6  5.7209   3 233    17.9
## 44   44  0.15936   0.0  6.91    0 0.4480 6.211   6.5  5.7209   3 233    17.9
## 45   45  0.12269   0.0  6.91    0 0.4480 6.069  40.0  5.7209   3 233    17.9
## 46   46  0.17142   0.0  6.91    0 0.4480 5.682  33.8  5.1004   3 233    17.9
## 47   47  0.18836   0.0  6.91    0 0.4480 5.786  33.3  5.1004   3 233    17.9
## 48   48  0.22927   0.0  6.91    0 0.4480    NA  85.5  5.6894   3 233    17.9
## 49   49  0.25387   0.0  6.91    0 0.4480 5.399  95.3  5.8700   3 233    17.9
## 50   50  0.21977   0.0  6.91    0 0.4480 5.602  62.0  6.0877   3 233    17.9
## 51   51  0.08873  21.0  5.64    0 0.4390 5.963  45.7  6.8147   4 243    16.8
## 52   52  0.04337  21.0  5.64    0 0.4390 6.115  63.0  6.8147   4 243    16.8
## 53   53  0.05360  21.0  5.64    0 0.4390 6.511  21.1  6.8147   4 243    16.8
## 54   54  0.04981  21.0  5.64    0 0.4390 5.998  21.4  6.8147   4 243    16.8
## 55   55  0.25199  75.0  4.00    0 0.4100 5.888  47.6  7.3197   3 469    21.1
## 56   56  0.01311  90.0  1.22    0 0.4030 7.249  21.9  8.6966   5 226    17.9
## 57   57  0.02055  85.0  0.74    0 0.4100 6.383  35.7  9.1876   2 313    17.3
## 58   58  0.01432 100.0  1.32    0 0.4110 6.816  40.5  8.3248   5 256    15.1
## 59   59  0.15445  25.0  5.13    0 0.4530 6.145  29.2  7.8148   8 284    19.7
## 60   60  0.10328  25.0  5.13    0 0.4530 5.927  47.2  6.9320   8 284    19.7
## 61   61  0.25199  25.0  5.13    0 0.4530 5.741  66.2  7.2254   8 284    19.7
## 62   62  0.17171  25.0  5.13    0 0.4530 5.966  93.4  6.8185   8 284    19.7
## 63   63  0.11027  25.0  5.13    0 0.4530 6.456  67.8  7.2255   8 284    19.7
## 64   64  0.12650  25.0  5.13    0 0.4530 6.762  43.4  7.9809   8 284    19.7
## 65   65  0.01951  17.5  1.38    0 0.4161 7.104  59.5  9.2229   3 216    18.6
## 66   66  0.03584  80.0    NA    0 0.3980 6.290  17.8  6.6115   4 337    16.1
## 67   67  0.04379  80.0  3.37    0 0.3980 5.787  31.1  6.6115   4 337    16.1
## 68   68  0.05789  12.5  6.07    0 0.4090 5.878  21.4  6.4980   4 345    18.9
## 69   69  0.13554  12.5  6.07    0 0.4090 5.594  36.8  6.4980   4 345    18.9
## 70   70  0.25199  12.5  6.07    0 0.4090 5.885  33.0  6.4980   4 345    18.9
## 71   71  0.08826   0.0 10.81    0 0.4130 6.417   6.6  5.2873   4 305    19.2
## 72   72  0.15876   0.0 10.81    0 0.4130 5.961  17.5  5.2873   4 305    19.2
## 73   73  0.09164   0.0 10.81    0 0.4130 6.065   7.8  5.2873   4 305    19.2
## 74   74  0.19539   0.0 10.81    0 0.4130 6.245   6.2  5.2873   4 305    19.2
## 75   75  0.07896   0.0 12.83    0 0.4370 6.273   6.0  4.2515   5 398    18.7
## 76   76  0.09512   0.0 12.83    0 0.4370 6.286  45.0  4.5026   5 398    18.7
## 77   77  0.10153   0.0 12.83    0 0.4370 6.279  74.5  4.0522   5 398    18.7
## 78   78  0.08707   0.0 12.83    0 0.4370 6.140  45.8  4.0905   5 398    18.7
## 79   79  0.05646   0.0 12.83    0 0.4370 6.232  53.7  5.0141   5 398    18.7
## 80   80  0.08387   0.0 12.83    0 0.4370 5.874  36.6  4.5026   5 398    18.7
## 81   81  0.04113  25.0  4.86    0 0.4260 6.727  33.5  5.4007   4 281    19.0
## 82   82  0.25199  25.0  4.86    0 0.4260 6.619  70.4  5.4007   4 281    19.0
## 83   83  0.03659  25.0  4.86    0 0.4260 6.302  32.2  5.4007   4 281    19.0
## 84   84  0.25199  25.0  4.86    0 0.4260 6.167  46.7  5.4007   4 281    19.0
```

```
## 85   85  0.05059   0.0  4.49    0 0.4490 6.389  48.0  4.7794   3 247    18.5
## 86   86  0.05735   0.0  4.49    0 0.4490 6.630  56.1  4.4377   3 247    18.5
## 87   87  0.05188   0.0  4.49    0 0.4490 6.015  45.1  4.4272   3 247    18.5
## 88   88  0.07151   0.0  4.49    0 0.4490 6.121  56.8  3.7476   3 247    18.5
## 89   89  0.05660   0.0  3.41    0 0.4890 7.007  86.3  3.4217   2 270    17.8
## 90   90  0.05302   0.0  3.41    0 0.4890 7.079  63.1  3.4145   2 270    17.8
## 91   91  0.04684   0.0  3.41    0 0.4890 6.417  66.1  3.0923   2 270    17.8
## 92   92  0.03932   0.0  3.41    0 0.4890 6.405  73.9  3.0921   2 270    17.8
## 93   93  0.04203  28.0 15.04    0 0.4640 6.442  53.6  3.6659   4 270    18.2
## 94   94  0.25199  28.0 15.04    0 0.4640 6.211  28.9  3.6659   4 270    18.2
## 95   95  0.04294  28.0 15.04    0 0.4640 6.249  77.3  3.6150   4 270    18.2
## 96   96  0.25199   0.0  2.89    0 0.4450 6.625  57.8  3.4952   2 276    18.0
## 97   97  0.11504   0.0  2.89    0 0.4450 6.163  69.6  3.4952   2 276    18.0
## 98   98  0.12083   0.0  2.89    0 0.4450 8.069  76.0  3.4952   2 276    18.0
## 99   99  0.08187   0.0  2.89    0 0.4450 7.820  36.9  3.4952   2 276    18.0
## 100 100  0.06860   0.0  2.89    0 0.4450 7.416  62.5  3.4952   2 276    18.0
## 101 101  0.14866   0.0  8.56    0 0.5200 6.727  79.9  2.7778   5 384    20.9
## 102 102  0.11432   0.0  8.56    0 0.5200 6.781  71.3  2.8561   5 384    20.9
## 103 103  0.25199   0.0  8.56    0 0.5200 6.405  85.4  2.7147   5 384    20.9
## 104 104  0.25199   0.0  8.56    0 0.5200 6.137  87.4  2.7147   5 384    20.9
## 105 105  0.13960   0.0  8.56    0 0.5200 6.167  90.0  2.4210   5 384    20.9
## 106 106  0.25199   0.0  8.56    0 0.5200 5.851  96.7  2.1069   5 384    20.9
## 107 107  0.17120   0.0    NA    0 0.5200 5.836  91.9  2.2110   5 384    20.9
## 108 108  0.13117   0.0  8.56    0 0.5200 6.127  85.2  2.1224   5 384    20.9
## 109 109  0.12802   0.0  8.56    0 0.5200 6.474  97.1  2.4329   5 384    20.9
## 110 110  0.26363   0.0  8.56    0 0.5200 6.229  91.2  2.5451   5 384    20.9
## 111 111  0.10793   0.0  8.56    0 0.5200 6.195  54.4  2.7778   5 384    20.9
## 112 112  0.10084   0.0 10.01    0 0.5470 6.715  81.6  2.6775   6 432    17.8
## 113 113  0.12329   0.0 10.01    0 0.5470 5.913  92.9  2.3534   6 432    17.8
## 114 114  0.22212   0.0 10.01    0 0.5470 6.092  95.4  2.5480   6 432    17.8
## 115 115  0.14231   0.0 10.01    0 0.5470 6.254  84.2  2.2565   6 432    17.8
## 116 116  0.17134   0.0 10.01    0 0.5470 5.928  88.2  2.4631   6 432    17.8
## 117 117  0.13158   0.0 10.01    0 0.5470 6.176  72.5  2.7301   6 432    17.8
## 118 118  0.15098   0.0 10.01    0 0.5470 6.021  82.6  2.7474   6 432    17.8
## 119 119  0.13058   0.0 10.01    0 0.5470 5.872  73.1  2.4775   6 432    17.8
## 120 120  0.14476   0.0 10.01    0 0.5470 5.731  65.2  2.7592   6 432    17.8
## 121 121  0.06899   0.0 25.65    0 0.5810 5.870  69.7  2.2577   2 188    19.1
## 122 122  0.07165   0.0 25.65    0 0.5810 6.004  84.1  2.1974   2 188    19.1
## 123 123  0.09299   0.0 25.65    0 0.5810 5.961  92.9  2.0869   2 188    19.1
## 124 124  0.25199   0.0 25.65    0 0.5810 5.856  97.0  1.9444   2 188    19.1
## 125 125  0.09849   0.0 25.65    0 0.5810 5.879  95.8  2.0063   2 188    19.1
## 126 126  0.16902   0.0 25.65    0 0.5810 5.986  88.4  1.9929   2 188    19.1
## 127 127  0.38735   0.0 25.65    0 0.5810 5.613  95.6  1.7572   2 188    19.1
## 128 128  0.25915   0.0 21.89    0 0.6240 5.693  96.0  1.7883   4 437    21.2
## 129 129  0.25199   0.0 21.89    0 0.6240 6.431  98.8  1.8125   4 437    21.2
## 130 130  0.25199   0.0 21.89    0 0.6240 5.637  94.7  1.9799   4 437    21.2
## 131 131  0.34006   0.0 21.89    0 0.6240 6.458  98.9  2.1185   4 437    21.2
## 132 132  1.19294   0.0 21.89    0 0.6240 6.326  97.7  2.2710   4 437    21.2
## 133 133  0.25199   0.0 21.89    0 0.6240 6.372  97.9  2.3274   4 437    21.2
## 134 134  0.32982   0.0 21.89    0 0.6240 5.822  95.4  2.4699   4 437    21.2
## 135 135  0.25199   0.0 21.89    0 0.6240 5.757  98.4  2.3460   4 437    21.2
## 136 136  0.55778   0.0 21.89    0 0.6240 6.335  98.2  2.1107   4 437    21.2
## 137 137  0.32264   0.0 21.89    0 0.6240 5.942  93.5  1.9669   4 437    21.2
## 138 138  0.35233   0.0 21.89    0 0.6240 6.454  98.4  1.8498   4 437    21.2
```

```
## 139 139  0.24980   0.0 21.89    0 0.6240 5.857  98.2  1.6686   4 437    21.2
## 140 140  0.54452   0.0 21.89    0 0.6240 6.151  97.9  1.6687   4 437    21.2
## 141 141  0.29090   0.0 21.89    0 0.6240 6.174  93.6  1.6119   4 437    21.2
## 142 142  1.62864   0.0 21.89    0 0.6240 5.019 100.0  1.4394   4 437    21.2
## 143 143  3.32105   0.0 19.58    1 0.8710 5.403 100.0  1.3216   5 403    14.7
## 144 144  4.09740   0.0 19.58    0 0.8710 5.468 100.0  1.4118   5 403    14.7
## 145 145  2.77974   0.0 19.58    0 0.8710 4.903  97.8  1.3459   5 403    14.7
## 146 146  2.37934   0.0 19.58    0 0.8710 6.130 100.0  1.4191   5 403    14.7
## 147 147  2.15505   0.0 19.58    0 0.8710 5.628 100.0  1.5166   5 403    14.7
## 148 148  2.36862   0.0 19.58    0 0.8710 4.926  95.7  1.4608   5 403    14.7
## 149 149  2.33099   0.0 19.58    0 0.8710 5.186  93.8  1.5296   5 403    14.7
## 150 150  0.25199   0.0 19.58    0 0.8710 5.597  94.9  1.5257   5 403    14.7
## 151 151  1.65660   0.0 19.58    0 0.8710 6.122  97.3  1.6180   5 403    14.7
## 152 152  0.25199   0.0 19.58    0 0.8710 5.404 100.0  1.5916   5 403    14.7
## 153 153  1.12658   0.0 19.58    1 0.8710 5.012  88.0  1.6102   5 403    14.7
## 154 154  2.14918   0.0 19.58    0 0.8710 5.709  98.5  1.6232   5 403    14.7
## 155 155  1.41385   0.0 19.58    1 0.8710 6.129  96.0  1.7494   5 403    14.7
## 156 156  3.53501   0.0 19.58    1 0.8710 6.152  82.6  1.7455   5 403    14.7
## 157 157  0.25199   0.0 19.58    0 0.8710 5.272  94.0  1.7364   5 403    14.7
## 158 158  1.22358   0.0 19.58    0 0.6050 6.943  97.4  1.8773   5 403    14.7
## 159 159  1.34284   0.0 19.58    0 0.6050    NA 100.0  1.7573   5 403    14.7
## 160 160  0.25199   0.0 19.58    0 0.8710 6.510 100.0  1.7659   5 403    14.7
## 161 161  1.27346   0.0 19.58    1 0.6050 6.250  92.6  1.7984   5 403    14.7
## 162 162  1.46336   0.0 19.58    0 0.6050 7.489  90.8  1.9709   5 403    14.7
## 163 163  0.25199   0.0 19.58    1 0.6050 7.802  98.2  2.0407   5 403    14.7
## 164 164  1.51902   0.0 19.58    1 0.6050 8.375  93.9  2.1620   5 403    14.7
## 165 165  2.24236   0.0 19.58    0 0.6050 5.854  91.8  2.4220   5 403    14.7
## 166 166  2.92400   0.0 19.58    0 0.6050 6.101  93.0  2.2834   5 403    14.7
## 167 167  2.01019   0.0 19.58    0 0.6050 7.929  96.2  2.0459   5 403    14.7
## 168 168  1.80028   0.0 19.58    0 0.6050 5.877  79.2  2.4259   5 403    14.7
## 169 169  2.30040   0.0 19.58    0 0.6050 6.319  96.1  2.1000   5 403    14.7
## 170 170  2.44953   0.0 19.58    0 0.6050 6.402  95.2  2.2625   5 403    14.7
## 171 171  0.25199   0.0 19.58    0 0.6050 5.875  94.6  2.4259   5 403    14.7
## 172 172  2.31390   0.0 19.58    0 0.6050 5.880  97.3  2.3887   5 403    14.7
## 173 173  0.13914   0.0  4.05    0 0.5100 5.572  88.5  2.5961   5 296    16.6
## 174 174  0.25199   0.0  4.05    0 0.5100 6.416  84.1  2.6463   5 296    16.6
## 175 175  0.08447   0.0  4.05    0 0.5100 5.859  68.7  2.7019   5 296    16.6
## 176 176  0.06664   0.0  4.05    0 0.5100 6.546  33.1  3.1323   5 296    16.6
## 177 177  0.07022   0.0  4.05    0 0.5100 6.020  47.2  3.5549   5 296    16.6
## 178 178  0.05425   0.0  4.05    0 0.5100 6.315  73.4  3.3175   5 296    16.6
## 179 179  0.06642   0.0  4.05    0 0.5100 6.860  74.4  2.9153   5 296    16.6
## 180 180  0.05780   0.0  2.46    0 0.4880 6.980  58.4  2.8290   3 193    17.8
## 181 181  0.25199   0.0  2.46    0 0.4880 7.765  83.3  2.7410   3 193    17.8
## 182 182  0.06888   0.0  2.46    0 0.4880 6.144  62.2  2.5979   3 193    17.8
## 183 183  0.09103   0.0  2.46    0 0.4880 7.155  92.2  2.7006   3 193    17.8
## 184 184  0.10008   0.0  2.46    0 0.4880 6.563  95.6  2.8470   3 193    17.8
## 185 185  0.08308   0.0  2.46    0 0.4880 5.604  89.8  2.9879   3 193    17.8
## 186 186  0.06047   0.0  2.46    0 0.4880 6.153  68.8  3.2797   3 193    17.8
## 187 187  0.05602   0.0    NA    0 0.4880 7.831  53.6  3.1992   3 193    17.8
## 188 188  0.07875  45.0  3.44    0 0.4370 6.782  41.1  3.7886   5 398    15.2
## 189 189  0.12579  45.0  3.44    0 0.4370 6.556  29.1  4.5667   5 398    15.2
## 190 190  0.08370  45.0  3.44    0 0.4370 7.185  38.9  4.5667   5 398    15.2
## 191 191  0.09068  45.0  3.44    0 0.4370 6.951  21.5  6.4798   5 398    15.2
## 192 192  0.06911  45.0  3.44    0 0.4370 6.739  30.8  6.4798   5 398    15.2
```

```
## 193 193  0.08664  45.0  3.44    0 0.4370 7.178  26.3  6.4798   5 398    15.2
## 194 194  0.02187  60.0  2.93    0 0.4010 6.800   9.9  6.2196   1 265    15.6
## 195 195  0.01439  60.0  2.93    0 0.4010 6.604  18.8  6.2196   1 265    15.6
## 196 196  0.01381  80.0  0.46    0 0.4220 7.875  32.0  5.6484   4 255    14.4
## 197 197  0.04011  80.0  1.52    0 0.4040 7.287  34.1  7.3090   2 329    12.6
## 198 198  0.04666  80.0  1.52    0 0.4040 7.107  36.6  7.3090   2 329    12.6
## 199 199  0.03768  80.0  1.52    0 0.4040 7.274  38.3  7.3090   2 329    12.6
## 200 200  0.03150  95.0  1.47    0 0.4030 6.975  15.3  7.6534   3 402    17.0
## 201 201  0.25199  95.0  1.47    0 0.4030 7.135  13.9  7.6534   3 402    17.0
## 202 202  0.03445  82.5  2.03    0 0.4150 6.162  38.4  6.2700   2 348    14.7
## 203 203  0.02177  82.5  2.03    0 0.4150 7.610  15.7  6.2700   2 348    14.7
## 204 204  0.03510  95.0  2.68    0 0.4161 7.853  33.2  5.1180   4 224    14.7
## 205 205  0.02009  95.0  2.68    0 0.4161 8.034  31.9  5.1180   4 224    14.7
## 206 206  0.13642   0.0 10.59    0 0.4890 5.891  22.3  3.9454   4 277    18.6
## 207 207  0.25199   0.0 10.59    0 0.4890 6.326  52.5  4.3549   4 277    18.6
## 208 208  0.25199   0.0 10.59    0 0.4890 5.783  72.7  4.3549   4 277    18.6
## 209 209  0.13587   0.0 10.59    1 0.4890 6.064  59.1  4.2392   4 277    18.6
## 210 210  0.43571   0.0 10.59    1 0.4890 5.344 100.0  3.8750   4 277    18.6
## 211 211  0.17446   0.0 10.59    1 0.4890 5.960  92.1  3.8771   4 277    18.6
## 212 212  0.37578   0.0 10.59    1 0.4890 5.404  88.6  3.6650   4 277    18.6
## 213 213  0.21719   0.0 10.59    1 0.4890 5.807  53.8  3.6526   4 277    18.6
## 214 214  0.14052   0.0 10.59    0 0.4890 6.375  32.3  3.9454   4 277    18.6
## 215 215  0.28955   0.0 10.59    0 0.4890 5.412   9.8  3.5875   4 277    18.6
## 216 216  0.19802   0.0 10.59    0 0.4890 6.182  42.4  3.9454   4 277    18.6
## 217 217  0.04560   0.0 13.89    1 0.5500 5.888  56.0  3.1121   5 276    16.4
## 218 218  0.07013   0.0 13.89    0 0.5500 6.642  85.1  3.4211   5 276    16.4
## 219 219  0.11069   0.0 13.89    1 0.5500 5.951  93.8  2.8893   5 276    16.4
## 220 220  0.11425   0.0 13.89    1 0.5500 6.373  92.4  3.3633   5 276    16.4
## 221 221  0.35809   0.0  6.20    1 0.5070 6.951  88.5  2.8617   8 307    17.4
## 222 222  0.40771   0.0  6.20    1 0.5070 6.164  91.3  3.0480   8 307    17.4
## 223 223  0.62356   0.0  6.20    1 0.5070 6.879  77.7  3.2721   8 307    17.4
## 224 224  0.61470   0.0    NA    0 0.5070 6.618  80.8  3.2721   8 307    17.4
## 225 225  0.25199   0.0  6.20    0 0.5040 8.266  78.3  2.8944   8 307    17.4
## 226 226  0.52693   0.0  6.20    0 0.5040 8.725  83.0  2.8944   8 307    17.4
## 227 227  0.38214   0.0  6.20    0 0.5040 8.040  86.5  3.2157   8 307    17.4
## 228 228  0.41238   0.0  6.20    0 0.5040 7.163  79.9  3.2157   8 307    17.4
## 229 229  0.29819   0.0  6.20    0 0.5040 7.686  17.0  3.3751   8 307    17.4
## 230 230  0.44178   0.0  6.20    0 0.5040 6.552  21.4  3.3751   8 307    17.4
## 231 231  0.53700   0.0  6.20    0 0.5040 5.981  68.1  3.6715   8 307    17.4
## 232 232  0.46296   0.0  6.20    0 0.5040 7.412  76.9  3.6715   8 307    17.4
## 233 233  0.57529   0.0  6.20    0 0.5070 8.337  73.3  3.8384   8 307    17.4
## 234 234  0.33147   0.0  6.20    0 0.5070 8.247  70.4  3.6519   8 307    17.4
## 235 235  0.44791   0.0  6.20    1 0.5070 6.726  66.5  3.6519   8 307    17.4
## 236 236  0.33045   0.0  6.20    0 0.5070 6.086  61.5  3.6519   8 307    17.4
## 237 237  0.52058   0.0  6.20    1 0.5070 6.631  76.5  4.1480   8 307    17.4
## 238 238  0.51183   0.0  6.20    0 0.5070 7.358  71.6  4.1480   8 307    17.4
## 239 239  0.08244  30.0  4.93    0 0.4280 6.481  18.5  6.1899   6 300    16.6
## 240 240  0.09252  30.0  4.93    0 0.4280 6.606  42.2  6.1899   6 300    16.6
## 241 241  0.11329  30.0  4.93    0 0.4280 6.897  54.3  6.3361   6 300    16.6
## 242 242  0.10612  30.0  4.93    0 0.4280 6.095  65.1  6.3361   6 300    16.6
## 243 243  0.10290  30.0    NA    0 0.4280 6.358  52.9  7.0355   6 300    16.6
## 244 244  0.12757  30.0  4.93    0 0.4280 6.393   7.8  7.0355   6 300    16.6
## 245 245  0.20608  22.0  5.86    0 0.4310 5.593  76.5  7.9549   7 330    19.1
## 246 246  0.19133  22.0  5.86    0 0.4310 5.605  70.2  7.9549   7 330    19.1
```

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## 247 247  0.33983  22.0  5.86    0 0.4310 6.108  34.9  8.0555   7 330    19.1
## 248 248  0.19657  22.0  5.86    0 0.4310 6.226  79.2  8.0555   7 330    19.1
## 249 249  0.16439  22.0  5.86    0 0.4310 6.433  49.1  7.8265   7 330    19.1
## 250 250  0.19073  22.0  5.86    0 0.4310 6.718  17.5  7.8265   7 330    19.1
## 251 251  0.14030  22.0  5.86    0 0.4310 6.487  13.0  7.3967   7 330    19.1
## 252 252  0.21409  22.0  5.86    0 0.4310 6.438   8.9  7.3967   7 330    19.1
## 253 253  0.08221  22.0  5.86    0 0.4310 6.957   6.8  8.9067   7 330    19.1
## 254 254  0.36894  22.0  5.86    0 0.4310 8.259   8.4  8.9067   7 330    19.1
## 255 255  0.04819  80.0  3.64    0 0.3920 6.108  32.0  9.2203   1 315    16.4
## 256 256  0.03548  80.0  3.64    0 0.3920 5.876  19.1  9.2203   1 315    16.4
## 257 257  0.01538  90.0  3.75    0 0.3940 7.454  34.2  6.3361   3 244    15.9
## 258 258  0.25199  20.0  3.97    0 0.6470 8.704  86.9  1.8010   5 264    13.0
## 259 259  0.66351  20.0  3.97    0 0.6470 7.333 100.0  1.8946   5 264    13.0
## 260 260  0.65665  20.0  3.97    0 0.6470 6.842 100.0  2.0107   5 264    13.0
## 261 261  0.54011  20.0  3.97    0 0.6470 7.203  81.8  2.1121   5 264    13.0
## 262 262  0.53412  20.0  3.97    0 0.6470 7.520  89.4  2.1398   5 264    13.0
## 263 263  0.52014  20.0  3.97    0 0.6470 8.398  91.5  2.2885   5 264    13.0
## 264 264  0.82526  20.0  3.97    0 0.6470 7.327  94.5  2.0788   5 264    13.0
## 265 265  0.55007  20.0  3.97    0 0.6470 7.206  91.6  1.9301   5 264    13.0
## 266 266  0.76162  20.0  3.97    0 0.6470 5.560  62.8  1.9865   5 264    13.0
## 267 267  0.78570  20.0  3.97    0 0.6470 7.014  84.6  2.1329   5 264    13.0
## 268 268  0.57834  20.0  3.97    0 0.5750 8.297  67.0  2.4216   5 264    13.0
## 269 269  0.54050  20.0  3.97    0 0.5750 7.470  52.6  2.8720   5 264    13.0
## 270 270  0.09065  20.0  6.96    1 0.4640 5.920  61.5  3.9175   3 223    18.6
## 271 271  0.29916  20.0  6.96    0 0.4640 5.856  42.1  4.4290   3 223    18.6
## 272 272  0.16211  20.0  6.96    0 0.4640 6.240  16.3  4.4290   3 223    18.6
## 273 273  0.11460  20.0  6.96    0 0.4640 6.538  58.7  3.9175   3 223    18.6
## 274 274  0.22188  20.0  6.96    1 0.4640 7.691  51.8  4.3665   3 223    18.6
## 275 275  0.05644  40.0  6.41    1 0.4470 6.758  32.9  4.0776   4 254    17.6
## 276 276  0.09604  40.0  6.41    0 0.4470 6.854  42.8  4.2673   4 254    17.6
## 277 277  0.10469  40.0  6.41    1 0.4470 7.267  49.0  4.7872   4 254    17.6
## 278 278  0.06127  40.0  6.41    1 0.4470 6.826  27.6  4.8628   4 254    17.6
## 279 279  0.07978  40.0  6.41    0 0.4470 6.482  32.1  4.1403   4 254    17.6
## 280 280  0.21038  20.0  3.33    0 0.4429 6.812  32.2  4.1007   5 216    14.9
## 281 281  0.03578  20.0  3.33    0 0.4429 7.820  64.5  4.6947   5 216    14.9
## 282 282  0.03705  20.0  3.33    0 0.4429 6.968  37.2  5.2447   5 216    14.9
## 283 283  0.06129  20.0  3.33    1 0.4429 7.645  49.7  5.2119   5 216    14.9
## 284 284  0.01501  90.0  1.21    1 0.4010 7.923  24.8  5.8850   1 198    13.6
## 285 285  0.00906  90.0  2.97    0 0.4000 7.088  20.8  7.3073   1 285    15.3
## 286 286  0.01096  55.0  2.25    0 0.3890 6.453  31.9  7.3073   1 300    15.3
## 287 287  0.01965  80.0  1.76    0 0.3850 6.230  31.5  9.0892   1 241    18.2
## 288 288  0.03871  52.5  5.32    0 0.4050 6.209  31.3  7.3172   6 293    16.6
## 289 289  0.04590  52.5    NA    0 0.4050 6.315  45.6  7.3172   6 293    16.6
## 290 290  0.04297  52.5  5.32    0 0.4050 6.565  22.9  7.3172   6 293    16.6
## 291 291  0.03502  80.0  4.95    0 0.4110 6.861  27.9  5.1167   4 245    19.2
## 292 292  0.07886  80.0  4.95    0 0.4110 7.148  27.7  5.1167   4 245    19.2
## 293 293  0.03615  80.0  4.95    0 0.4110 6.630  23.4  5.1167   4 245    19.2
## 294 294  0.08265   0.0 13.92    0 0.4370 6.127  18.4  5.5027   4 289    16.0
## 295 295  0.25199   0.0 13.92    0 0.4370 6.009  42.3  5.5027   4 289    16.0
## 296 296  0.12932   0.0 13.92    0 0.4370 6.678  31.1  5.9604   4 289    16.0
## 297 297  0.05372   0.0 13.92    0 0.4370 6.549  51.0  5.9604   4 289    16.0
## 298 298  0.14103   0.0 13.92    0 0.4370 5.790  58.0  6.3200   4 289    16.0
## 299 299  0.06466  70.0  2.24    0 0.4000 6.345  20.1  7.8278   5 358    14.8
## 300 300  0.05561  70.0  2.24    0 0.4000 7.041  10.0  7.8278   5 358    14.8
```

```
## 301 301  0.04417  70.0  2.24    0 0.4000 6.871  47.4  7.8278   5 358    14.8
## 302 302  0.03537  34.0  6.09    0 0.4330 6.590  40.4  5.4917   7 329    16.1
## 303 303  0.09266  34.0  6.09    0 0.4330 6.495  18.4  5.4917   7 329    16.1
## 304 304  0.10000  34.0  6.09    0 0.4330 6.982  17.7  5.4917   7 329    16.1
## 305 305  0.05515  33.0  2.18    0 0.4720 7.236  41.1  4.0220   7 222    18.4
## 306 306  0.05479  33.0  2.18    0 0.4720 6.616  58.1  3.3700   7 222    18.4
## 307 307  0.07503  33.0  2.18    0 0.4720 7.420  71.9  3.0992   7 222    18.4
## 308 308  0.04932  33.0  2.18    0 0.4720 6.849  70.3  3.1827   7 222    18.4
## 309 309  0.49298   0.0  9.90    0 0.5440 6.635  82.5  3.3175   4 304    18.4
## 310 310  0.25199   0.0  9.90    0 0.5440 5.972  76.7  3.1025   4 304    18.4
## 311 311  0.25199   0.0  9.90    0 0.5440 4.973  37.8  2.5194   4 304    18.4
## 312 312  0.79041   0.0  9.90    0 0.5440 6.122  52.8  2.6403   4 304    18.4
## 313 313  0.26169   0.0  9.90    0 0.5440 6.023  90.4  2.8340   4 304    18.4
## 314 314  0.26938   0.0  9.90    0 0.5440 6.266  82.8  3.2628   4 304    18.4
## 315 315  0.36920   0.0  9.90    0 0.5440 6.567  87.3  3.6023   4 304    18.4
## 316 316  0.25356   0.0  9.90    0 0.5440 5.705  77.7  3.9450   4 304    18.4
## 317 317  0.31827   0.0  9.90    0 0.5440 5.914  83.2  3.9986   4 304    18.4
## 318 318  0.24522   0.0  9.90    0 0.5440 5.782  71.7  4.0317   4 304    18.4
## 319 319  0.40202   0.0  9.90    0 0.5440 6.382  67.2  3.5325   4 304    18.4
## 320 320  0.47547   0.0  9.90    0 0.5440 6.113  58.8  4.0019   4 304    18.4
## 321 321  0.16760   0.0  7.38    0 0.4930 6.426  52.3  4.5404   5 287    19.6
## 322 322  0.18159   0.0  7.38    0 0.4930 6.376  54.3  4.5404   5 287    19.6
## 323 323  0.35114   0.0  7.38    0 0.4930 6.041  49.9  4.7211   5 287    19.6
## 324 324  0.28392   0.0  7.38    0 0.4930 5.708  74.3  4.7211   5 287    19.6
## 325 325  0.34109   0.0  7.38    0 0.4930 6.415  40.1  4.7211   5 287    19.6
## 326 326  0.19186   0.0  7.38    0 0.4930 6.431  14.7  5.4159   5 287    19.6
## 327 327  0.30347   0.0  7.38    0 0.4930 6.312  28.9  5.4159   5 287    19.6
## 328 328  0.24103   0.0  7.38    0 0.4930 6.083  43.7  5.4159   5 287    19.6
## 329 329  0.06617   0.0  3.24    0 0.4600 5.868  25.8  5.2146   4 430    16.9
## 330 330  0.06724   0.0  3.24    0 0.4600 6.333  17.2  5.2146   4 430    16.9
## 331 331  0.04544   0.0  3.24    0 0.4600 6.144  32.2  5.8736   4 430    16.9
## 332 332  0.05023  35.0  6.06    0 0.4379 5.706  28.4  6.6407   1 304    16.9
## 333 333  0.25199  35.0    NA    0 0.4379 6.031  23.3  6.6407   1 304    16.9
## 334 334  0.25199   0.0  5.19    0 0.5150 6.316  38.1  6.4584   5 224    20.2
## 335 335  0.03738   0.0  5.19    0 0.5150 6.310  38.5  6.4584   5 224    20.2
## 336 336  0.03961   0.0  5.19    0 0.5150 6.037  34.5  5.9853   5 224    20.2
## 337 337  0.03427   0.0  5.19    0 0.5150 5.869  46.3  5.2311   5 224    20.2
## 338 338  0.03041   0.0  5.19    0 0.5150 5.895  59.6  5.6150   5 224    20.2
## 339 339  0.03306   0.0  5.19    0 0.5150 6.059  37.3  4.8122   5 224    20.2
## 340 340  0.05497   0.0  5.19    0 0.5150 5.985  45.4  4.8122   5 224    20.2
## 341 341  0.06151   0.0  5.19    0 0.5150 5.968  58.5  4.8122   5 224    20.2
## 342 342  0.01301  35.0  1.52    0 0.4420 7.241  49.3  7.0379   1 284    15.5
## 343 343  0.02498   0.0  1.89    0 0.5180 6.540  59.7  6.2669   1 422    15.9
## 344 344  0.02543  55.0  3.78    0 0.4840 6.696  56.4  5.7321   5 370    17.6
## 345 345  0.03049  55.0  3.78    0 0.4840 6.874  28.1  6.4654   5 370    17.6
## 346 346  0.03113   0.0  4.39    0 0.4420 6.014  48.5  8.0136   3 352    18.8
## 347 347  0.25199   0.0  4.39    0 0.4420 5.898  52.3  8.0136   3 352    18.8
## 348 348  0.01870  85.0  4.15    0 0.4290 6.516  27.7  8.5353   4 351    17.9
## 349 349  0.25199  80.0  2.01    0 0.4350 6.635  29.7  8.3440   4 280    17.0
## 350 350  0.02899  40.0  1.25    0 0.4290 6.939  34.5  8.7921   1 335    19.7
## 351 351  0.06211  40.0  1.25    0 0.4290 6.490  44.4  8.7921   1 335    19.7
## 352 352  0.07950  60.0  1.69    0 0.4110 6.579  35.9 10.7103   4 411    18.3
## 353 353  0.07244  60.0  1.69    0 0.4110 5.884  18.5 10.7103   4 411    18.3
## 354 354  0.01709  90.0  2.02    0 0.4100 6.728  36.1 12.1265   5 187    17.0
```

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## 355 355  0.04301  80.0  1.91    0 0.4130 5.663  21.9 10.5857   4 334    22.0
## 356 356  0.10659  80.0  1.91    0 0.4130 5.936  19.5 10.5857   4 334    22.0
## 357 357  8.98296   0.0 18.10    1 0.7700 6.212  97.4  2.1222  24 666    20.2
## 358 358  3.84970   0.0 18.10    1 0.7700 6.395  91.0  2.5052  24 666    20.2
## 359 359  5.20177   0.0 18.10    1 0.7700 6.127  83.4  2.7227  24 666    20.2
## 360 360  4.26131   0.0 18.10    0 0.7700 6.112  81.3  2.5091  24 666    20.2
## 361 361  4.54192   0.0 18.10    0 0.7700 6.398  88.0  2.5182  24 666    20.2
## 362 362  3.83684   0.0 18.10    0 0.7700 6.251  91.1  2.2955  24 666    20.2
## 363 363  3.67822   0.0 18.10    0 0.7700 5.362  96.2  2.1036  24 666    20.2
## 364 364  0.25199   0.0 18.10    1 0.7700 5.803  89.0  1.9047  24 666    20.2
## 365 365  0.25199   0.0 18.10    1 0.7180 8.780  82.9  1.9047  24 666    20.2
## 366 366  0.25199   0.0 18.10    0 0.7180 3.561  87.9  1.6132  24 666    20.2
## 367 367  3.69695   0.0 18.10    0 0.7180 4.963  91.4  1.7523  24 666    20.2
## 368 368 13.52220   0.0 18.10    0 0.6310 3.863 100.0  1.5106  24 666    20.2
## 369 369  4.89822   0.0 18.10    0 0.6310 4.970 100.0  1.3325  24 666    20.2
## 370 370  5.66998   0.0 18.10    1 0.6310 6.683  96.8  1.3567  24 666    20.2
## 371 371  6.53876   0.0 18.10    1 0.6310 7.016  97.5  1.2024  24 666    20.2
## 372 372  9.23230   0.0 18.10    0 0.6310    NA 100.0  1.1691  24 666    20.2
## 373 373  8.26725   0.0 18.10    1 0.6680 5.875  89.6  1.1296  24 666    20.2
## 374 374 11.10810   0.0 18.10    0 0.6680 4.906 100.0  1.1742  24 666    20.2
## 375 375 18.49820   0.0 18.10    0 0.6680 4.138 100.0  1.1370  24 666    20.2
## 376 376 19.60910   0.0 18.10    0 0.6710 7.313  97.9  1.3163  24 666    20.2
## 377 377 15.28800   0.0 18.10    0 0.6710 6.649  93.3  1.3449  24 666    20.2
## 378 378  9.82349   0.0 18.10    0 0.6710 6.794  98.8  1.3580  24 666    20.2
## 379 379 23.64820   0.0 18.10    0 0.6710 6.380  96.2  1.3861  24 666    20.2
## 380 380 17.86670   0.0 18.10    0 0.6710 6.223 100.0  1.3861  24 666    20.2
## 381 381 88.97620   0.0 18.10    0 0.6710 6.968  91.9  1.4165  24 666    20.2
## 382 382 15.87440   0.0 18.10    0 0.6710 6.545  99.1  1.5192  24 666    20.2
## 383 383  0.25199   0.0 18.10    0 0.7000 5.536 100.0  1.5804  24 666    20.2
## 384 384  7.99248   0.0 18.10    0 0.7000 5.520 100.0  1.5331  24 666    20.2
## 385 385 20.08490   0.0 18.10    0 0.7000 4.368  91.2  1.4395  24 666    20.2
## 386 386 16.81180   0.0 18.10    0 0.7000 5.277  98.1  1.4261  24 666    20.2
## 387 387 24.39380   0.0 18.10    0 0.7000 4.652 100.0  1.4672  24 666    20.2
## 388 388 22.59710   0.0 18.10    0 0.7000 5.000  89.5  1.5184  24 666    20.2
## 389 389 14.33370   0.0 18.10    0 0.7000 4.880 100.0  1.5895  24 666    20.2
## 390 390  8.15174   0.0 18.10    0 0.7000 5.390  98.9  1.7281  24 666    20.2
## 391 391  6.96215   0.0 18.10    0 0.7000 5.713  97.0  1.9265  24 666    20.2
## 392 392  5.29305   0.0 18.10    0 0.7000 6.051  82.5  2.1678  24 666    20.2
## 393 393 11.57790   0.0 18.10    0 0.7000 5.036  97.0  1.7700  24 666    20.2
## 394 394  8.64476   0.0 18.10    0 0.6930 6.193  92.6  1.7912  24 666    20.2
## 395 395 13.35980   0.0 18.10    0 0.6930 5.887  94.7  1.7821  24 666    20.2
## 396 396  8.71675   0.0 18.10    0 0.6930 6.471  98.8  1.7257  24 666    20.2
## 397 397  5.87205   0.0 18.10    0 0.6930 6.405  96.0  1.6768  24 666    20.2
## 398 398  7.67202   0.0 18.10    0 0.6930 5.747  98.9  1.6334  24 666    20.2
## 399 399 38.35180   0.0 18.10    0 0.6930 5.453 100.0  1.4896  24 666    20.2
## 400 400  9.91655   0.0 18.10    0 0.6930    NA  77.8  1.5004  24 666    20.2
## 401 401 25.04610   0.0 18.10    0 0.6930 5.987 100.0  1.5888  24 666    20.2
## 402 402  0.25199   0.0 18.10    0 0.6930 6.343 100.0  1.5741  24 666    20.2
## 403 403  9.59571   0.0 18.10    0 0.6930 6.404 100.0  1.6390  24 666    20.2
## 404 404 24.80170   0.0 18.10    0 0.6930 5.349  96.0  1.7028  24 666    20.2
## 405 405 41.52920   0.0 18.10    0 0.6930 5.531  85.4  1.6074  24 666    20.2
## 406 406 67.92080   0.0 18.10    0 0.6930 5.683 100.0  1.4254  24 666    20.2
## 407 407 20.71620   0.0 18.10    0 0.6590 4.138 100.0  1.1781  24 666    20.2
## 408 408 11.95110   0.0 18.10    0 0.6590 5.608 100.0  1.2852  24 666    20.2
```

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## 409 409  7.40389   0.0 18.10    0 0.5970 5.617  97.9  1.4547  24 666    20.2
## 410 410 14.43830   0.0 18.10    0 0.5970 6.852 100.0  1.4655  24 666    20.2
## 411 411 51.13580   0.0 18.10    0 0.5970 5.757 100.0  1.4130  24 666    20.2
## 412 412 14.05070   0.0 18.10    0 0.5970 6.657 100.0  1.5275  24 666    20.2
## 413 413 18.81100   0.0    NA    0 0.5970 4.628 100.0  1.5539  24 666    20.2
## 414 414 28.65580   0.0 18.10    0 0.5970 5.155 100.0  1.5894  24 666    20.2
## 415 415  0.25199   0.0 18.10    0 0.6930 4.519 100.0  1.6582  24 666    20.2
## 416 416 18.08460   0.0 18.10    0 0.6790 6.434 100.0  1.8347  24 666    20.2
## 417 417 10.83420   0.0 18.10    0 0.6790 6.782  90.8  1.8195  24 666    20.2
## 418 418 25.94060   0.0 18.10    0 0.6790 5.304  89.1  1.6475  24 666    20.2
## 419 419 73.53410   0.0 18.10    0 0.6790 5.957 100.0  1.8026  24 666    20.2
## 420 420 11.81230   0.0 18.10    0 0.7180 6.824  76.5  1.7940  24 666    20.2
## 421 421  0.25199   0.0 18.10    0 0.7180 6.411 100.0  1.8589  24 666    20.2
## 422 422  7.02259   0.0 18.10    0 0.7180 6.006  95.3  1.8746  24 666    20.2
## 423 423  0.25199   0.0 18.10    0 0.6140 5.648  87.6  1.9512  24 666    20.2
## 424 424  7.05042   0.0 18.10    0 0.6140 6.103  85.1  2.0218  24 666    20.2
## 425 425  8.79212   0.0 18.10    0 0.5840    NA  70.6  2.0635  24 666    20.2
## 426 426 15.86030   0.0 18.10    0 0.6790 5.896  95.4  1.9096  24 666    20.2
## 427 427 12.24720   0.0 18.10    0 0.5840 5.837  59.7  1.9976  24 666    20.2
## 428 428 37.66190   0.0 18.10    0 0.6790 6.202  78.7  1.8629  24 666    20.2
## 429 429  7.36711   0.0 18.10    0 0.6790 6.193  78.1  1.9356  24 666    20.2
## 430 430  9.33889   0.0 18.10    0 0.6790 6.380  95.6  1.9682  24 666    20.2
## 431 431  8.49213   0.0 18.10    0 0.5840 6.348  86.1  2.0527  24 666    20.2
## 432 432 10.06230   0.0 18.10    0 0.5840 6.833  94.3  2.0882  24 666    20.2
## 433 433  6.44405   0.0 18.10    0 0.5840 6.425  74.8  2.2004  24 666    20.2
## 434 434  5.58107   0.0 18.10    0 0.7130 6.436  87.9  2.3158  24 666    20.2
## 435 435  0.25199   0.0    NA    0 0.7130 6.208  95.0  2.2222  24 666    20.2
## 436 436 11.16040   0.0 18.10    0 0.7400 6.629  94.6  2.1247  24 666    20.2
## 437 437  0.25199   0.0 18.10    0 0.7400 6.461  93.3  2.0026  24 666    20.2
## 438 438  0.25199   0.0 18.10    0 0.7400 6.152 100.0  1.9142  24 666    20.2
## 439 439 13.67810   0.0 18.10    0 0.7400 5.935  87.9  1.8206  24 666    20.2
## 440 440  9.39063   0.0 18.10    0 0.7400 5.627  93.9  1.8172  24 666    20.2
## 441 441 22.05110   0.0 18.10    0 0.7400 5.818  92.4  1.8662  24 666    20.2
## 442 442  9.72418   0.0 18.10    0 0.7400 6.406  97.2  2.0651  24 666    20.2
## 443 443  5.66637   0.0 18.10    0 0.7400 6.219 100.0  2.0048  24 666    20.2
## 444 444  9.96654   0.0 18.10    0 0.7400 6.485 100.0  1.9784  24 666    20.2
## 445 445  0.25199   0.0 18.10    0 0.7400 5.854  96.6  1.8956  24 666    20.2
## 446 446 10.67180   0.0 18.10    0 0.7400 6.459  94.8  1.9879  24 666    20.2
## 447 447  6.28807   0.0 18.10    0 0.7400 6.341  96.4  2.0720  24 666    20.2
## 448 448  9.92485   0.0 18.10    0 0.7400 6.251  96.6  2.1980  24 666    20.2
## 449 449  9.32909   0.0 18.10    0 0.7130 6.185  98.7  2.2616  24 666    20.2
## 450 450  7.52601   0.0 18.10    0 0.7130 6.417  98.3  2.1850  24 666    20.2
## 451 451  6.71772   0.0 18.10    0 0.7130 6.749  92.6  2.3236  24 666    20.2
## 452 452  5.44114   0.0 18.10    0 0.7130 6.655  98.2  2.3552  24 666    20.2
## 453 453  0.25199   0.0 18.10    0 0.7130 6.297  91.8  2.3682  24 666    20.2
## 454 454  8.24809   0.0 18.10    0 0.7130 7.393  99.3  2.4527  24 666    20.2
## 455 455  9.51363   0.0 18.10    0 0.7130 6.728  94.1  2.4961  24 666    20.2
## 456 456  4.75237   0.0 18.10    0 0.7130 6.525  86.5  2.4358  24 666    20.2
## 457 457  4.66883   0.0 18.10    0 0.7130 5.976  87.9  2.5806  24 666    20.2
## 458 458  8.20058   0.0 18.10    0 0.7130 5.936  80.3  2.7792  24 666    20.2
## 459 459  7.75223   0.0 18.10    0 0.7130 6.301  83.7  2.7831  24 666    20.2
## 460 460  6.80117   0.0 18.10    0 0.7130 6.081  84.4  2.7175  24 666    20.2
## 461 461  4.81213   0.0 18.10    0 0.7130 6.701  90.0  2.5975  24 666    20.2
## 462 462  3.69311   0.0 18.10    0 0.7130 6.376  88.4  2.5671  24 666    20.2
```

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## 463 463  6.65492   0.0 18.10    0 0.7130 6.317  83.0  2.7344  24 666    20.2
## 464 464  5.82115   0.0 18.10    0 0.7130 6.513  89.9  2.8016  24 666    20.2
## 465 465  7.83932   0.0 18.10    0 0.6550 6.209  65.4  2.9634  24 666    20.2
## 466 466  3.16360   0.0 18.10    0 0.6550 5.759  48.2  3.0665  24 666    20.2
## 467 467  3.77498   0.0 18.10    0 0.6550 5.952  84.7  2.8715  24 666    20.2
## 468 468  4.42228   0.0 18.10    0 0.5840 6.003  94.5  2.5403  24 666    20.2
## 469 469 15.57570   0.0 18.10    0 0.5800 5.926  71.0  2.9084  24 666    20.2
## 470 470 13.07510   0.0 18.10    0 0.5800 5.713  56.7  2.8237  24 666    20.2
## 471 471  4.34879   0.0 18.10    0 0.5800 6.167  84.0  3.0334  24 666    20.2
## 472 472  4.03841   0.0 18.10    0 0.5320 6.229  90.7  3.0993  24 666    20.2
## 473 473  3.56868   0.0 18.10    0 0.5800 6.437  75.0  2.8965  24 666    20.2
## 474 474  4.64689   0.0 18.10    0 0.6140 6.980  67.6  2.5329  24 666    20.2
## 475 475  8.05579   0.0 18.10    0 0.5840 5.427  95.4  2.4298  24 666    20.2
## 476 476  6.39312   0.0 18.10    0 0.5840 6.162  97.4  2.2060  24 666    20.2
## 477 477  4.87141   0.0 18.10    0 0.6140 6.484  93.6  2.3053  24 666    20.2
## 478 478 15.02340   0.0 18.10    0 0.6140 5.304  97.3  2.1007  24 666    20.2
## 479 479 10.23300   0.0 18.10    0 0.6140 6.185  96.7  2.1705  24 666    20.2
## 480 480 14.33370   0.0 18.10    0 0.6140 6.229  88.0  1.9512  24 666    20.2
## 481 481  5.82401   0.0 18.10    0 0.5320 6.242  64.7  3.4242  24 666    20.2
## 482 482  5.70818   0.0 18.10    0 0.5320 6.750  74.9  3.3317  24 666    20.2
## 483 483  5.73116   0.0 18.10    0 0.5320 7.061  77.0  3.4106  24 666    20.2
## 484 484  2.81838   0.0 18.10    0 0.5320 5.762  40.3  4.0983  24 666    20.2
## 485 485  2.37857   0.0 18.10    0 0.5830 5.871  41.9  3.7240  24 666    20.2
## 486 486  3.67367   0.0 18.10    0 0.5830 6.312  51.9  3.9917  24 666    20.2
## 487 487  5.69175   0.0 18.10    0 0.5830 6.114  79.8  3.5459  24 666    20.2
## 488 488  4.83567   0.0 18.10    0 0.5830 5.905  53.2  3.1523  24 666    20.2
## 489 489  0.15086   0.0 27.74    0 0.6090 5.454  92.7  1.8209   4 711    20.1
## 490 490  0.18337   0.0 27.74    0 0.6090 5.414  98.3  1.7554   4 711    20.1
## 491 491  0.20746   0.0 27.74    0 0.6090 5.093  98.0  1.8226   4 711    20.1
## 492 492  0.25199   0.0 27.74    0 0.6090 5.983  98.8  1.8681   4 711    20.1
## 493 493  0.11132   0.0 27.74    0 0.6090 5.983  83.5  2.1099   4 711    20.1
## 494 494  0.17331   0.0  9.69    0 0.5850 5.707  54.0  2.3817   6 391    19.2
## 495 495  0.27957   0.0  9.69    0 0.5850 5.926  42.6  2.3817   6 391    19.2
## 496 496  0.17899   0.0  9.69    0 0.5850 5.670  28.8  2.7986   6 391    19.2
## 497 497  0.25199   0.0  9.69    0 0.5850 5.390  72.9  2.7986   6 391    19.2
## 498 498  0.26838   0.0  9.69    0 0.5850 5.794  70.6  2.8927   6 391    19.2
## 499 499  0.23912   0.0  9.69    0 0.5850 6.019  65.3  2.4091   6 391    19.2
## 500 500  0.17783   0.0  9.69    0 0.5850 5.569  73.5  2.3999   6 391    19.2
## 501 501  0.22438   0.0  9.69    0 0.5850 6.027  79.7  2.4982   6 391    19.2
## 502 502  0.06263   0.0 11.93    0 0.5730 6.593  69.1  2.4786   1 273    21.0
## 503 503  0.04527   0.0 11.93    0 0.5730 6.120  76.7  2.2875   1 273    21.0
## 504 504  0.06076   0.0 11.93    0 0.5730 6.976  91.0  2.1675   1 273    21.0
## 505 505  0.10959   0.0 11.93    0 0.5730 6.794  89.3  2.3889   1 273    21.0
## 506 506  0.04741   0.0 11.93    0 0.5730 6.030  80.8  2.5050   1 273    21.0
##          b lstat medv
## 1   396.90  4.98 24.0
## 2   396.90  9.14 21.6
## 3   392.83  4.03 34.7
## 4   394.63  2.94 33.4
## 5   396.90  5.33 36.2
## 6   394.12  5.21 28.7
## 7   395.60 12.43 22.9
## 8   396.90 19.15   NA
## 9   386.63 29.93 16.5
```

```
## 10  386.71 17.10   NA
## 11  392.52 20.45 15.0
## 12  396.90 13.27 18.9
## 13  390.50 15.71 21.7
## 14  396.90  8.26 20.4
## 15  380.02 10.26 18.2
## 16  395.62  8.47 19.9
## 17  386.85  6.58 23.1
## 18  386.75 14.67 17.5
## 19  288.99 11.69 20.2
## 20  390.95 11.28 18.2
## 21  376.57 21.02 13.6
## 22  392.53 13.83 19.6
## 23  396.90 18.72 15.2
## 24  394.54 19.88   NA
## 25  394.33 16.30 15.6
## 26  303.42 16.51 13.9
## 27  376.88 14.81 16.6
## 28  306.38 17.28 14.8
## 29  387.94 12.80 18.4
## 30  380.23 11.98 21.0
## 31  360.17 22.60 12.7
## 32  376.73 13.04 14.5
## 33  232.60 27.71 13.2
## 34  358.77 18.35 13.1
## 35  248.31 20.34 13.5
## 36  396.90  9.68 18.9
## 37  377.56 11.41 20.0
## 38  396.90  8.77 21.0
## 39  393.43 10.13 24.7
## 40  395.63  4.32 30.8
## 41  395.62  1.98   NA
## 42  385.41  4.84 26.6
## 43  383.37  5.81 25.3
## 44  394.46  7.44 24.7
## 45  389.39  9.55 21.2
## 46  396.90 10.21 19.3
## 47  396.90 14.15   NA
## 48  392.74 18.80 16.6
## 49  396.90 30.81 14.4
## 50  396.90 16.20 19.4
## 51  395.56 13.45 19.7
## 52  393.97  9.43 20.5
## 53  396.90  5.28 25.0
## 54  396.90  8.43 23.4
## 55  396.90 14.80 18.9
## 56  395.93  4.81   NA
## 57  396.90  5.77 24.7
## 58  392.90  3.95 31.6
## 59  390.68  6.86   NA
## 60  396.90  9.22 19.6
## 61  395.11 13.15 18.7
## 62  378.08 14.44 16.0
## 63  396.90  6.73 22.2
```

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## 64  395.58  9.50 25.0
## 65  393.24  8.05 33.0
## 66  396.90  4.67 23.5
## 67  396.90 10.24 19.4
## 68  396.21  8.10 22.0
## 69  396.90 13.09 17.4
## 70  396.90  8.79 20.9
## 71  383.73  6.72 24.2
## 72  376.94  9.88 21.7
## 73  390.91  5.52 22.8
## 74  377.17  7.54 23.4
## 75  394.92  6.78 24.1
## 76  383.23  8.94 21.4
## 77  373.66 11.97 20.0
## 78  386.96 10.27 20.8
## 79  386.40 12.34 21.2
## 80  396.06  9.10 20.3
## 81  396.90  5.29 28.0
## 82  395.63  7.22 23.9
## 83  396.90  6.72 24.8
## 84  390.64  7.51 22.9
## 85  396.90  9.62 23.9
## 86  392.30  6.53 26.6
## 87  395.99 12.86   NA
## 88  395.15  8.44   NA
## 89  396.90  5.50 23.6
## 90  396.06  5.70 28.7
## 91  392.18  8.81 22.6
## 92  393.55  8.20 22.0
## 93  395.01  8.16 22.9
## 94  396.33  6.21 25.0
## 95  396.90 10.59 20.6
## 96  357.98  6.65 28.4
## 97  391.83 11.34 21.4
## 98  396.90  4.21 38.7
## 99  393.53  3.57 43.8
## 100 396.90  6.19 33.2
## 101 394.76  9.42 27.5
## 102 395.58  7.67   NA
## 103  70.80 10.63 18.6
## 104 394.47 13.44 19.3
## 105 392.69 12.33 20.1
## 106 394.05 16.47 19.5
## 107 395.67 18.66 19.5
## 108 387.69 14.09 20.4
## 109 395.24 12.27 19.8
## 110 391.23 15.55 19.4
## 111 393.49 13.00 21.7
## 112 395.59 10.16 22.8
## 113 394.95 16.21 18.8
## 114 396.90 17.09 18.7
## 115 388.74 10.45 18.5
## 116 344.91 15.76 18.3
## 117 393.30 12.04 21.2
```

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## 118 394.51 10.30 19.2
## 119 338.63 15.37 20.4
## 120 391.50 13.61   NA
## 121 389.15 14.37 22.0
## 122 377.67 14.27 20.3
## 123 378.09 17.93 20.5
## 124 370.31 25.41 17.3
## 125 379.38 17.58 18.8
## 126 385.02 14.81 21.4
## 127 359.29 27.26 15.7
## 128 392.11 17.19 16.2
## 129 396.90 15.39 18.0
## 130 396.90 18.34 14.3
## 131 395.04 12.60 19.2
## 132 396.90 12.26 19.6
## 133 385.76 11.12 23.0
## 134 388.69 15.03 18.4
## 135 262.76 17.31 15.6
## 136 394.67 16.96 18.1
## 137 378.25 16.90 17.4
## 138 394.08 14.59 17.1
## 139 392.04 21.32 13.3
## 140 396.90 18.46 17.8
## 141 388.08 24.16 14.0
## 142 396.90 34.41 14.4
## 143 396.90 26.82 13.4
## 144 396.90 26.42 15.6
## 145 396.90 29.29 11.8
## 146 172.91 27.80 13.8
## 147 169.27 16.65 15.6
## 148 391.71 29.53 14.6
## 149 356.99 28.32 17.8
## 150 351.85 21.45 15.4
## 151 372.80 14.10 21.5
## 152 341.60 13.28 19.6
## 153 343.28 12.12 15.3
## 154 261.95 15.79 19.4
## 155 321.02 15.12 17.0
## 156  88.01 15.02 15.6
## 157  88.63 16.14 13.1
## 158 363.43  4.59 41.3
## 159 353.89  6.43 24.3
## 160 364.31  7.39 23.3
## 161 338.92  5.50   NA
## 162 374.43  1.73 50.0
## 163 389.61  1.92 50.0
## 164 388.45  3.32   NA
## 165 395.11 11.64 22.7
## 166 240.16  9.81 25.0
## 167 369.30  3.70 50.0
## 168 227.61 12.14 23.8
## 169 297.09 11.10 23.8
## 170 330.04 11.32 22.3
## 171 292.29 14.43 17.4
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## 172 348.13 12.03 19.1
## 173 396.90 14.69 23.1
## 174 395.50  9.04 23.6
## 175 393.23  9.64 22.6
## 176 390.96  5.33 29.4
## 177 393.23 10.11 23.2
## 178 395.60  6.29 24.6
## 179 391.27  6.92 29.9
## 180 396.90  5.04 37.2
## 181 395.56  7.56 39.8
## 182 396.90  9.45   NA
## 183 394.12  4.82 37.9
## 184 396.90  5.68 32.5
## 185 391.00 13.98 26.4
## 186 387.11 13.15 29.6
## 187 392.63  4.45 50.0
## 188 393.87  6.68 32.0
## 189 382.84  4.56 29.8
## 190 396.90  5.39 34.9
## 191 377.68  5.10 37.0
## 192 389.71  4.69 30.5
## 193 390.49  2.87 36.4
## 194 393.37  5.03 31.1
## 195 376.70  4.38 29.1
## 196 394.23  2.97   NA
## 197 396.90  4.08 33.3
## 198 354.31  8.61 30.3
## 199 392.20  6.62 34.6
## 200 396.90  4.56 34.9
## 201 384.30  4.45 32.9
## 202 393.77  7.43 24.1
## 203 395.38  3.11 42.3
## 204 392.78  3.81 48.5
## 205 390.55  2.88 50.0
## 206 396.90 10.87 22.6
## 207 394.87 10.97 24.4
## 208 389.43 18.06 22.5
## 209 381.32 14.66 24.4
## 210 396.90 23.09 20.0
## 211 393.25 17.27 21.7
## 212 395.24 23.98 19.3
## 213 390.94 16.03 22.4
## 214 385.81  9.38 28.1
## 215 348.93 29.55 23.7
## 216 393.63  9.47 25.0
## 217 392.80 13.51 23.3
## 218 392.78  9.69 28.7
## 219 396.90 17.92 21.5
## 220 393.74 10.50 23.0
## 221 391.70  9.71 26.7
## 222 395.24 21.46 21.7
## 223 390.39  9.93 27.5
## 224 396.90  7.60 30.1
## 225 385.05  4.14 44.8
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## 226 382.00  4.63 50.0
## 227 387.38  3.13 37.6
## 228 372.08  6.36 31.6
## 229 377.51  3.92 46.7
## 230 380.34  3.76 31.5
## 231 378.35 11.65 24.3
## 232 376.14  5.25 31.7
## 233 385.91  2.47 41.7
## 234 378.95  3.95 48.3
## 235 360.20  8.05 29.0
## 236 376.75 10.88 24.0
## 237 388.45  9.54 25.1
## 238 390.07  4.73 31.5
## 239 379.41  6.36 23.7
## 240 383.78  7.37 23.3
## 241 391.25 11.38 22.0
## 242 394.62 12.40 20.1
## 243 372.75 11.22 22.2
## 244 374.71  5.19 23.7
## 245 372.49 12.50 17.6
## 246 389.13 18.46 18.5
## 247 390.18  9.16 24.3
## 248 376.14 10.15 20.5
## 249 374.71  9.52 24.5
## 250 393.74  6.56   NA
## 251 396.28  5.90 24.4
## 252 377.07  3.59 24.8
## 253 386.09  3.53 29.6
## 254 396.90  3.54 42.8
## 255 392.89  6.57 21.9
## 256 395.18  9.25 20.9
## 257 386.34  3.11 44.0
## 258 389.70  5.12 50.0
## 259 383.29  7.79 36.0
## 260 391.93  6.90 30.1
## 261 392.80  9.59 33.8
## 262 388.37  7.26 43.1
## 263 386.86  5.91 48.8
## 264 393.42 11.25 31.0
## 265 387.89  8.10 36.5
## 266 392.40 10.45   NA
## 267 384.07 14.79 30.7
## 268 384.54  7.44 50.0
## 269 390.30  3.16 43.5
## 270 391.34 13.65 20.7
## 271 388.65 13.00 21.1
## 272 396.90  6.59 25.2
## 273 394.96  7.73 24.4
## 274 390.77  6.58 35.2
## 275 396.90  3.53 32.4
## 276 396.90  2.98 32.0
## 277 389.25  6.05 33.2
## 278 393.45  4.16 33.1
## 279 396.90  7.19 29.1
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## 280 396.90  4.85 35.1
## 281 387.31  3.76 45.4
## 282 392.23  4.59 35.4
## 283 377.07  3.01 46.0
## 284 395.52  3.16   NA
## 285 394.72  7.85 32.2
## 286 394.72  8.23 22.0
## 287 341.60 12.93 20.1
## 288 396.90  7.14 23.2
## 289 396.90  7.60 22.3
## 290 371.72  9.51 24.8
## 291 396.90  3.33 28.5
## 292 396.90  3.56   NA
## 293 396.90  4.70 27.9
## 294 396.90  8.58 23.9
## 295 396.90 10.40 21.7
## 296 396.90  6.27 28.6
## 297 392.85  7.39 27.1
## 298 396.90 15.84 20.3
## 299 368.24  4.97 22.5
## 300 371.58  4.74 29.0
## 301 390.86  6.07 24.8
## 302 395.75  9.50 22.0
## 303 383.61  8.67 26.4
## 304 390.43  4.86 33.1
## 305 393.68  6.93   NA
## 306 393.36  8.93 28.4
## 307 396.90  6.47 33.4
## 308 396.90  7.53 28.2
## 309 396.90  4.54 22.8
## 310 396.24  9.97 20.3
## 311 350.45 12.64 16.1
## 312 396.90  5.98 22.1
## 313 396.30 11.72 19.4
## 314 393.39  7.90 21.6
## 315 395.69  9.28 23.8
## 316 396.42 11.50 16.2
## 317 390.70 18.33 17.8
## 318 396.90 15.94 19.8
## 319 395.21 10.36   NA
## 320 396.23 12.73 21.0
## 321 396.90  7.20 23.8
## 322 396.90  6.87 23.1
## 323 396.90  7.70 20.4
## 324 391.13 11.74 18.5
## 325 396.90  6.12 25.0
## 326 393.68  5.08 24.6
## 327 396.90  6.15 23.0
## 328 396.90 12.79 22.2
## 329 382.44  9.97 19.3
## 330 375.21  7.34 22.6
## 331 368.57  9.09   NA
## 332 394.02 12.43 17.1
## 333 362.25  7.83 19.4
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## 334 389.71  5.68 22.2
## 335 389.40  6.75 20.7
## 336 396.90  8.01   NA
## 337 396.90  9.80 19.5
## 338 394.81 10.56 18.5
## 339 396.14  8.51 20.6
## 340 396.90  9.74 19.0
## 341 396.90  9.29 18.7
## 342 394.74  5.49 32.7
## 343 389.96  8.65 16.5
## 344 396.90  7.18 23.9
## 345 387.97  4.61 31.2
## 346 385.64 10.53 17.5
## 347 364.61 12.67 17.2
## 348 392.43  6.36 23.1
## 349 390.94  5.99 24.5
## 350 389.85  5.89 26.6
## 351 396.90  5.98 22.9
## 352 370.78  5.49 24.1
## 353 392.33  7.79 18.6
## 354 384.46  4.50   NA
## 355 382.80  8.05 18.2
## 356 376.04  5.57 20.6
## 357 377.73 17.60 17.8
## 358 391.34 13.27 21.7
## 359 395.43 11.48 22.7
## 360 390.74 12.67 22.6
## 361 374.56  7.79 25.0
## 362 350.65 14.19 19.9
## 363 380.79 10.19 20.8
## 364 353.04 14.64 16.8
## 365 354.55  5.29 21.9
## 366 354.70  7.12 27.5
## 367 316.03 14.00 21.9
## 368 131.42 13.33   NA
## 369 375.52  3.26 50.0
## 370 375.33  3.73 50.0
## 371 392.05  2.96 50.0
## 372 366.15  9.53 50.0
## 373 347.88  8.88 50.0
## 374 396.90 34.77 13.8
## 375 396.90 37.97 13.8
## 376 396.90 13.44 15.0
## 377 363.02 23.24 13.9
## 378 396.90 21.24 13.3
## 379 396.90 23.69 13.1
## 380 393.74 21.78 10.2
## 381 396.90 17.21 10.4
## 382 396.90 21.08 10.9
## 383 396.90 23.60 11.3
## 384 396.90 24.56 12.3
## 385 285.83 30.63  8.8
## 386 396.90 30.81  7.2
## 387 396.90 28.28 10.5
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## 388 396.90 31.99  7.4
## 389 372.92 30.62 10.2
## 390 396.90 20.85 11.5
## 391 394.43 17.11 15.1
## 392 378.38 18.76 23.2
## 393 396.90 25.68  9.7
## 394 396.90 15.17 13.8
## 395 396.90 16.35 12.7
## 396 391.98 17.12 13.1
## 397 396.90 19.37 12.5
## 398 393.10 19.92  8.5
## 399 396.90 30.59  5.0
## 400 338.16 29.97  6.3
## 401 396.90 26.77  5.6
## 402 396.90 20.32  7.2
## 403 376.11 20.31 12.1
## 404 396.90 19.77  8.3
## 405 329.46 27.38  8.5
## 406 384.97 22.98  5.0
## 407 370.22 23.34 11.9
## 408 332.09 12.13 27.9
## 409 314.64 26.40 17.2
## 410 179.36 19.78 27.5
## 411   2.60 10.11 15.0
## 412  35.05 21.22 17.2
## 413  28.79 34.37 17.9
## 414 210.97 20.08 16.3
## 415  88.27 36.98  7.0
## 416  27.25 29.05  7.2
## 417  21.57 25.79  7.5
## 418 127.36 26.64   NA
## 419  16.45 20.62  8.8
## 420  48.45 22.74  8.4
## 421 318.75 15.02 16.7
## 422 319.98 15.70 14.2
## 423 291.55 14.10 20.8
## 424   2.52 23.29 13.4
## 425   3.65 17.16 11.7
## 426   7.68 24.39  8.3
## 427  24.65 15.69 10.2
## 428  18.82 14.52 10.9
## 429  96.73 21.52 11.0
## 430  60.72 24.08  9.5
## 431  83.45 17.64 14.5
## 432  81.33 19.69 14.1
## 433  97.95 12.03 16.1
## 434 100.19 16.22 14.3
## 435 100.63 15.17 11.7
## 436 109.85 23.27 13.4
## 437  27.49 18.05  9.6
## 438   9.32 26.45  8.7
## 439  68.95 34.02  8.4
## 440 396.90 22.88 12.8
## 441 391.45 22.11 10.5
```
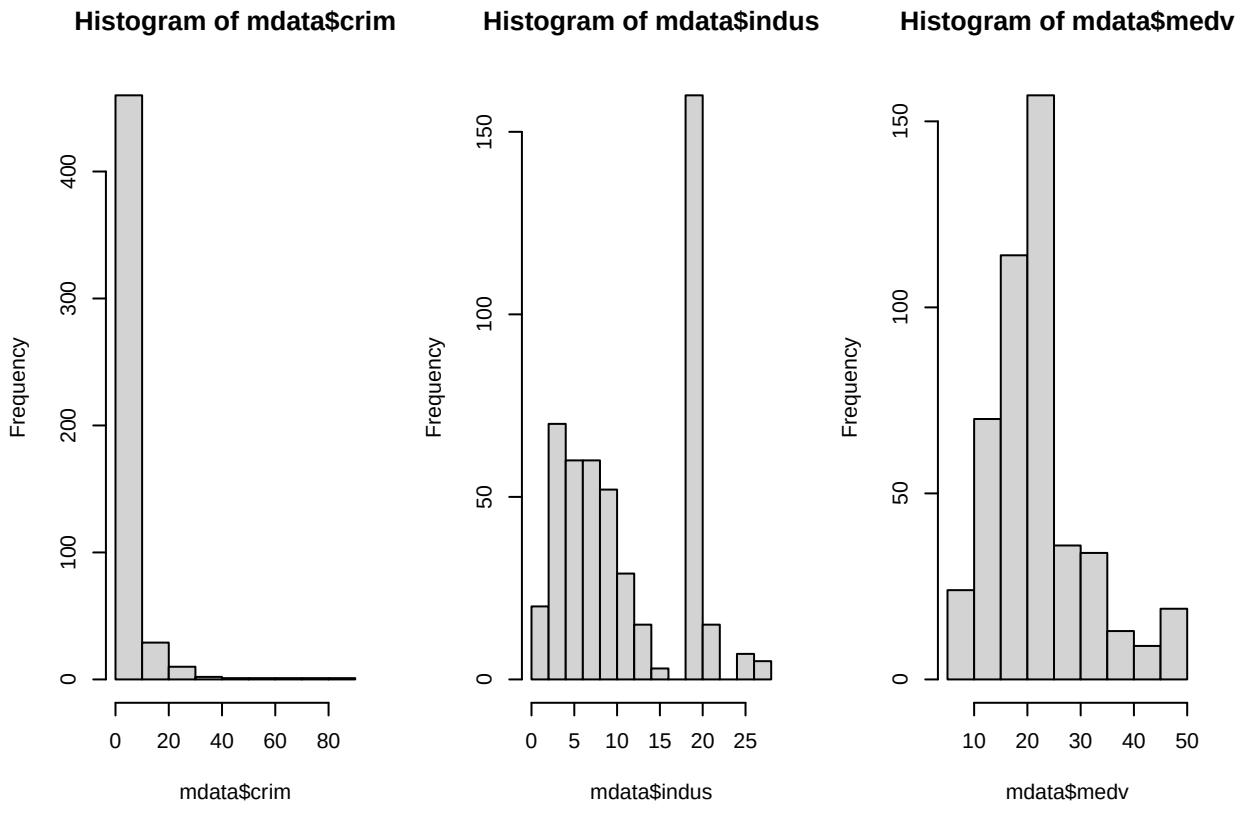

```
## 442 385.96 19.52 17.1
## 443 395.69 16.59 18.4
## 444 386.73 18.85 15.4
## 445 240.52 23.79 10.8
## 446  43.06 23.98 11.8
## 447 318.01 17.79 14.9
## 448 388.52 16.44 12.6
## 449 396.90 18.13 14.1
## 450 304.21 19.31 13.0
## 451   0.32 17.44 13.4
## 452 355.29 17.73 15.2
## 453 385.09 17.27 16.1
## 454 375.87 16.74 17.8
## 455   6.68 18.71 14.9
## 456  50.92 18.13 14.1
## 457  10.48 19.01 12.7
## 458   3.50 16.94 13.5
## 459 272.21 16.23 14.9
## 460 396.90 14.70 20.0
## 461 255.23 16.42 16.4
## 462 391.43 14.65 17.7
## 463 396.90 13.99 19.5
## 464 393.82 10.29 20.2
## 465 396.90 13.22 21.4
## 466 334.40 14.13 19.9
## 467  22.01 17.15 19.0
## 468 331.29 21.32 19.1
## 469 368.74 18.13 19.1
## 470 396.90 14.76 20.1
## 471 396.90 16.29 19.9
## 472 395.33 12.87 19.6
## 473 393.37 14.36 23.2
## 474 374.68 11.66 29.8
## 475 352.58 18.14 13.8
## 476 302.76 24.10   NA
## 477 396.21 18.68 16.7
## 478 349.48 24.91 12.0
## 479 379.70 18.03 14.6
## 480 383.32 13.11 21.4
## 481 396.90 10.74 23.0
## 482 393.07  7.74 23.7
## 483 395.28  7.01 25.0
## 484 392.92 10.42 21.8
## 485 370.73 13.34 20.6
## 486 388.62 10.58 21.2
## 487 392.68 14.98 19.1
## 488 388.22 11.45 20.6
## 489 395.09 18.06 15.2
## 490 344.05 23.97  7.0
## 491 318.43 29.68  8.1
## 492 390.11 18.07 13.6
## 493 396.90 13.35 20.1
## 494 396.90 12.01 21.8
## 495 396.90 13.59 24.5
```

```
## 496 393.29 17.60   NA
## 497 396.90 21.14 19.7
## 498 396.90 14.10 18.3
## 499 396.90 12.92   NA
## 500 395.77 15.10 17.5
## 501 396.90 14.33 16.8
## 502 391.99  9.67 22.4
## 503 396.90  9.08   NA
## 504 396.90  5.64 23.9
## 505 393.45  6.48 22.0
## 506 396.90  7.88 11.9
```

`na.rm` argument ask the user whether the missing value should be remove before computing the median

```
par(mfrow=c(1,3))
hist(mdata$crim)
hist(mdata$indus)
hist(mdata$medv)
```



We can see that all three histogram is not symmetry.

K-Nearest Neighbor

```
iris_mis1 = read.csv('./Data/iris.mis1.csv')
iris_mis1
```

```
##       X Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1     1           NA         3.5          1.4         0.2
## 2     2          4.9         3.0          1.4         0.2
## 3     3          4.7          NA          1.3         0.2
## 4     4          4.6         3.1          1.5          NA
## 5     5          5.0         3.6          1.4         0.2
## 6     6          5.4         3.9          1.7         0.4
## 7     7          4.6         3.4          1.4         0.3
## 8     8          5.0         3.4          1.5         0.2
## 9     9          4.4          NA          1.4         0.2
## 10   10          4.9         3.1           NA         0.1
## 11   11           NA         3.7          1.5         0.2
## 12   12          4.8         3.4           NA         0.2
## 13   13          4.8         3.0          1.4         0.1
## 14   14           NA         3.0          1.1         0.1
## 15   15          5.8         4.0          1.2         0.2
## 16   16          5.7         4.4          1.5          NA
## 17   17          5.4         3.9          1.3         0.4
## 18   18          5.1         3.5          1.4         0.3
## 19   19          5.7         3.8          1.7          NA
## 20   20          5.1         3.8          1.5         0.3
## 21   21          5.4         3.4          1.7         0.2
## 22   22          5.1         3.7          1.5         0.4
## 23   23           NA         3.6          1.0         0.2
## 24   24          5.1         3.3          1.7          NA
## 25   25          4.8         3.4          1.9         0.2
## 26   26          5.0         3.0          1.6         0.2
## 27   27          5.0         3.4          1.6         0.4
## 28   28          5.2         3.5          1.5         0.2
## 29   29          5.2         3.4          1.4         0.2
## 30   30          4.7         3.2          1.6         0.2
## 31   31          4.8         3.1          1.6         0.2
## 32   32          5.4         3.4          1.5         0.4
## 33   33          5.2          NA          1.5         0.1
## 34   34          5.5         4.2          1.4         0.2
## 35   35           NA         3.1          1.5         0.2
## 36   36          5.0         3.2          1.2         0.2
## 37   37          5.5         3.5          1.3         0.2
## 38   38          4.9         3.6          1.4         0.1
## 39   39          4.4         3.0          1.3         0.2
## 40   40          5.1         3.4          1.5          NA
## 41   41          5.0         3.5          1.3         0.3
## 42   42          4.5         2.3          1.3         0.3
## 43   43          4.4         3.2          1.3         0.2
## 44   44          5.0         3.5          1.6         0.6
## 45   45          5.1         3.8          1.9         0.4
## 46   46          4.8         3.0          1.4         0.3
## 47   47          5.1         3.8           NA         0.2
## 48   48          4.6          NA          1.4         0.2
## 49   49          5.3         3.7          1.5         0.2
```

```
## 50   50          5.0         3.3          1.4         0.2
## 51   51          7.0         3.2          4.7          NA
## 52   52           NA         3.2          4.5         1.5
## 53   53          6.9          NA          4.9          NA
## 54   54          5.5         2.3           NA         1.3
## 55   55          6.5         2.8           NA         1.5
## 56   56          5.7         2.8          4.5         1.3
## 57   57          6.3         3.3          4.7         1.6
## 58   58          4.9         2.4          3.3         1.0
## 59   59          6.6         2.9           NA         1.3
## 60   60          5.2         2.7          3.9         1.4
## 61   61          5.0         2.0          3.5         1.0
## 62   62           NA         3.0          4.2         1.5
## 63   63          6.0         2.2          4.0          NA
## 64   64          6.1         2.9          4.7         1.4
## 65   65          5.6         2.9          3.6         1.3
## 66   66          6.7         3.1          4.4         1.4
## 67   67          5.6         3.0          4.5         1.5
## 68   68          5.8         2.7          4.1         1.0
## 69   69          6.2         2.2           NA         1.5
## 70   70          5.6         2.5           NA         1.1
## 71   71          5.9         3.2          4.8         1.8
## 72   72          6.1         2.8          4.0         1.3
## 73   73          6.3         2.5          4.9         1.5
## 74   74          6.1         2.8          4.7          NA
## 75   75          6.4         2.9          4.3         1.3
## 76   76           NA         3.0          4.4         1.4
## 77   77          6.8         2.8          4.8         1.4
## 78   78           NA         3.0          5.0         1.7
## 79   79           NA          NA           NA         1.5
## 80   80          5.7         2.6          3.5         1.0
## 81   81          5.5         2.4          3.8         1.1
## 82   82          5.5         2.4          3.7         1.0
## 83   83          5.8         2.7          3.9         1.2
## 84   84          6.0         2.7          5.1         1.6
## 85   85          5.4         3.0          4.5         1.5
## 86   86          6.0         3.4          4.5         1.6
## 87   87          6.7         3.1          4.7         1.5
## 88   88          6.3         2.3          4.4         1.3
## 89   89          5.6         3.0          4.1         1.3
## 90   90          5.5         2.5          4.0          NA
## 91   91          5.5         2.6          4.4         1.2
## 92   92          6.1         3.0          4.6         1.4
## 93   93          5.8         2.6          4.0         1.2
## 94   94          5.0         2.3          3.3         1.0
## 95   95          5.6         2.7          4.2         1.3
## 96   96          5.7         3.0           NA         1.2
## 97   97          5.7         2.9          4.2         1.3
## 98   98          6.2         2.9          4.3         1.3
## 99   99           NA         2.5          3.0         1.1
## 100 100          5.7         2.8          4.1         1.3
## 101 101           NA         3.3          6.0          NA
## 102 102          5.8         2.7          5.1         1.9
## 103 103           NA         3.0          5.9         2.1
```

```
## 104 104          6.3         2.9          5.6         1.8
## 105 105          6.5         3.0          5.8         2.2
## 106 106          7.6         3.0          6.6         2.1
## 107 107           NA         2.5           NA         1.7
## 108 108          7.3         2.9          6.3         1.8
## 109 109           NA          NA           NA         1.8
## 110 110           NA         3.6          6.1         2.5
## 111 111          6.5         3.2          5.1         2.0
## 112 112          6.4         2.7          5.3         1.9
## 113 113          6.8         3.0          5.5         2.1
## 114 114           NA         2.5          5.0         2.0
## 115 115          5.8         2.8          5.1         2.4
## 116 116           NA         3.2          5.3         2.3
## 117 117          6.5         3.0           NA         1.8
## 118 118          7.7         3.8          6.7         2.2
## 119 119          7.7         2.6          6.9          NA
## 120 120          6.0         2.2          5.0         1.5
## 121 121          6.9         3.2          5.7         2.3
## 122 122          5.6         2.8          4.9         2.0
## 123 123          7.7          NA          6.7         2.0
## 124 124          6.3         2.7          4.9         1.8
## 125 125          6.7         3.3          5.7         2.1
## 126 126           NA         3.2          6.0          NA
## 127 127          6.2         2.8          4.8         1.8
## 128 128          6.1         3.0          4.9         1.8
## 129 129          6.4         2.8          5.6         2.1
## 130 130          7.2         3.0          5.8         1.6
## 131 131          7.4          NA          6.1         1.9
## 132 132          7.9         3.8          6.4         2.0
## 133 133          6.4         2.8          5.6         2.2
## 134 134          6.3         2.8          5.1         1.5
## 135 135          6.1         2.6          5.6         1.4
## 136 136          7.7         3.0          6.1         2.3
## 137 137           NA         3.4          5.6         2.4
## 138 138          6.4         3.1          5.5         1.8
## 139 139          6.0         3.0          4.8         1.8
## 140 140          6.9         3.1           NA         2.1
## 141 141          6.7         3.1          5.6         2.4
## 142 142          6.9         3.1          5.1         2.3
## 143 143          5.8          NA          5.1         1.9
## 144 144           NA         3.2          5.9         2.3
## 145 145          6.7         3.3          5.7         2.5
## 146 146          6.7         3.0          5.2         2.3
## 147 147          6.3         2.5          5.0         1.9
## 148 148           NA         3.0          5.2         2.0
## 149 149          6.2          NA          5.4         2.3
## 150 150          5.9         3.0          5.1         1.8
```

```
library(multiUS)
iris_knn = KNNimp(data=iris_mis1, k=10)
iris_knn
```

```
##       X Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1     1     5.025663    3.500000     1.400000   0.2000000
```

```
## 2     2     4.900000    3.000000     1.400000   0.2000000
## 3     3     4.700000    3.318172     1.300000   0.2000000
## 4     4     4.600000    3.100000     1.500000   0.1965569
## 5     5     5.000000    3.600000     1.400000   0.2000000
## 6     6     5.400000    3.900000     1.700000   0.4000000
## 7     7     4.600000    3.400000     1.400000   0.3000000
## 8     8     5.000000    3.400000     1.500000   0.2000000
## 9     9     4.400000    3.153891     1.400000   0.2000000
## 10   10     4.900000    3.100000     1.509647   0.1000000
## 11   11     5.087472    3.700000     1.500000   0.2000000
## 12   12     4.800000    3.400000     1.503575   0.2000000
## 13   13     4.800000    3.000000     1.400000   0.1000000
## 14   14     4.788126    3.000000     1.100000   0.1000000
## 15   15     5.800000    4.000000     1.200000   0.2000000
## 16   16     5.700000    4.400000     1.500000   0.2850789
## 17   17     5.400000    3.900000     1.300000   0.4000000
## 18   18     5.100000    3.500000     1.400000   0.3000000
## 19   19     5.700000    3.800000     1.700000   0.2974964
## 20   20     5.100000    3.800000     1.500000   0.3000000
## 21   21     5.400000    3.400000     1.700000   0.2000000
## 22   22     5.100000    3.700000     1.500000   0.4000000
## 23   23     5.148035    3.600000     1.000000   0.2000000
## 24   24     5.100000    3.300000     1.700000   0.2523010
## 25   25     4.800000    3.400000     1.900000   0.2000000
## 26   26     5.000000    3.000000     1.600000   0.2000000
## 27   27     5.000000    3.400000     1.600000   0.4000000
## 28   28     5.200000    3.500000     1.500000   0.2000000
## 29   29     5.200000    3.400000     1.400000   0.2000000
## 30   30     4.700000    3.200000     1.600000   0.2000000
## 31   31     4.800000    3.100000     1.600000   0.2000000
## 32   32     5.400000    3.400000     1.500000   0.4000000
## 33   33     5.200000    3.520084     1.500000   0.1000000
## 34   34     5.500000    4.200000     1.400000   0.2000000
## 35   35     4.790390    3.100000     1.500000   0.2000000
## 36   36     5.000000    3.200000     1.200000   0.2000000
## 37   37     5.500000    3.500000     1.300000   0.2000000
## 38   38     4.900000    3.600000     1.400000   0.1000000
## 39   39     4.400000    3.000000     1.300000   0.2000000
## 40   40     5.100000    3.400000     1.500000   0.2874765
## 41   41     5.000000    3.500000     1.300000   0.3000000
## 42   42     4.500000    2.300000     1.300000   0.3000000
## 43   43     4.400000    3.200000     1.300000   0.2000000
## 44   44     5.000000    3.500000     1.600000   0.6000000
## 45   45     5.100000    3.800000     1.900000   0.4000000
## 46   46     4.800000    3.000000     1.400000   0.3000000
## 47   47     5.100000    3.800000     1.504947   0.2000000
## 48   48     4.600000    3.113484     1.400000   0.2000000
## 49   49     5.300000    3.700000     1.500000   0.2000000
## 50   50     5.000000    3.300000     1.400000   0.2000000
## 51   51     7.000000    3.200000     4.700000   1.5139891
## 52   52     6.100938    3.200000     4.500000   1.5000000
## 53   53     6.900000    2.907860     4.900000   1.4439768
## 54   54     5.500000    2.300000     3.779966   1.3000000
## 55   55     6.500000    2.800000     4.582692   1.5000000
```

```
## 56   56     5.700000    2.800000     4.500000   1.3000000
## 57   57     6.300000    3.300000     4.700000   1.6000000
## 58   58     4.900000    2.400000     3.300000   1.0000000
## 59   59     6.600000    2.900000     4.522296   1.3000000
## 60   60     5.200000    2.700000     3.900000   1.4000000
## 61   61     5.000000    2.000000     3.500000   1.0000000
## 62   62     6.001809    3.000000     4.200000   1.5000000
## 63   63     6.000000    2.200000     4.000000   1.1589358
## 64   64     6.100000    2.900000     4.700000   1.4000000
## 65   65     5.600000    2.900000     3.600000   1.3000000
## 66   66     6.700000    3.100000     4.400000   1.4000000
## 67   67     5.600000    3.000000     4.500000   1.5000000
## 68   68     5.800000    2.700000     4.100000   1.0000000
## 69   69     6.200000    2.200000     4.293208   1.5000000
## 70   70     5.600000    2.500000     3.967292   1.1000000
## 71   71     5.900000    3.200000     4.800000   1.8000000
## 72   72     6.100000    2.800000     4.000000   1.3000000
## 73   73     6.300000    2.500000     4.900000   1.5000000
## 74   74     6.100000    2.800000     4.700000   1.3339249
## 75   75     6.400000    2.900000     4.300000   1.3000000
## 76   76     6.129578    3.000000     4.400000   1.4000000
## 77   77     6.800000    2.800000     4.800000   1.4000000
## 78   78     6.150422    3.000000     5.000000   1.7000000
## 79   79     6.197689    2.925143     4.585341   1.5000000
## 80   80     5.700000    2.600000     3.500000   1.0000000
## 81   81     5.500000    2.400000     3.800000   1.1000000
## 82   82     5.500000    2.400000     3.700000   1.0000000
## 83   83     5.800000    2.700000     3.900000   1.2000000
## 84   84     6.000000    2.700000     5.100000   1.6000000
## 85   85     5.400000    3.000000     4.500000   1.5000000
## 86   86     6.000000    3.400000     4.500000   1.6000000
## 87   87     6.700000    3.100000     4.700000   1.5000000
## 88   88     6.300000    2.300000     4.400000   1.3000000
## 89   89     5.600000    3.000000     4.100000   1.3000000
## 90   90     5.500000    2.500000     4.000000   1.1313078
## 91   91     5.500000    2.600000     4.400000   1.2000000
## 92   92     6.100000    3.000000     4.600000   1.4000000
## 93   93     5.800000    2.600000     4.000000   1.2000000
## 94   94     5.000000    2.300000     3.300000   1.0000000
## 95   95     5.600000    2.700000     4.200000   1.3000000
## 96   96     5.700000    3.000000     4.204144   1.2000000
## 97   97     5.700000    2.900000     4.200000   1.3000000
## 98   98     6.200000    2.900000     4.300000   1.3000000
## 99   99     5.610210    2.500000     3.000000   1.1000000
## 100 100     5.700000    2.800000     4.100000   1.3000000
## 101 101     6.736502    3.300000     6.000000   1.9803417
## 102 102     5.800000    2.700000     5.100000   1.9000000
## 103 103     6.788565    3.000000     5.900000   2.1000000
## 104 104     6.300000    2.900000     5.600000   1.8000000
## 105 105     6.500000    3.000000     5.800000   2.2000000
## 106 106     7.600000    3.000000     6.600000   2.1000000
## 107 107     5.989036    2.500000     4.821780   1.7000000
## 108 108     7.300000    2.900000     6.300000   1.8000000
## 109 109     6.492510    2.867999     5.436849   1.8000000
```

```
## 110 110     7.065768    3.600000     6.100000   2.5000000
## 111 111     6.500000    3.200000     5.100000   2.0000000
## 112 112     6.400000    2.700000     5.300000   1.9000000
## 113 113     6.800000    3.000000     5.500000   2.1000000
## 114 114     6.120194    2.500000     5.000000   2.0000000
## 115 115     5.800000    2.800000     5.100000   2.4000000
## 116 116     6.795669    3.200000     5.300000   2.3000000
## 117 117     6.500000    3.000000     5.308921   1.8000000
## 118 118     7.700000    3.800000     6.700000   2.2000000
## 119 119     7.700000    2.600000     6.900000   2.0343210
## 120 120     6.000000    2.200000     5.000000   1.5000000
## 121 121     6.900000    3.200000     5.700000   2.3000000
## 122 122     5.600000    2.800000     4.900000   2.0000000
## 123 123     7.700000    3.276215     6.700000   2.0000000
## 124 124     6.300000    2.700000     4.900000   1.8000000
## 125 125     6.700000    3.300000     5.700000   2.1000000
## 126 126     6.848736    3.200000     6.000000   2.1410787
## 127 127     6.200000    2.800000     4.800000   1.8000000
## 128 128     6.100000    3.000000     4.900000   1.8000000
## 129 129     6.400000    2.800000     5.600000   2.1000000
## 130 130     7.200000    3.000000     5.800000   1.6000000
## 131 131     7.400000    3.209440     6.100000   1.9000000
## 132 132     7.900000    3.800000     6.400000   2.0000000
## 133 133     6.400000    2.800000     5.600000   2.2000000
## 134 134     6.300000    2.800000     5.100000   1.5000000
## 135 135     6.100000    2.600000     5.600000   1.4000000
## 136 136     7.700000    3.000000     6.100000   2.3000000
## 137 137     6.793561    3.400000     5.600000   2.4000000
## 138 138     6.400000    3.100000     5.500000   1.8000000
## 139 139     6.000000    3.000000     4.800000   1.8000000
## 140 140     6.900000    3.100000     5.471773   2.1000000
## 141 141     6.700000    3.100000     5.600000   2.4000000
## 142 142     6.900000    3.100000     5.100000   2.3000000
## 143 143     5.800000    2.797346     5.100000   1.9000000
## 144 144     6.775173    3.200000     5.900000   2.3000000
## 145 145     6.700000    3.300000     5.700000   2.5000000
## 146 146     6.700000    3.000000     5.200000   2.3000000
## 147 147     6.300000    2.500000     5.000000   1.9000000
## 148 148     6.483484    3.000000     5.200000   2.0000000
## 149 149     6.200000    2.948077     5.400000   2.3000000
## 150 150     5.900000    3.000000     5.100000   1.8000000
```

Statistical Method

Same data type

For data with all variable in a numeric data type, we can impute using Predictive Mean Matching (PMM)

```
airquality = read.table('./Data/airquality.txt')
airquality
```

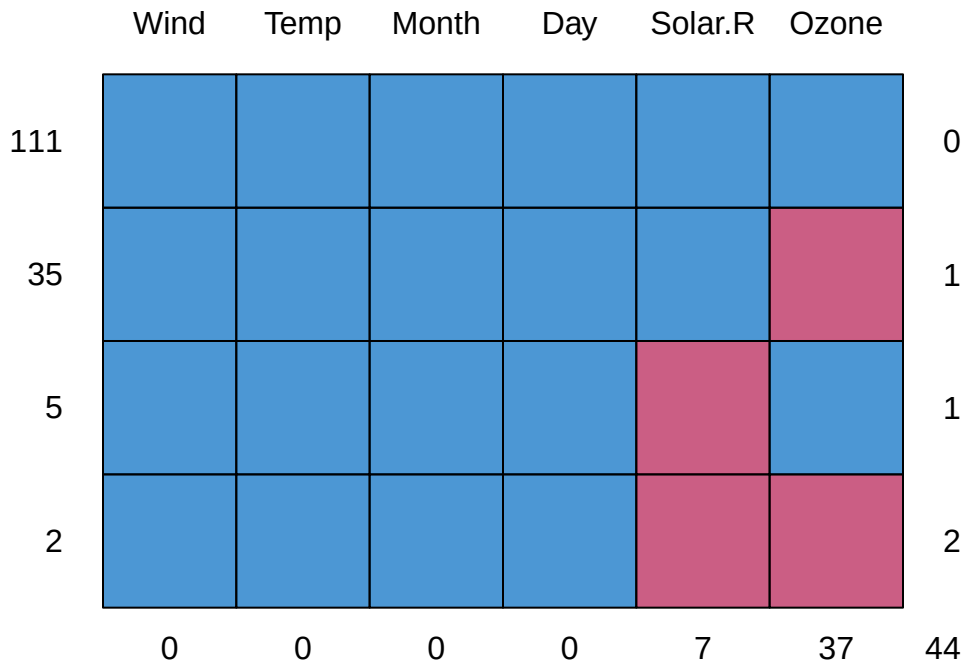
```
##     Ozone Solar.R Wind Temp Month Day
```

```
## 1      41     190  7.4   67     5   1
## 2      36     118  8.0   72     5   2
## 3      12     149 12.6   74     5   3
## 4      18     313 11.5   62     5   4
## 5      NA      NA 14.3   56     5   5
## 6      28      NA 14.9   66     5   6
## 7      23     299  8.6   65     5   7
## 8      19      99 13.8   59     5   8
## 9       8      19 20.1   61     5   9
## 10     NA     194  8.6   69     5  10
## 11      7      NA  6.9   74     5  11
## 12     16     256  9.7   69     5  12
## 13     11     290  9.2   66     5  13
## 14     14     274 10.9   68     5  14
## 15     18      65 13.2   58     5  15
## 16     14     334 11.5   64     5  16
## 17     34     307 12.0   66     5  17
## 18      6      78 18.4   57     5  18
## 19     30     322 11.5   68     5  19
## 20     11      44  9.7   62     5  20
## 21      1       8  9.7   59     5  21
## 22     11     320 16.6   73     5  22
## 23      4      25  9.7   61     5  23
## 24     32      92 12.0   61     5  24
## 25     NA      66 16.6   57     5  25
## 26     NA     266 14.9   58     5  26
## 27     NA      NA  8.0   57     5  27
## 28     23      13 12.0   67     5  28
## 29     45     252 14.9   81     5  29
## 30    115     223  5.7   79     5  30
## 31     37     279  7.4   76     5  31
## 32     NA     286  8.6   78     6   1
## 33     NA     287  9.7   74     6   2
## 34     NA     242 16.1   67     6   3
## 35     NA     186  9.2   84     6   4
## 36     NA     220  8.6   85     6   5
## 37     NA     264 14.3   79     6   6
## 38     29     127  9.7   82     6   7
## 39     NA     273  6.9   87     6   8
## 40     71     291 13.8   90     6   9
## 41     39     323 11.5   87     6  10
## 42     NA     259 10.9   93     6  11
## 43     NA     250  9.2   92     6  12
## 44     23     148  8.0   82     6  13
## 45     NA     332 13.8   80     6  14
## 46     NA     322 11.5   79     6  15
## 47     21     191 14.9   77     6  16
## 48     37     284 20.7   72     6  17
## 49     20      37  9.2   65     6  18
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 52     NA     150  6.3   77     6  21
## 53     NA      59  1.7   76     6  22
## 54     NA      91  4.6   76     6  23
```

```
## 55     NA     250  6.3   76     6  24
## 56     NA     135  8.0   75     6  25
## 57     NA     127  8.0   78     6  26
## 58     NA      47 10.3   73     6  27
## 59     NA      98 11.5   80     6  28
## 60     NA      31 14.9   77     6  29
## 61     NA     138  8.0   83     6  30
## 62    135     269  4.1   84     7   1
## 63     49     248  9.2   85     7   2
## 64     32     236  9.2   81     7   3
## 65     NA     101 10.9   84     7   4
## 66     64     175  4.6   83     7   5
## 67     40     314 10.9   83     7   6
## 68     77     276  5.1   88     7   7
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 71     85     175  7.4   89     7  10
## 72     NA     139  8.6   82     7  11
## 73     10     264 14.3   73     7  12
## 74     27     175 14.9   81     7  13
## 75     NA     291 14.9   91     7  14
## 76      7      48 14.3   80     7  15
## 77     48     260  6.9   81     7  16
## 78     35     274 10.3   82     7  17
## 79     61     285  6.3   84     7  18
## 80     79     187  5.1   87     7  19
## 81     63     220 11.5   85     7  20
## 82     16       7  6.9   74     7  21
## 83     NA     258  9.7   81     7  22
## 84     NA     295 11.5   82     7  23
## 85     80     294  8.6   86     7  24
## 86    108     223  8.0   85     7  25
## 87     20      81  8.6   82     7  26
## 88     52      82 12.0   86     7  27
## 89     82     213  7.4   88     7  28
## 90     50     275  7.4   86     7  29
## 91     64     253  7.4   83     7  30
## 92     59     254  9.2   81     7  31
## 93     39      83  6.9   81     8   1
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 96     78      NA  6.9   86     8   4
## 97     35      NA  7.4   85     8   5
## 98     66      NA  4.6   87     8   6
## 99    122     255  4.0   89     8   7
## 100    89     229 10.3   90     8   8
## 101   110     207  8.0   90     8   9
## 102    NA     222  8.6   92     8  10
## 103    NA     137 11.5   86     8  11
## 104    44     192 11.5   86     8  12
## 105    28     273 11.5   82     8  13
## 106    65     157  9.7   80     8  14
## 107    NA      64 11.5   79     8  15
## 108    22      71 10.3   77     8  16
```

```
## 109    59      51  6.3   79     8  17
## 110    23     115  7.4   76     8  18
## 111    31     244 10.9   78     8  19
## 112    44     190 10.3   78     8  20
## 113    21     259 15.5   77     8  21
## 114     9      36 14.3   72     8  22
## 115    NA     255 12.6   75     8  23
## 116    45     212  9.7   79     8  24
## 117   168     238  3.4   81     8  25
## 118    73     215  8.0   86     8  26
## 119    NA     153  5.7   88     8  27
## 120    76     203  9.7   97     8  28
## 121   118     225  2.3   94     8  29
## 122    84     237  6.3   96     8  30
## 123    85     188  6.3   94     8  31
## 124    96     167  6.9   91     9   1
## 125    78     197  5.1   92     9   2
## 126    73     183  2.8   93     9   3
## 127    91     189  4.6   93     9   4
## 128    47      95  7.4   87     9   5
## 129    32      92 15.5   84     9   6
## 130    20     252 10.9   80     9   7
## 131    23     220 10.3   78     9   8
## 132    21     230 10.9   75     9   9
## 133    24     259  9.7   73     9  10
## 134    44     236 14.9   81     9  11
## 135    21     259 15.5   76     9  12
## 136    28     238  6.3   77     9  13
## 137     9      24 10.9   71     9  14
## 138    13     112 11.5   71     9  15
## 139    46     237  6.9   78     9  16
## 140    18     224 13.8   67     9  17
## 141    13      27 10.3   76     9  18
## 142    24     238 10.3   68     9  19
## 143    16     201  8.0   82     9  20
## 144    13     238 12.6   64     9  21
## 145    23      14  9.2   71     9  22
## 146    36     139 10.3   81     9  23
## 147     7      49 10.3   69     9  24
## 148    14      20 16.6   63     9  25
## 149    30     193  6.9   70     9  26
## 150    NA     145 13.2   77     9  27
## 151    14     191 14.3   75     9  28
## 152    18     131  8.0   76     9  29
## 153    20     223 11.5   68     9  30
```

```
library(mice)
md.pattern(airquality)
```




```
##     Wind Temp Month Day Solar.R Ozone
## 111    1    1     1   1       1     1  0
## 35     1    1     1   1       1     0  1
## 5      1    1     1   1       0     1  1
## 2      1    1     1   1       0     0  2
##        0    0     0   0       7    37 44
```

```
impdata = mice(airquality, m=5, meth='pmm')
```

```
##
##  iter imp variable
##   1   1  Ozone  Solar.R
##   1   2  Ozone  Solar.R
##   1   3  Ozone  Solar.R
##   1   4  Ozone  Solar.R
##   1   5  Ozone  Solar.R
##   2   1  Ozone  Solar.R
##   2   2  Ozone  Solar.R
##   2   3  Ozone  Solar.R
##   2   4  Ozone  Solar.R
##   2   5  Ozone  Solar.R
##   3   1  Ozone  Solar.R
##   3   2  Ozone  Solar.R
##   3   3  Ozone  Solar.R
##   3   4  Ozone  Solar.R
```

```
##   3   5  Ozone  Solar.R
##   4   1  Ozone  Solar.R
##   4   2  Ozone  Solar.R
##   4   3  Ozone  Solar.R
##   4   4  Ozone  Solar.R
##   4   5  Ozone  Solar.R
##   5   1  Ozone  Solar.R
##   5   2  Ozone  Solar.R
##   5   3  Ozone  Solar.R
##   5   4  Ozone  Solar.R
##   5   5  Ozone  Solar.R
```

```
completedata = complete(impdata)
completedata
```

```
##     Ozone Solar.R Wind Temp Month Day
## 1      41     190  7.4   67     5   1
## 2      36     118  8.0   72     5   2
## 3      12     149 12.6   74     5   3
## 4      18     313 11.5   62     5   4
## 5      19     194 14.3   56     5   5
## 6      28     186 14.9   66     5   6
## 7      23     299  8.6   65     5   7
## 8      19      99 13.8   59     5   8
## 9       8      19 20.1   61     5   9
## 10     11     194  8.6   69     5  10
## 11      7      48  6.9   74     5  11
## 12     16     256  9.7   69     5  12
## 13     11     290  9.2   66     5  13
## 14     14     274 10.9   68     5  14
## 15     18      65 13.2   58     5  15
## 16     14     334 11.5   64     5  16
## 17     34     307 12.0   66     5  17
## 18      6      78 18.4   57     5  18
## 19     30     322 11.5   68     5  19
## 20     11      44  9.7   62     5  20
## 21      1       8  9.7   59     5  21
## 22     11     320 16.6   73     5  22
## 23      4      25  9.7   61     5  23
## 24     32      92 12.0   61     5  24
## 25     14      66 16.6   57     5  25
## 26     19     266 14.9   58     5  26
## 27     13      49  8.0   57     5  27
## 28     23      13 12.0   67     5  28
## 29     45     252 14.9   81     5  29
## 30    115     223  5.7   79     5  30
## 31     37     279  7.4   76     5  31
## 32     45     286  8.6   78     6   1
## 33     30     287  9.7   74     6   2
## 34     13     242 16.1   67     6   3
## 35     32     186  9.2   84     6   4
## 36     23     220  8.6   85     6   5
## 37     14     264 14.3   79     6   6
## 38     29     127  9.7   82     6   7
```

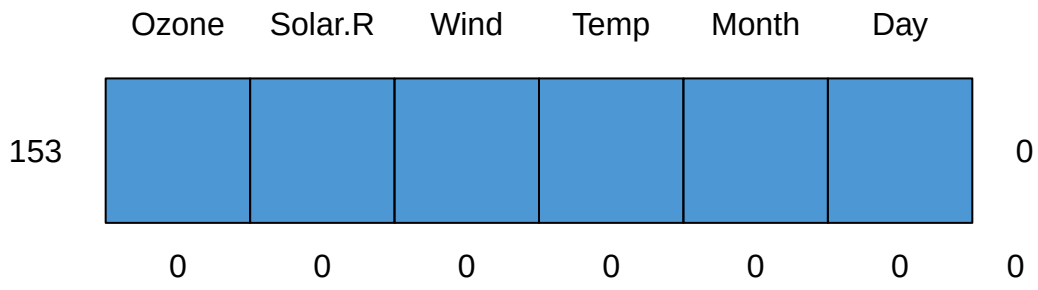
```
## 39     61     273  6.9   87     6   8
## 40     71     291 13.8   90     6   9
## 41     39     323 11.5   87     6  10
## 42     61     259 10.9   93     6  11
## 43     79     250  9.2   92     6  12
## 44     23     148  8.0   82     6  13
## 45     18     332 13.8   80     6  14
## 46     28     322 11.5   79     6  15
## 47     21     191 14.9   77     6  16
## 48     37     284 20.7   72     6  17
## 49     20      37  9.2   65     6  18
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 52     20     150  6.3   77     6  21
## 53     37      59  1.7   76     6  22
## 54     63      91  4.6   76     6  23
## 55     23     250  6.3   76     6  24
## 56     16     135  8.0   75     6  25
## 57     40     127  8.0   78     6  26
## 58     27      47 10.3   73     6  27
## 59     65      98 11.5   80     6  28
## 60     34      31 14.9   77     6  29
## 61     78     138  8.0   83     6  30
## 62    135     269  4.1   84     7   1
## 63     49     248  9.2   85     7   2
## 64     32     236  9.2   81     7   3
## 65     18     101 10.9   84     7   4
## 66     64     175  4.6   83     7   5
## 67     40     314 10.9   83     7   6
## 68     77     276  5.1   88     7   7
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 71     85     175  7.4   89     7  10
## 72     29     139  8.6   82     7  11
## 73     10     264 14.3   73     7  12
## 74     27     175 14.9   81     7  13
## 75     47     291 14.9   91     7  14
## 76      7      48 14.3   80     7  15
## 77     48     260  6.9   81     7  16
## 78     35     274 10.3   82     7  17
## 79     61     285  6.3   84     7  18
## 80     79     187  5.1   87     7  19
## 81     63     220 11.5   85     7  20
## 82     16       7  6.9   74     7  21
## 83     49     258  9.7   81     7  22
## 84     20     295 11.5   82     7  23
## 85     80     294  8.6   86     7  24
## 86    108     223  8.0   85     7  25
## 87     20      81  8.6   82     7  26
## 88     52      82 12.0   86     7  27
## 89     82     213  7.4   88     7  28
## 90     50     275  7.4   86     7  29
## 91     64     253  7.4   83     7  30
## 92     59     254  9.2   81     7  31
```

```
## 93     39      83  6.9   81     8   1
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 96     78     323  6.9   86     8   4
## 97     35     157  7.4   85     8   5
## 98     66     286  4.6   87     8   6
## 99    122     255  4.0   89     8   7
## 100    89     229 10.3   90     8   8
## 101   110     207  8.0   90     8   9
## 102    85     222  8.6   92     8  10
## 103    29     137 11.5   86     8  11
## 104    44     192 11.5   86     8  12
## 105    28     273 11.5   82     8  13
## 106    65     157  9.7   80     8  14
## 107    11      64 11.5   79     8  15
## 108    22      71 10.3   77     8  16
## 109    59      51  6.3   79     8  17
## 110    23     115  7.4   76     8  18
## 111    31     244 10.9   78     8  19
## 112    44     190 10.3   78     8  20
## 113    21     259 15.5   77     8  21
## 114     9      36 14.3   72     8  22
## 115    23     255 12.6   75     8  23
## 116    45     212  9.7   79     8  24
## 117   168     238  3.4   81     8  25
## 118    73     215  8.0   86     8  26
## 119    78     153  5.7   88     8  27
## 120    76     203  9.7   97     8  28
## 121   118     225  2.3   94     8  29
## 122    84     237  6.3   96     8  30
## 123    85     188  6.3   94     8  31
## 124    96     167  6.9   91     9   1
## 125    78     197  5.1   92     9   2
## 126    73     183  2.8   93     9   3
## 127    91     189  4.6   93     9   4
## 128    47      95  7.4   87     9   5
## 129    32      92 15.5   84     9   6
## 130    20     252 10.9   80     9   7
## 131    23     220 10.3   78     9   8
## 132    21     230 10.9   75     9   9
## 133    24     259  9.7   73     9  10
## 134    44     236 14.9   81     9  11
## 135    21     259 15.5   76     9  12
## 136    28     238  6.3   77     9  13
## 137     9      24 10.9   71     9  14
## 138    13     112 11.5   71     9  15
## 139    46     237  6.9   78     9  16
## 140    18     224 13.8   67     9  17
## 141    13      27 10.3   76     9  18
## 142    24     238 10.3   68     9  19
## 143    16     201  8.0   82     9  20
## 144    13     238 12.6   64     9  21
## 145    23      14  9.2   71     9  22
## 146    36     139 10.3   81     9  23
```

```
## 147     7      49 10.3   69     9  24
## 148    14      20 16.6   63     9  25
## 149    30     193  6.9   70     9  26
## 150    30     145 13.2   77     9  27
## 151    14     191 14.3   75     9  28
## 152    18     131  8.0   76     9  29
## 153    20     223 11.5   68     9  30
```

```
md.pattern(completedata)
```

```
##  /\     /\
## {  `---'  }
## {  0   0  }
## ==>  V <==  No need for mice. This data set is completely observed.
##  \  \|/  /
##   `-----'
```




```
##     Ozone Solar.R Wind Temp Month Day
## 153     1       1    1    1     1   1 0
##         0       0    0    0     0   0 0
```

Different data type

For data with different data type, we can use **use different method depends on the variable type**

```r
dat2 = read.csv('./Data/dat2.csv')
dat2
```

```
##       X  Age Gender Cholesterol SystolicBP  BMI Smoking Education
## 1     1 67.9 Female       236.4      129.8 26.4     Yes      High
## 2     2 54.8 Female       256.3      133.4 28.4      No    Medium
## 3     3 68.4   Male       198.7      158.5 24.1     Yes      High
## 4     4 67.9   Male       205.0      136.0 19.9      No       Low
## 5     5 60.9   Male       207.7      145.4 26.7      No    Medium
## 6     6 44.9 Female       222.5      130.6 30.6      No       Low
## 7     7 49.9   Male       201.9      152.2 27.3    <NA>    Medium
## 8     8 55.1 Female       206.2      151.3 27.5      No       Low
## 9     9 57.5   Male       202.5      142.4 28.3      No      High
## 10   10 77.2   Male       239.9      161.1 29.1      No      High
## 11   11 63.8 Female       238.6      140.0 26.3     Yes      <NA>
## 12   12 50.9   Male       247.3      142.2 26.1     Yes      High
## 13   13 48.1 Female          NA      156.4 24.3      No      <NA>
## 14   14 55.1 Female       221.3      149.9 21.6      No       Low
## 15   15 55.0   Male          NA      153.9 21.3      No       Low
## 16   16 54.1   Male       303.0      160.2 24.1      No    Medium
## 17   17 59.6 Female       238.9      147.7 24.3      No      High
## 18   18 50.2   Male       224.0      151.8 25.8      No    Medium
## 19   19 61.1 Female       202.6      138.7 22.3     Yes       Low
## 20   20 47.4 Female       212.6      149.9 23.7      No      High
## 21   21 55.7   Male       185.6      142.0 33.7     Yes       Low
## 22   22 60.6   Male       188.3      158.2 29.0     Yes      High
## 23   23 58.6   Male       216.0      144.7 28.5      No    Medium
## 24   24 64.1 Female          NA      145.5 27.3      No      High
## 25   25 57.0 Female       226.6      145.2 23.5      No      High
## 26   26 61.6 Female       216.4      124.4   NA      No      High
## 27   27 66.4   Male       182.5      135.1 25.8     Yes    Medium
## 28   28 51.8   Male       241.2      165.2 27.8     Yes      High
## 29   29 47.0   Male       236.5      152.4 27.3    <NA>       Low
## 30   30 57.9   Male       263.9      145.6 35.0      No      High
## 31   31 55.6   Male       181.6      143.6 26.0     Yes       Low
## 32   32 53.0   Male       218.8      143.5 24.3     Yes      <NA>
## 33   33 53.9 Female       267.1      149.7 20.5    <NA>    Medium
## 34   34 52.2 Female       228.4      153.2 23.2      No       Low
## 35   35 63.5 Female       258.4      135.2 38.3      No      High
## 36   36 66.9 Female       239.2      143.8 28.7      No      High
## 37   37 65.6 Female       228.8      132.4 31.2     Yes       Low
## 38   38 54.0 Female       247.3      140.8 28.3     Yes      High
## 39   39 67.7 Female       182.9      150.4 28.1      No       Low
## 40   40 55.2 Female       217.5      130.4 26.7     Yes       Low
## 41   41 71.9   Male       240.0      155.6 29.7      No      High
## 42   42 62.1 Female       257.4      157.2 33.5      No      <NA>
## 43   43 53.8   Male       243.8      145.1 31.2      No      High
## 44   44 50.7   Male       230.2      147.9 26.5      No       Low
## 45   45 47.9 Female       252.6      158.9 27.8      No    Medium
## 46   46 48.8 Female       225.9      139.2 21.3      No       Low
## 47   47 44.7 Female       199.4      135.6 32.2      No    Medium
## 48   48 67.0   Male       225.0      133.4   NA     Yes      High
## 49   49 64.3 Female       221.7      135.3 21.1      No    Medium
```

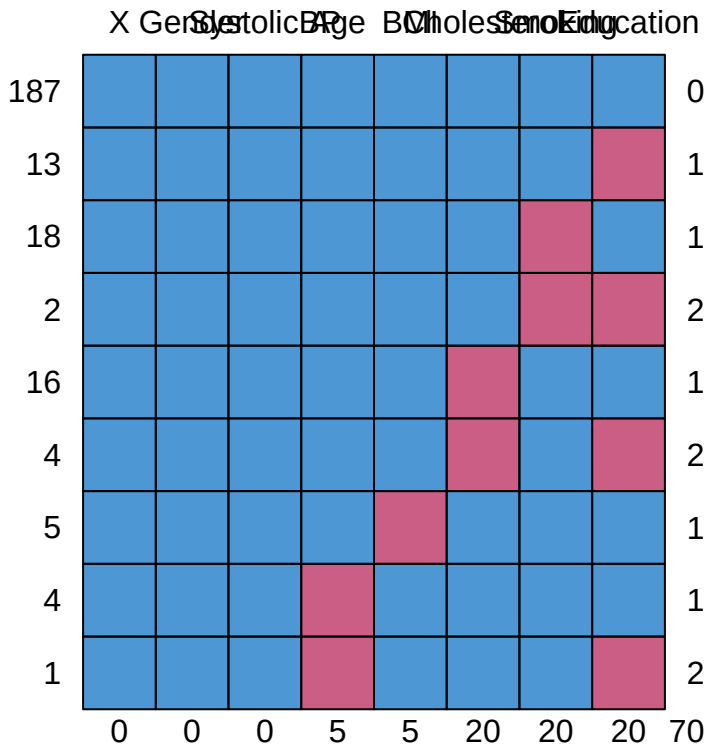
```
## 50   50 55.6 Female       234.4      137.9 27.3    <NA>       Low
## 51   51 59.7   Male       216.6      149.0 23.7     Yes      <NA>
## 52   52 54.4   Male       241.1      135.6 22.4      No       Low
## 53   53 77.5 Female       274.5      142.4 31.9     Yes      High
## 54   54 51.0 Female       183.0      146.8 32.3      No    Medium
## 55   55 57.1   Male       239.4      132.1 35.9      No       Low
## 56   56 59.6   Male       208.5      159.7 29.5     Yes       Low
## 57   57 62.6 Female       210.7      158.5 19.7      No       Low
## 58   58 56.1 Female       182.6      126.8 29.5      No    Medium
## 59   59 39.3 Female       219.5      140.3 24.5     Yes    Medium
## 60   60 47.1   Male       233.5      141.4 26.6      No    Medium
## 61   61 60.4   Male       191.8      146.9 28.4     Yes      High
## 62   62 57.4   Male       271.5      133.2 27.7      No      High
## 63   63 49.8 Female       207.6      141.4 30.7      No    Medium
## 64   64 56.6 Female       171.6      153.2 24.6      No       Low
## 65   65 50.8   Male       222.9      155.3 24.6      No      High
## 66   66 59.5   Male       281.3      147.5 28.2      No       Low
## 67   67 45.8   Male       263.4      148.6 31.1      No       Low
## 68   68 60.5 Female       255.9      138.6 25.8      No      <NA>
## 69   69 59.5   Male       244.3      140.7 24.6      No      High
## 70   70 58.0 Female       236.5      157.0 23.2      No    Medium
## 71   71 57.7   Male       215.2      145.9 24.2      No    Medium
## 72   72 59.6 Female          NA      138.2 26.2      No    Medium
## 73   73 52.2 Female       172.9      161.9 22.5     Yes    Medium
## 74   74 56.5 Female          NA      139.2 30.3     Yes    Medium
## 75   75 62.9 Female       183.3      156.7 18.8      No      High
## 76   76 66.5   Male       202.2      151.1 26.8      No       Low
## 77   77 58.7 Female       242.9      149.1 21.3      No       Low
## 78   78 56.5   Male       204.6      142.0 32.5      No      <NA>
## 79   79 50.0 Female       189.1      154.2 25.3      No      <NA>
## 80   80 45.7   Male       202.6      128.5 32.1      No    Medium
## 81   81 51.0   Male       184.9      135.1 25.6     Yes      High
## 82   82 67.8 Female       244.6      142.7 26.5    <NA>       Low
## 83   83 63.8   Male       190.0      146.8 23.1      No    Medium
## 84   84 55.7   Male       222.2      146.2 14.5     Yes    Medium
## 85   85 54.0 Female       239.3      142.3 34.3      No    Medium
## 86   86 54.1 Female       254.1      142.2 21.5    <NA>    Medium
## 87   87 65.7 Female       270.5      150.0 38.2     Yes    Medium
## 88   88 55.2 Female          NA      138.4 28.8      No      <NA>
## 89   89 67.8 Female       247.5      122.9   NA      No    Medium
## 90   90 62.8   Male       212.4      145.2 30.3      No       Low
## 91   91 68.2   Male       221.3      154.0 31.1      No      <NA>
## 92   92 50.3 Female       259.9      155.2 26.4    <NA>      <NA>
## 93   93 57.6 Female       211.2      142.2 28.0      No      <NA>
## 94   94 50.3   Male       241.7      144.6 35.1      No      High
## 95   95 62.4   Male          NA      160.6 21.5     Yes      High
## 96   96 58.5   Male       214.0      138.6 27.2      No    Medium
## 97   97 55.2   Male       259.0      143.9 30.7     Yes       Low
## 98   98 69.4 Female       220.3      150.1 21.5     Yes      High
## 99   99 59.4 Female       220.6      138.6 19.9      No      High
## 100 100 65.7 Female       242.1      140.5 33.1     Yes       Low
## 101 101 63.9 Female       247.3      151.0 24.3    <NA>    Medium
## 102 102 51.1   Male       203.7      137.8 23.0     Yes    Medium
## 103 103 52.4   Male       252.8      149.9 27.2     Yes      High
```

```
## 104 104 57.9 Female       210.5      133.0 25.1      No       Low
## 105 105   NA   Male       204.6      124.6 25.1     Yes    Medium
## 106 106 62.2   Male       170.3      151.5 21.4     Yes      High
## 107 107 47.0   Male       222.2      143.8 23.6      No    Medium
## 108 108 70.8 Female       233.1      140.8 31.0      No      High
## 109 109 53.4 Female       208.8      139.9 29.5    <NA>    Medium
## 110 110 71.3   Male       255.0      155.3 24.7    <NA>       Low
## 111 111 54.1 Female       240.3      134.1 37.5      No      High
## 112 112 49.5   Male          NA      155.0 33.6     Yes    Medium
## 113 113 57.7 Female       268.4      134.6 24.3      No       Low
## 114 114 57.7 Female       190.0      143.8 27.0      No      <NA>
## 115 115 43.7 Female       232.4      143.0 13.8      No    Medium
## 116 116 66.1   Male       245.6      151.1 31.4      No      High
## 117 117 48.3 Female       202.0      127.1   NA      No      High
## 118 118 60.3 Female       219.5      142.6 25.3      No      High
## 119 119 61.6 Female       224.3      143.8 26.6      No      High
## 120 120 58.6   Male       215.1      150.9 27.8     Yes       Low
## 121 121 56.5 Female       227.3      156.6 31.7    <NA>    Medium
## 122 122 59.1   Male       221.9      135.2 23.3    <NA>      High
## 123 123 48.7 Female       205.9      148.5 31.9      No      High
## 124 124 50.9   Male       243.6      149.8 30.6      No       Low
## 125 125 48.4 Female       211.9      157.3 24.4      No      High
## 126 126 70.5 Female       210.8      144.3 26.2      No    Medium
## 127 127 69.8   Male       237.0      156.9 35.1      No      High
## 128 128 59.7 Female       265.8      146.1 26.7     Yes    Medium
## 129 129 47.4   Male       183.9      142.2 21.6     Yes    Medium
## 130 130 57.5 Female       230.3      150.4 21.2      No    Medium
## 131 131 69.9   Male       235.0      148.1 27.1      No    Medium
## 132 132 53.6   Male       226.3      149.1 28.4      No      High
## 133 133 64.0 Female       286.3      155.4 28.5      No       Low
## 134 134 49.5 Female       255.4      142.3 26.3      No    Medium
## 135 135 63.2   Male       212.9      142.8 19.1    <NA>      High
## 136 136 49.7 Female       210.8      143.1 25.5    <NA>       Low
## 137 137 47.4 Female          NA      156.1 31.3     Yes      High
## 138 138 49.7 Female       249.5      165.1 17.7     Yes      High
## 139 139 50.4 Female       242.6      155.0 30.0      No      High
## 140 140 50.0   Male       211.3      155.8 21.2      No       Low
## 141 141 63.6   Male       238.4      163.2 26.5      No       Low
## 142 142 58.1   Male       223.8      139.4 21.5      No      High
## 143 143 54.8 Female          NA      130.2 30.8      No      High
## 144 144   NA   Male       205.3      133.9 24.9      No       Low
## 145 145 49.2 Female       226.4      147.8 29.2      No    Medium
## 146 146 51.2   Male       201.3      145.4 24.0      No    Medium
## 147 147 48.3 Female       202.3      117.5 22.4      No       Low
## 148 148 53.8 Female       225.7      157.3 21.1      No      High
## 149 149 61.4   Male       220.1      143.0 22.5      No      High
## 150 150 47.8   Male       213.8      144.6 25.9      No    Medium
## 151 151 69.6   Male       262.3      149.3 33.2      No      High
## 152 152 46.7   Male       227.7      131.8 29.8      No      High
## 153 153 56.7   Male       256.9      138.0 24.7      No      High
## 154 154 76.9 Female       202.3      155.7 28.4    <NA>      <NA>
## 155 155 64.8 Female       219.8      165.3 23.2    <NA>      High
## 156 156 55.4 Female       192.3      152.2 24.8      No      High
## 157 157 50.4 Female       259.7      152.7 28.1      No    Medium
```

```
## 158 158 62.3 Female       202.3      127.8 38.7      No      <NA>
## 159 159 57.4 Female       260.5      155.9 28.4     Yes      High
## 160 160 54.4   Male       202.1      156.7 27.8     Yes      High
## 161 161   NA   Male       223.4      141.6 17.7      No      <NA>
## 162 162 53.5 Female          NA      147.1 32.3     Yes      High
## 163 163 79.3   Male       219.7      154.6 32.6     Yes      High
## 164 164 71.3 Female       225.9      167.2 20.6      No      High
## 165 165 63.9   Male       180.1      133.9 27.4      No      High
## 166 166 63.3 Female       218.8      155.7 23.9      No    Medium
## 167 167 53.0 Female          NA      159.2 27.9      No       Low
## 168 168 64.8   Male       182.0      154.5 25.3     Yes      High
## 169 169 54.6 Female       246.9      148.2 31.7      No       Low
## 170 170 49.2 Female          NA      143.7 28.3     Yes      <NA>
## 171 171 72.9   Male       220.4      146.9 27.8      No       Low
## 172 172 49.9   Male       239.0      154.1 29.0      No    Medium
## 173 173 55.1 Female       213.1      134.2 19.8      No       Low
## 174 174 52.5   Male       243.2      132.7 22.5     Yes      High
## 175 175 49.7 Female       228.7      137.9 33.1      No    Medium
## 176 176 62.4 Female       260.9      130.7 28.2      No       Low
## 177 177 45.0 Female       209.9      128.2 29.1      No      High
## 178 178 55.8 Female       198.1      159.3 21.5      No      <NA>
## 179 179 52.8 Female       234.1      135.8 36.5      No    Medium
## 180 180 46.1 Female       221.0      140.1 25.1     Yes    Medium
## 181 181 56.9 Female       218.6      133.6 29.4      No    Medium
## 182 182 54.0   Male          NA      150.4 26.3     Yes      <NA>
## 183 183 52.6   Male          NA      150.6 31.3      No      High
## 184 184 65.5 Female       226.0      157.3 23.6     Yes      High
## 185 185 61.9 Female       240.6      140.5 31.5      No      High
## 186 186 56.8 Female       243.5      157.9 31.6      No      High
## 187 187 58.8 Female       245.4      146.6 24.1     Yes      <NA>
## 188 188 51.5 Female       248.5      131.9 20.4     Yes       Low
## 189 189 55.8 Female       256.3      156.9 29.1      No      High
## 190 190 66.5 Female       222.4      160.6 17.5     Yes       Low
## 191 191 57.4   Male       215.2      153.4 30.5     Yes      High
## 192 192 58.8 Female       196.5      140.8 30.6      No       Low
## 193 193 74.1 Female       220.0      131.5 30.7      No    Medium
## 194 194 51.7   Male       203.6      145.6 26.0     Yes      High
## 195 195 65.4 Female       235.3      131.5 35.1      No      High
## 196 196 72.2 Female       220.9      126.7 26.8      No      High
## 197 197 48.8 Female       212.4      152.4 23.3     Yes       Low
## 198 198 57.6   Male       202.4      142.1 25.8      No    Medium
## 199 199 54.3 Female          NA      141.1 22.1     Yes      High
## 200 200   NA   Male       211.4      138.6 22.0      No      High
## 201 201 48.9 Female       195.8      158.6 28.3      No       Low
## 202 202 50.2   Male       192.2      129.0 27.6      No      High
## 203 203 67.9   Male       251.7      140.7 25.1     Yes    Medium
## 204 204 62.4   Male          NA      151.0 26.5      No       Low
## 205 205 63.9   Male       207.5      148.2 26.7     Yes    Medium
## 206 206 70.3   Male       218.7      138.9 26.1      No    Medium
## 207 207 54.5 Female       212.0      144.6 34.8      No    Medium
## 208 208 64.2 Female       215.1      143.2 24.9     Yes       Low
## 209 209 57.0 Female       218.2      162.4   NA     Yes       Low
## 210 210 53.4   Male       211.3      146.2 26.0      No      High
## 211 211 65.1   Male          NA      138.5 22.9      No      High
```

```
## 212 212 57.8   Male       242.5      157.3 23.5      No      High
## 213 213 48.8 Female       223.0      132.2 28.1    <NA>      High
## 214 214 55.5 Female       191.4      150.7 25.0     Yes      High
## 215 215 69.8   Male       244.7      157.8 28.1      No    Medium
## 216 216 67.1 Female       184.4      133.3 28.8      No      High
## 217 217   NA Female       216.1      148.5 30.5      No    Medium
## 218 218 58.3 Female       218.8      154.9 23.1      No    Medium
## 219 219 64.5 Female       203.4      156.6 33.1     Yes       Low
## 220 220 44.2 Female       232.4      160.7 19.4      No      High
## 221 221 69.1   Male       189.9      164.8 19.3      No    Medium
## 222 222 53.1 Female       261.6      147.2 32.2     Yes      High
## 223 223 59.8   Male       234.3      136.6 32.6      No       Low
## 224 224 55.9   Male       265.9      137.5 22.5      No      High
## 225 225 70.4   Male       240.9      152.3 29.5      No    Medium
## 226 226 45.4 Female       185.6      129.2 21.8      No      High
## 227 227 56.3   Male       240.9      150.3 34.1      No       Low
## 228 228 48.7 Female       236.2      133.4 27.7      No      High
## 229 229 60.8 Female       249.9      135.8 26.8      No       Low
## 230 230 75.8 Female       251.1      148.7 26.0    <NA>       Low
## 231 231 45.1 Female       236.5      139.2 22.2    <NA>       Low
## 232 232 57.0   Male       240.6      136.7 30.9      No      High
## 233 233 56.3 Female       211.8      138.4 27.4      No    Medium
## 234 234 70.1   Male       263.1      159.6 29.5     Yes      High
## 235 235 49.4 Female          NA      131.2 24.0      No      High
## 236 236 61.6   Male       181.0      146.3 25.6      No      High
## 237 237 71.4 Female       195.0      140.4 28.4      No      High
## 238 238 55.4 Female       247.2      175.4 20.0      No    Medium
## 239 239 51.7   Male       199.3      143.6 23.4      No       Low
## 240 240 56.2 Female       216.5      163.8 24.8      No      High
## 241 241 61.6 Female       227.6      154.0 29.8      No      High
## 242 242 49.2 Female       214.1      129.2 23.4    <NA>    Medium
## 243 243 70.7 Female       176.2      150.5 22.8      No       Low
## 244 244 57.5   Male       253.3      152.3 29.1      No      High
## 245 245 33.7 Female       223.8      145.5 24.2      No      High
## 246 246 48.4 Female       238.2      125.3 31.6      No       Low
## 247 247 70.2 Female       225.7      168.1 20.3     Yes      High
## 248 248 49.5 Female          NA      143.3 25.8      No       Low
## 249 249 56.7   Male       228.0      130.9 24.0     Yes      High
## 250 250 57.8 Female       244.9      157.9 25.2      No       Low
```

```
md.pattern(dat2)
```




```
##     X Gender SystolicBP Age BMI Cholesterol Smoking Education
## 187 1      1          1   1   1           1       1         1  0
## 13  1      1          1   1   1           1       1         0  1
## 18  1      1          1   1   1           1       0         1  1
## 2   1      1          1   1   1           1       0         0  2
## 16  1      1          1   1   1           0       1         1  1
## 4   1      1          1   1   1           0       1         0  2
## 5   1      1          1   1   0           1       1         1  1
## 4   1      1          1   0   1           1       1         1  1
## 1   1      1          1   0   1           1       1         0  2
##     0      0          0   5   5          20      20        20 70
```

```
str(dat2)
```

```
## 'data.frame':    250 obs. of  8 variables:
##  $ X          : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ Age        : num  67.9 54.8 68.4 67.9 60.9 44.9 49.9 55.1 57.5 77.2 ...
##  $ Gender     : chr  "Female" "Female" "Male" "Male" ...
##  $ Cholesterol: num  236 256 199 205 208 ...
##  $ SystolicBP : num  130 133 158 136 145 ...
##  $ BMI        : num  26.4 28.4 24.1 19.9 26.7 30.6 27.3 27.5 28.3 29.1 ...
##  $ Smoking    : chr  "Yes" "No" "Yes" "No" ...
##  $ Education  : chr  "High" "Medium" "High" "Low" ...
```

```r
library(dplyr)
dat2 = dat2 %>%
  mutate(Gender=as.factor(Gender)) %>%
  mutate(Smoking=as.factor(Smoking)) %>%
  mutate(Education=as.factor(Education))
str(dat2)
```

```
## 'data.frame':    250 obs. of  8 variables:
##  $ X          : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ Age        : num  67.9 54.8 68.4 67.9 60.9 44.9 49.9 55.1 57.5 77.2 ...
##  $ Gender     : Factor w/ 2 levels "Female","Male": 1 1 2 2 2 1 2 1 2 2 ...
##  $ Cholesterol: num  236 256 199 205 208 ...
##  $ SystolicBP : num  130 133 158 136 145 ...
##  $ BMI        : num  26.4 28.4 24.1 19.9 26.7 30.6 27.3 27.5 28.3 29.1 ...
##  $ Smoking    : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 NA 1 1 1 ...
##  $ Education  : Factor w/ 3 levels "High","Low","Medium": 1 3 1 2 3 2 3 2 1 1 ...
```