Group5

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```
# Set CRAN mirror
options(repos = c(CRAN = "https://cran.rstudio.com/"))

# Install necessary packages if not already installed
if (!requireNamespace("tidyverse", quietly = TRUE)) {
  install.packages("tidyverse")
}

if (!requireNamespace("ggplot2", quietly = TRUE)) {
  install.packages("ggplot2")
}
```

Diabetes Dataset Analysis

Load necessary libraries and dataset

Print the structure of your dataset

```
print("Structure of the dataset:")
```

```
## [1] "Structure of the dataset:"
```

```
str(data)
```

```
## 'data.frame':    768 obs. of  9 variables:
##  $ Pregnancies             : int  6 1 8 1 0 5 3 10 2 8 ...
##  $ Glucose                 : int  148 85 183 89 137 116 78 115 197 125 ...
##  $ BloodPressure           : int  72 66 64 66 40 74 50 0 70 96 ...
##  $ SkinThickness           : int  35 29 0 23 35 0 32 0 45 0 ...
##  $ Insulin                 : int  0 0 0 94 168 0 88 0 543 0 ...
##  $ BMI                     : num  33.6 26.6 23.3 28.1 43.1 25.6 31 35.3 30.5 0 ...
##  $ DiabetesPedigreeFunction: num  0.627 0.351 0.672 0.167 2.288 ...
##  $ Age                     : int  50 31 32 21 33 30 26 29 53 54 ...
##  $ Outcome                 : int  1 0 1 0 1 0 1 0 1 1 ...
```

List the variables in your dataset

```
print("Variables in the dataset:")
```

```
## [1] "Variables in the dataset:"
```

```
print(colnames(data))
```

```
## [1] "Pregnancies"              "Glucose"
## [3] "BloodPressure"            "SkinThickness"
## [5] "Insulin"                  "BMI"
## [7] "DiabetesPedigreeFunction" "Age"
## [9] "Outcome"
```

Print the top 15 rows of your dataset

```
print("Top 15 rows of the dataset:")
```

```
## [1] "Top 15 rows of the dataset:"
```

```
print(head(data, 15))
```

```
##    Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1            6     148            72            35       0 33.6
## 2            1      85            66            29       0 26.6
## 3            8     183            64             0       0 23.3
## 4            1      89            66            23      94 28.1
## 5            0     137            40            35     168 43.1
## 6            5     116            74             0       0 25.6
## 7            3      78            50            32      88 31.0
## 8           10     115             0             0       0 35.3
## 9            2     197            70            45     543 30.5
## 10           8     125            96             0       0  0.0
## 11           4     110            92             0       0 37.6
## 12          10     168            74             0       0 38.0
## 13          10     139            80             0       0 27.1
## 14           1     189            60            23     846 30.1
## 15           5     166            72            19     175 25.8
##    DiabetesPedigreeFunction Age Outcome
## 1                     0.627  50       1
## 2                     0.351  31       0
## 3                     0.672  32       1
## 4                     0.167  21       0
## 5                     2.288  33       1
## 6                     0.201  30       0
## 7                     0.248  26       1
## 8                     0.134  29       0
## 9                     0.158  53       1
```

```
## 10                    0.232  54       1
## 11                    0.191  30       0
## 12                    0.537  34       1
## 13                    1.441  57       0
## 14                    0.398  59       1
## 15                    0.587  51       1
```

Write a user defined function using any of the variables from the data set.

```r
# User-defined function using the 'BMI' variable
calculate_bmi_ratio <- function(BMI) {
  average_bmi <- mean(BMI, na.rm = TRUE)
  return(BMI / average_bmi)
}

print("BMI ratio compared to the average BMI:")
```

```
## [1] "BMI ratio compared to the average BMI:"
```

```r
bmi_ratio <- calculate_bmi_ratio(data$BMI)
print(bmi_ratio)
```

```
##   [1] 1.0502436 0.8314428 0.7282939 0.8783287 1.3471875 0.8001856 0.9689747
##   [8] 1.1033809 0.9533461 0.0000000 1.1752726 1.1877755 0.8470715 0.9408432
##  [15] 0.8064370 0.9377175 1.4315820 0.9252146 1.3534389 1.0815008 1.2284099
##  [22] 1.1065066 1.2440385 0.9064602 1.1440153 0.9721005 1.2315356 0.7251682
##  [29] 0.6939109 1.0658722 1.1252610 0.9877291 0.7751798 0.6220193 0.8627001
##  [36] 0.7501740 1.0377407 1.0283635 1.1940269 1.1596440 1.0627465 1.2565414
##  [43] 0.7095396 1.4190791 0.8564486 1.3128045 0.9283403 0.8752030 1.2221585
##  [50] 0.0000000 0.6063906 0.7564254 0.7626769 1.0533693 1.0846266 0.7189167
##  [57] 1.1783983 1.4628393 1.2659186 1.2971759 0.0000000 1.0283635 0.7814312
##  [64] 0.7939341 1.0252378 0.9064602 1.0158606 1.3346846 0.6126421 0.9033345
##  [71] 1.0283635 0.8939573 1.3565646 1.0971295 1.0002320 0.7720541 1.0189863
##  [78] 1.1783983 1.3503132 0.7814312 0.7001624 0.0000000 0.9158374 0.7689283
##  [85] 1.5253538 1.0127349 1.1440153 1.2034041 1.1596440 0.8283171 0.5970135
##  [92] 1.0002320 1.4597136 0.7439225 0.7720541 1.0596208 0.9877291 0.6376479
##  [99] 0.8970831 1.5534853 1.2190327 0.8158142 0.7032881 0.8314428 1.2377871
## [106] 0.8970831 0.7001624 0.9220889 1.0721237 1.1690211 1.0408664 1.0627465
## [113] 0.9752262 1.0627465 0.9533461 0.9752262 1.0627465 1.0533693 0.8814544
## [120] 0.7251682 1.6628857 1.0689979 1.0502436 0.8376943 1.0408664 1.7191487
## [127] 1.3409360 1.0408664 1.0783751 0.8720773 0.9283403 1.0408664 1.0783751
## [134] 1.1971527 0.6595280 1.0564950 0.9627233 0.8970831 0.9752262 1.1533925
## [141] 0.6595280 1.2346614 1.0158606 1.0127349 1.0252378 0.0000000 1.0252378
## [148] 0.9533461 1.0533693 0.8533229 1.1690211 0.6845338 1.0721237 1.2690443
## [155] 1.4972223 1.5628625 0.7689283 0.7876827 0.9064602 1.2784215 0.9283403
## [162] 1.1627697 1.3815704 0.9283403 0.9877291 0.9345918 1.0158606 0.9252146
## [169] 0.9971063 0.8877059 0.9627233 1.1065066 0.9033345 1.3596904 0.9283403
## [176] 1.0221121 0.9752262 2.0973614 1.4065762 1.2221585 0.7251682 1.0908780
## [183] 0.8658258 0.8376943 0.8627001 1.1221353 0.9408432 1.0002320 0.8720773
## [190] 0.9877291 0.7064138 1.0346150 0.9502204 1.6347542 0.7626769 1.2315356
## [197] 0.7595512 0.7157910 1.0877523 0.9658490 0.9689747 1.2534157 0.8533229
```

```
## [204] 0.6376479 1.1783983 0.7470483 1.1721469 1.1783983 1.0377407 1.1096324
## [211] 0.8658258 1.3378103 1.0689979 1.3315588 1.0689979 1.3065530 1.1190095
## [218] 0.9377175 0.9064602 1.1815240 1.0815008 0.9877291 0.7876827 0.9002088
## [225] 0.7376711 1.0815008 1.1158838 1.1627697 1.1471411 1.4128277 1.3753190
## [232] 1.4440849 0.7939341 1.0940037 0.9283403 1.3628161 1.1221353 1.3784447
## [239] 0.9627233 0.5751334 0.9127117 1.0346150 0.8001856 0.8470715 1.1940269
## [246] 0.9377175 0.9752262 1.6347542 1.1065066 0.9408432 0.9752262 0.8752030
## [253] 0.7626769 1.1190095 0.8627001 1.0502436 0.9408432 0.8970831 0.8095628
## [260] 1.0408664 0.9658490 0.9377175 1.0033577 1.0127349 1.0002320 1.0502436
## [267] 1.1346382 1.2502900 0.7845570 0.8595744 1.4253306 0.7876827 0.7189167
## [274] 1.0377407 1.0689979 1.2659186 0.8283171 0.8689515 0.7783055 0.7908084
## [281] 1.1846498 1.1221353 1.0127349 0.9502204 0.8439457 0.8126885 1.2096556
## [288] 1.4253306 0.6501508 1.1283867 1.1533925 1.1440153 1.3534389 1.2659186
## [295] 0.6845338 1.1096324 0.8752030 0.9595976 1.1440153 0.7376711 1.0096092
## [302] 0.9877291 1.1190095 1.6535085 0.6564022 1.2409128 0.7970599 0.7751798
## [309] 0.9533461 1.0283635 0.8189399 1.2315356 0.8314428 0.9220889 1.1221353
## [316] 1.0658722 0.6032649 0.9533461 1.1909012 0.7345454 0.8595744 0.9877291
## [323] 0.8564486 0.8376943 1.1158838 0.8001856 1.0971295 1.0971295 1.4222049
## [330] 0.9627233 0.7220425 1.0221121 1.3534389 0.7376711 0.7470483 1.4972223
## [337] 1.0564950 0.9752262 1.0689979 1.2471643 0.8095628 0.8095628 1.0002320
## [344] 1.0846266 1.1502668 1.2034041 0.8970831 0.7345454 0.6814080 1.2815472
## [351] 1.3190559 0.9752262 1.0752494 0.8501972 1.3346846 0.9502204 1.0408664
## [358] 1.2471643 1.1033809 1.1408896 0.9752262 0.9314660 1.2252842 1.2034041
## [365] 1.0908780 1.0627465 0.8627001 0.6564022 0.8595744 1.0252378 1.2002784
## [372] 0.0000000 1.1190095 1.0908780 1.1315124 1.2252842 0.7876827 1.1627697
## [379] 1.5097252 1.3565646 0.9627233 0.6251450 0.7939341 0.7845570 0.7595512
## [386] 0.6970367 1.0096092 1.3534389 1.0002320 0.9877291 1.0002320 1.4284563
## [393] 0.7407968 0.6907852 1.0283635 0.8658258 0.7720541 1.0721237 0.6595280
## [400] 1.0908780 1.0002320 0.7564254 1.0940037 0.9877291 1.0283635 1.3159302
## [407] 0.9033345 0.6845338 0.8095628 1.3253074 1.1158838 1.0752494 1.3253074
## [414] 0.8189399 1.0815008 1.1158838 0.8501972 1.2034041 0.5688819 0.8251914
## [421] 1.4159534 0.8126885 1.2690443 0.9627233 1.3409360 1.1565182 0.0000000
## [428] 1.0658722 1.2690443 1.0940037 0.6939109 0.9502204 0.9377175 0.8001856
## [435] 0.7658026 1.3253074 1.1690211 0.9345918 0.5688819 1.1502668 1.0721237
## [442] 1.0064834 1.0377407 0.9533461 0.9283403 1.8566806 0.7908084 1.1408896
## [449] 1.0502436 0.9533461 0.6626537 0.9033345 1.2471643 0.6126421 1.1815240
## [456] 1.0502436 0.8345686 0.9439689 1.1752726 0.8095628 0.6501508 0.6814080
## [463] 1.1033809 0.8627001 0.7501740 0.6814080 0.8689515 1.1502668 0.9377175
## [470] 1.4409592 1.2909244 1.0377407 1.2127813 0.9345918 0.9033345 0.8533229
## [477] 1.0533693 0.7439225 0.8095628 0.8752030 1.1096324 1.1002552 0.8689515
## [484] 1.1940269 1.3815704 1.3221817 1.2721701 1.4534621 0.8001856 0.8158142
## [491] 1.1502668 1.0471179 1.0252378 0.9033345 0.0000000 0.8314428 0.8126885
## [498] 0.9408432 0.7845570 0.9158374 0.7876827 1.1627697 1.2190327 1.0408664
## [505] 1.1658954 1.0408664 1.1408896 0.8939573 0.9502204 0.7814312 0.9283403
## [512] 0.6907852 0.7564254 0.8533229 0.8001856 0.9877291 0.9470947 1.1752726
## [519] 1.0252378 0.6126421 0.7814312 1.0377407 0.0000000 1.0689979 0.9877291
## [526] 0.6814080 0.5688819 0.8220657 0.9627233 0.7689283 0.9314660 1.4159534
## [533] 1.2909244 0.9314660 1.0408664 1.0283635 0.9252146 0.6782823 1.1346382
## [540] 1.1377639 1.2315356 1.0127349 1.0908780 1.2346614 1.0002320 1.0783751
## [547] 1.3628161 1.0346150 1.0252378 0.8908316 0.8564486 0.9971063 0.8689515
## [554] 0.9345918 1.1533925 0.7970599 1.1909012 0.8689515 1.4440849 0.9408432
## [561] 1.0564950 1.2909244 1.1752726 0.8408200 1.0127349 0.8158142 1.2065298
## [568] 1.0002320 0.9783519 1.0721237 1.0158606 0.7064138 0.9220889 1.0846266
## [575] 0.9408432 1.1096324 0.7501740 1.3409360 0.8439457 1.0846266 1.3159302
```

```
## [582] 0.7814312 0.8283171 1.2096556 0.8970831 0.7032881 1.0908780 0.7595512
## [589] 1.0408664 0.6595280 1.4628393 1.2315356 1.0752494 0.8908316 1.0502436
## [596] 1.0002320 1.4159534 0.8689515 1.1502668 0.7220425 0.8470715 0.7407968
## [603] 0.8689515 1.1002552 0.8877059 1.1190095 1.2502900 0.6095164 1.2971759
## [610] 0.7501740 0.9658490 1.0283635 1.1940269 1.0158606 1.1283867 0.8064370
## [617] 0.8970831 0.6282707 0.8814544 1.0127349 1.2002784 0.7564254 1.2752958
## [624] 1.3596904 0.9627233 1.1783983 0.7720541 1.0127349 1.0815008 0.7720541
## [631] 0.8564486 1.0783751 0.8189399 0.8595744 0.8095628 0.9752262 0.9002088
## [638] 0.9877291 1.2784215 0.6095164 0.9158374 1.0721237 0.9220889 0.8752030
## [645] 0.8627001 1.2315356 0.7314196 1.1815240 0.8845802 0.8251914 0.7876827
## [652] 1.0564950 1.0658722 0.8376943 1.0689979 1.2096556 0.6814080 1.2159070
## [659] 1.2190327 1.0689979 0.8658258 1.3409360 1.1752726 1.1846498 1.0533693
## [666] 1.0877523 1.0158606 0.8595744 1.0627465 0.9658490 1.0502436 0.7939341
## [673] 1.1096324 1.7910404 1.1127581 0.9658490 0.7751798 1.1033809 1.1252610
## [680] 0.7564254 0.7564254 1.5503596 1.3940733 1.0096092 0.0000000 1.0377407
## [687] 0.7220425 0.8845802 0.7532997 1.4409592 0.7689283 1.3221817 1.2221585
## [694] 1.2034041 0.7345454 0.9502204 0.9345918 0.7814312 1.0783751 1.3909476
## [701] 1.1221353 0.8627001 1.0940037 1.2034041 0.8877059 1.2440385 0.0000000
## [708] 1.0752494 1.0252378 1.1877755 0.9752262 0.9252146 1.2877987 0.8251914
## [715] 0.9220889 1.0596208 1.0564950 0.7220425 1.1096324 1.1127581 0.9158374
## [722] 1.1909012 0.9158374 1.2221585 1.0252378 1.2315356 1.1283867 1.0127349
## [729] 0.7157910 0.9408432 0.8877059 0.8877059 1.3909476 0.9064602 0.7282939
## [736] 1.1065066 0.8564486 1.0002320 1.1440153 1.2346614 1.3221817 0.9627233
## [743] 0.8908316 1.0221121 1.2690443 0.9377175 1.5409824 1.4472107 1.1377639
## [750] 0.7595512 0.9752262 1.2190327 0.8126885 1.3534389 1.0127349 1.1408896
## [757] 1.0002320 1.1346382 1.1721469 1.1096324 0.8877059 1.3753190 0.7032881
## [764] 1.0283635 1.1502668 0.8189399 0.9408432 0.9502204
```

Use data manipulation techniques and filter rows based on any logical criteria that exist in your dataset.

```r
# Calculate the average BMI
average_bmi <- mean(data$BMI, na.rm = TRUE)

# Filter rows where BMI is greater than the average BMI
filtered_data <- data %>% filter(BMI > average_bmi)

# Display the filtered data
print("Rows where BMI is greater than the average BMI:")
```

```
## [1] "Rows where BMI is greater than the average BMI:"
```

```r
print(filtered_data)
```

```
##     Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1             6     148            72            35       0 33.6
## 2             0     137            40            35     168 43.1
## 3            10     115             0             0       0 35.3
## 4             4     110            92             0       0 37.6
## 5            10     168            74             0       0 38.0
## 6             0     118            84            47     230 45.8
```

```
## 7            1     103            30            38      83 43.3
## 8            1     115            70            30      96 34.6
## 9            3     126            88            41     235 39.3
## 10           8      99            84             0       0 35.4
## 11           7     196            90             0       0 39.8
## 12          11     143            94            33     146 36.6
## 13           7     147            76             0       0 39.4
## 14           5     117            92             0       0 34.1
## 15           5     109            75            26       0 36.0
## 16          11     138            76             0       0 33.2
## 17           9     102            76            37       0 32.9
## 18           2      90            68            42       0 38.2
## 19           4     111            72            47     207 37.1
## 20           3     180            64            25      70 34.0
## 21           7     133            84             0       0 40.2
## 22           9     171           110            24     240 45.4
## 23           0     180            66            39       0 42.0
## 24           7     103            66            32       0 39.1
## 25           8     176            90            34     300 33.7
## 26           7     150            66            42     342 34.7
## 27           7     187            68            39     304 37.7
## 28           0     100            88            60     110 46.8
## 29           0     146            82             0       0 40.5
## 30           0     105            64            41     142 41.5
## 31           8     133            72             0       0 32.9
## 32           7     114            66             0       0 32.8
## 33           0     109            88            30       0 32.5
## 34           2     109            92             0       0 42.7
## 35           2     100            66            20      90 32.9
## 36          13     126            90             0       0 43.4
## 37           4     129            86            20     270 35.1
## 38           1      79            75            30       0 32.0
## 39           7      62            78             0       0 32.6
## 40           5      95            72            33       0 37.7
## 41           0     131             0             0       0 43.2
## 42           5     137           108             0       0 48.8
## 43           2     110            74            29     125 32.4
## 44          13     106            72            54       0 36.6
## 45           2     100            68            25      71 38.5
## 46          15     136            70            32     110 37.1
## 47           4     123            80            15     176 32.0
## 48           7      81            78            40      48 46.7
## 49           6     144            72            27     228 33.9
## 50           1     122            90            51     220 49.7
## 51           1     163            72             0       0 39.0
## 52           2      85            65             0       0 39.6
## 53           3      83            58            31      18 34.3
## 54           0      95            85            25      36 37.4
## 55           3     171            72            33     135 33.3
## 56           8     155            62            26     495 34.0
## 57           4      76            62             0       0 34.0
## 58           5     124            74             0       0 34.0
## 59           5      78            48             0       0 33.7
## 60           0     162            76            56     100 53.2
```

```
## 61            6     111            64            39       0 34.2
## 62            2     107            74            30     100 33.6
## 63            0     113            76             0       0 33.3
## 64            1      88            30            42      99 55.0
## 65            3     120            70            30     135 42.9
## 66            1     118            58            36      94 33.3
## 67            1     117            88            24     145 34.5
## 68            9     122            56             0       0 33.3
## 69            3     170            64            37     225 34.5
## 70            8      84            74            31       0 38.3
## 71            2     125            60            20     140 33.8
## 72            5     105            72            29     325 36.9
## 73            5     106            82            30       0 39.5
## 74            2     108            52            26      63 32.5
## 75           10     108            66             0       0 32.4
## 76            4     154            62            31     284 32.8
## 77            9      57            80            37       0 32.8
## 78            5     147            78             0       0 33.7
## 79            1     136            74            50     204 37.4
## 80            9     156            86            28     155 34.3
## 81            1     153            82            42     485 40.6
## 82            8     188            78             0       0 47.9
## 83            7     152            88            44       0 50.0
## 84           17     163            72            41     114 40.9
## 85            7     102            74            40     105 37.2
## 86            0     114            80            34     285 44.2
## 87            3     148            66            25       0 32.5
## 88            6     134            70            23     130 35.4
## 89            1      79            60            42      48 43.5
## 90            8     179            72            42     130 32.7
## 91            0     129           110            46     130 67.1
## 92            5     143            78             0       0 45.0
## 93            5     130            82             0       0 39.1
## 94            0     119            64            18      92 34.9
## 95            7     194            68            28       0 35.9
## 96            1     128            98            41      58 32.0
## 97            9     123            70            44      94 33.1
## 98           11     135             0             0       0 52.3
## 99            5     158            84            41     210 39.4
## 100           4     109            64            44      99 34.8
## 101           1     138            82             0       0 40.1
## 102           6     103            72            32     190 37.7
## 103           8     196            76            29     280 37.5
## 104           5     162           104             0       0 37.7
## 105           1      96            64            27      87 33.2
## 106           7     184            84            33       0 35.5
## 107           0     147            85            54       0 42.8
## 108           7     179            95            31       0 34.2
## 109           0     140            65            26     130 42.6
## 110           9     112            82            32     175 34.2
## 111          12     151            70            40     271 41.8
## 112           5     109            62            41     129 35.8
## 113           5     112            66             0       0 37.8
## 114           0     177            60            29     478 34.6
```

```
## 115          1      87          78          27      32 34.6
## 116          0     101          76           0       0 35.7
## 117          3     162          52          38       0 37.2
## 118          4     197          70          39     744 36.7
## 119          0     117          80          31      53 45.2
## 120          4     142          86           0       0 44.0
## 121          6     134          80          37     370 46.2
## 122          4     122          68           0       0 35.0
## 123          4     171          72           0       0 43.6
## 124          7     181          84          21     192 35.9
## 125          0     179          90          27       0 44.1
## 126          4      91          70          32      88 33.1
## 127          2     146          76          35     194 38.2
## 128          0     165          90          33     680 52.3
## 129          9     124          70          33     402 35.4
## 130          0      86          68          32       0 35.8
## 131          1     113          64          35       0 33.6
## 132         11     155          76          28     150 33.3
## 133          4      95          70          32       0 32.1
## 134          3     142          80          15       0 32.4
## 135          4     123          62           0       0 32.0
## 136          5      96          74          18      67 33.6
## 137          0     138           0           0       0 36.3
## 138          2     128          64          42       0 40.0
## 139         10     101          86          37       0 45.6
## 140          1      71          78          50      45 33.2
## 141         13     106          70           0       0 34.2
## 142          2     100          70          52      57 40.5
## 143          0     146          70           0       0 37.9
## 144         10     129          76          28     122 35.9
## 145          7     133          88          15     155 32.4
## 146          5     155          84          44     545 38.7
## 147          1     119          86          39     220 45.6
## 148          5     108          72          43      75 36.1
## 149          0      78          88          29      40 36.9
## 150          0     107          62          30      74 36.6
## 151          2     128          78          37     182 43.3
## 152          1     128          48          45     194 40.5
## 153          6     151          62          31     120 35.5
## 154         14     100          78          25     184 36.6
## 155          0     167           0           0       0 32.3
## 156          5      77          82          41      42 35.8
## 157          5     115          98           0       0 52.9
## 158          2     120          76          37     105 39.7
## 159          2     124          68          28     205 32.9
## 160          0     106          70          37     148 39.4
## 161          7     109          80          31       0 35.9
## 162          2     112          68          22      94 34.1
## 163          3     115          66          39     140 38.1
## 164          2     112          75          32       0 35.7
## 165          1     122          64          32     156 35.1
## 166         10     179          70           0       0 35.1
## 167          2     102          86          36     120 45.5
## 168          2      87          58          16      52 32.7
```

```
## 169          1     180           0           0       0 43.3
## 170          0     165          76          43     255 47.9
## 171          0     117           0           0       0 33.8
## 172          9     152          78          34     171 34.2
## 173          7     178          84           0       0 39.9
## 174          1       0          68          35       0 32.0
## 175          5     122          86           0       0 34.7
## 176          8      95          72           0       0 36.8
## 177          8     126          88          36     108 38.5
## 178          5       0          80          32       0 41.0
## 179          4      92          80           0       0 42.2
## 180          3      61          82          28       0 34.4
## 181          3      90          78           0       0 42.7
## 182          1     125          50          40     167 33.3
## 183         13     129           0          30       0 39.9
## 184         12      88          74          40      54 35.3
## 185          1     196          76          36     249 36.5
## 186          5     103         108          37       0 39.2
## 187          4     146          78           0       0 38.5
## 188          4     147          74          25     293 34.9
## 189          5      99          54          28      83 34.0
## 190          1     133         102          28     140 32.8
## 191          3     173          82          48     465 38.4
## 192          0      84          64          22      66 35.8
## 193          2     105          58          40      94 34.9
## 194          2     122          52          43     158 36.2
## 195         12     140          82          43     325 39.2
## 196          1      87          60          37      75 37.2
## 197          4     156          75           0       0 48.3
## 198          0      93         100          39      72 43.4
## 199          5     116          74          29       0 32.3
## 200          8     105         100          36       0 43.3
## 201          5     144          82          26     285 32.0
## 202          1     100          66          29     196 32.0
## 203          5     166          76           0       0 45.7
## 204          4     158          78           0       0 32.9
## 205          0     131          66          40       0 34.3
## 206          3     193          70          31       0 34.9
## 207          4      95          64           0       0 32.0
## 208          5     136          84          41      88 35.0
## 209          5     168          64           0       0 32.9
## 210          2     123          48          32     165 42.1
## 211          1     172          68          49     579 42.4
## 212          6     102          90          39       0 35.7
## 213          1     112          72          30     176 34.4
## 214          1     143          84          23     310 42.4
## 215          0     138          60          35     167 34.6
## 216          3     173          84          33     474 35.7
## 217          4     144          82          32       0 38.5
## 218          1     119          88          41     170 45.3
## 219          0     102          64          46      78 40.6
## 220          8     151          78          32     210 42.9
## 221          4     184          78          39     277 37.0
## 222          1     181          64          30     180 34.1
```

```
## 223   0   135   94   46   145 40.6
## 224   1    95   82   25   180 35.0
## 225   0   141    0    0     0 42.4
## 226  12   140   85   33     0 37.4
## 227   6   107   88    0     0 36.8
## 228   0   189  104   25     0 34.3
## 229   2    83   66   23    50 32.2
## 230   4   117   64   27   120 33.2
## 231   0   180   78   63    14 59.4
## 232   0    95   80   45    92 36.5
## 233   0   104   64   37    64 33.6
## 234   0    91   68   32   210 39.9
## 235   2   100   54   28   105 37.8
## 236  14   175   62   30     0 33.6
## 237  10   148   84   48   237 37.6
## 238   8    74   70   40    49 35.3
## 239   0    97   64   36   100 36.8
## 240   6   154   78   41   140 46.1
## 241   1   144   82   40     0 41.3
## 242   0   137   70   38     0 33.2
## 243   0   119   66   27     0 38.8
## 244   2   105   80   45   191 33.7
## 245   3   158   70   30   328 35.5
## 246   0   123   88   37     0 35.2
## 247   0    84   82   31   125 38.2
## 248   0   145    0    0     0 44.2
## 249   0   135   68   42   250 42.3
## 250   1   139   62   41   480 40.7
## 251   0   173   78   32   265 46.5
## 252   2    83   65   28    66 36.8
## 253   2    89   90   30     0 33.5
## 254   4    99   68   38     0 32.8
## 255   3    84   72   32     0 37.2
## 256   6     0   68   41     0 39.0
## 257   7    94   64   25    79 33.3
## 258   3    96   78   39     0 37.3
## 259  10    75   82    0     0 33.3
## 260   0   180   90   26    90 36.5
## 261   7   125   86    0     0 37.6
## 262  13    76   60    0     0 32.8
## 263   3   124   80   33   130 33.2
## 264   9   130   70    0     0 34.2
## 265   0   107   76    0     0 45.3
## 266   1    86   66   52    65 41.3
## 267   1    77   56   30    56 33.3
## 268   4   132    0    0     0 32.9
## 269   0   127   80   37   210 36.3
## 270   3   129   92   49   155 36.4
## 271   8   100   74   40   215 39.4
## 272   3   128   72   25   190 32.4
## 273  10    90   85   32     0 34.9
## 274   4    84   90   23    56 39.5
## 275   1    88   78   29    76 32.0
## 276   8   186   90   35   225 34.5
```

```
## 277          5     187          76          27     207 43.6
## 278          4     131          68          21     166 33.1
## 279          1     164          82          43      67 32.8
## 280          1      84          64          23     115 36.9
## 281          1      97          70          40       0 38.1
## 282         11     103          68          40       0 46.2
## 283          6     125          76           0       0 33.8
## 284          0     198          66          32     274 41.3
## 285          1      87          68          34      77 37.6
## 286          0      91          80           0       0 32.4
## 287          1      99          72          30      18 38.6
## 288          6      92          62          32     126 32.0
## 289          0     121          66          30     165 34.3
## 290          3      78          70           0       0 32.5
## 291          2      98          60          17     120 34.7
## 292          1     119          44          47      63 35.5
## 293          2     118          80           0       0 42.9
## 294          2     197          70          99       0 34.7
## 295          0     151          90          46       0 42.1
## 296          8     100          76           0       0 38.7
## 297          8     143          66           0       0 34.9
## 298          3     176          86          27     156 33.3
## 299         11     111          84          40       0 46.8
## 300          2     112          78          50     140 39.4
## 301          3     132          80           0       0 34.4
## 302          6     123          72          45     230 33.6
## 303          0     188          82          14     185 32.0
## 304          0      67          76           0       0 45.3
## 305          1     173          74           0       0 36.8
## 306          7     150          78          29     126 35.2
## 307          1     124          60          32       0 35.8
## 308          1     181          78          42     293 40.0
## 309          0     152          82          39     272 41.5
## 310          3     174          58          22     194 32.9
## 311          7     168          88          42     321 38.2
## 312          6     105          80          28       0 32.5
## 313         11     138          74          26     144 36.1
## 314          0     119           0           0       0 32.4
## 315          2     112          86          42     160 38.4
## 316          6     183          94           0       0 40.8
## 317          0      94          70          27     115 43.5
## 318          4      90          88          47      54 37.7
## 319          0     132          78           0       0 32.4
## 320          5     128          80           0       0 34.6
## 321          0     102          78          40      90 34.5
## 322          7      97          76          32      91 40.9
## 323          4     128          70           0       0 34.3
## 324          2     157          74          35     440 39.4
## 325          0     179          50          36     159 37.8
## 326          1     117          60          23     106 33.8
## 327          5     123          74          40      77 34.1
## 328          1     106          70          28     135 34.2
## 329          2     155          52          27     540 38.7
## 330          1     120          80          48     200 38.9
```

```
## 331          11     127          106            0       0 39.0
## 332           3      80           82           31      70 34.2
## 333           1     199           76           43       0 42.9
## 334           8     167          106           46     231 37.6
## 335           9     145           80           46     130 37.9
## 336           6     115           60           39       0 33.7
## 337           1     112           80           45     132 34.8
## 338           4     145           82           18       0 32.5
## 339           6      98           58           33     190 34.0
## 340           6     165           68           26     168 33.6
## 341          10      68          106           23      49 35.5
## 342           3     123          100           35     240 57.3
## 343           8      91           82            0       0 35.6
## 344           0      93           60            0       0 35.3
## 345           3     121           52            0       0 36.0
## 346           0     162           76           36       0 49.6
## 347           0      95           64           39     105 44.6
## 348           4     125           80            0       0 32.3
## 349           2     129           74           26     205 33.2
## 350           1     144           82           46     180 46.1
## 351          13     158          114            0       0 42.3
## 352           2     121           70           32      95 39.1
## 353           7     129           68           49     125 38.5
## 354           4     127           88           11     155 34.5
## 355           4     118           70            0       0 44.5
## 356           2     122           76           27     200 35.9
## 357           1     168           88           29       0 35.0
## 358           2     129            0            0       0 38.5
## 359           6      80           80           36       0 39.8
## 360           2     127           46           21     335 34.4
## 361           9     164           78            0       0 32.8
## 362           2      93           64           32     160 38.0
## 363          10     129           62           36       0 41.2
## 364           7     187           50           33     392 33.9
## 365           3     173           78           39     185 33.8
## 366           1     108           60           46     178 35.5
## 367           5      97           76           27       0 35.6
## 368           1     114           66           36     200 38.1
## 369           5     117           86           30     105 39.1
## 370           1     111           94            0       0 32.8
## 371           4     112           78           40       0 39.4
## 372           1     116           78           29     180 36.1
## 373           0     141           84           26       0 32.4
## 374           2     174           88           37     120 44.5
## 375           4      95           60           32       0 35.4
## 376           8      65           72           23       0 32.0
## 377           2      99           60           17     160 36.6
## 378           1     102           74            0       0 39.5
## 379          11     120           80           37     150 42.3
## 380           9     140           94            0       0 32.7
## 381          13     153           88           37     140 40.6
## 382           1     147           94           41       0 49.3
## 383           1      81           74           41      57 46.3
## 384           3     187           70           22     200 36.4
```

```
## 385           1     121            78            39      74 39.0
## 386           0     181            88            44     510 43.3
## 387           8     154            78            32       0 32.4
## 388           1     128            88            39     110 36.5
## 389           7     137            90            41       0 32.0
## 390           0     123            72             0       0 36.3
## 391           1     106            76             0       0 37.5
## 392           6     190            92             0       0 35.5
## 393           9     170            74            31       0 44.0
## 394          10     101            76            48     180 32.9
## 395           2     122            70            27       0 36.8
##     DiabetesPedigreeFunction Age Outcome
## 1                      0.627  50       1
## 2                      2.288  33       1
## 3                      0.134  29       0
## 4                      0.191  30       0
## 5                      0.537  34       1
## 6                      0.551  31       1
## 7                      0.183  33       0
## 8                      0.529  32       1
## 9                      0.704  27       0
## 10                     0.388  50       0
## 11                     0.451  41       1
## 12                     0.254  51       1
## 13                     0.257  43       1
## 14                     0.337  38       0
## 15                     0.546  60       0
## 16                     0.420  35       0
## 17                     0.665  46       1
## 18                     0.503  27       1
## 19                     1.390  56       1
## 20                     0.271  26       0
## 21                     0.696  37       0
## 22                     0.721  54       1
## 23                     1.893  25       1
## 24                     0.344  31       1
## 25                     0.467  58       1
## 26                     0.718  42       0
## 27                     0.254  41       1
## 28                     0.962  31       0
## 29                     1.781  44       0
## 30                     0.173  22       0
## 31                     0.270  39       1
## 32                     0.258  42       1
## 33                     0.855  38       1
## 34                     0.845  54       0
## 35                     0.867  28       1
## 36                     0.583  42       1
## 37                     0.231  23       0
## 38                     0.396  22       0
## 39                     0.391  41       0
## 40                     0.370  27       0
## 41                     0.270  26       1
## 42                     0.227  37       1
```

```
## 43                    0.698  27       0
## 44                    0.178  45       0
## 45                    0.324  26       0
## 46                    0.153  43       1
## 47                    0.443  34       0
## 48                    0.261  42       0
## 49                    0.255  40       0
## 50                    0.325  31       1
## 51                    1.222  33       1
## 52                    0.930  27       0
## 53                    0.336  25       0
## 54                    0.247  24       1
## 55                    0.199  24       1
## 56                    0.543  46       1
## 57                    0.391  25       0
## 58                    0.220  38       1
## 59                    0.654  25       0
## 60                    0.759  25       1
## 61                    0.260  24       0
## 62                    0.404  23       0
## 63                    0.278  23       1
## 64                    0.496  26       1
## 65                    0.452  30       0
## 66                    0.261  23       0
## 67                    0.403  40       1
## 68                    1.114  33       1
## 69                    0.356  30       1
## 70                    0.457  39       0
## 71                    0.088  31       0
## 72                    0.159  28       0
## 73                    0.286  38       0
## 74                    0.318  22       0
## 75                    0.272  42       1
## 76                    0.237  23       0
## 77                    0.096  41       0
## 78                    0.218  65       0
## 79                    0.399  24       0
## 80                    1.189  42       1
## 81                    0.687  23       0
## 82                    0.137  43       1
## 83                    0.337  36       1
## 84                    0.817  47       1
## 85                    0.204  45       0
## 86                    0.167  27       0
## 87                    0.256  22       0
## 88                    0.542  29       1
## 89                    0.678  23       0
## 90                    0.719  36       1
## 91                    0.319  26       1
## 92                    0.190  47       0
## 93                    0.956  37       1
## 94                    0.725  23       0
## 95                    0.745  41       1
## 96                    1.321  33       1
```

```
## 97                   0.374  40       0
## 98                   0.578  40       1
## 99                   0.395  29       1
## 100                  0.905  26       1
## 101                  0.236  28       0
## 102                  0.324  55       0
## 103                  0.605  57       1
## 104                  0.151  52       1
## 105                  0.289  21       0
## 106                  0.355  41       1
## 107                  0.375  24       0
## 108                  0.164  60       0
## 109                  0.431  24       1
## 110                  0.260  36       1
## 111                  0.742  38       1
## 112                  0.514  25       1
## 113                  0.261  41       1
## 114                  1.072  21       1
## 115                  0.101  22       0
## 116                  0.198  26       0
## 117                  0.652  24       1
## 118                  2.329  31       0
## 119                  0.089  24       0
## 120                  0.645  22       1
## 121                  0.238  46       1
## 122                  0.394  29       0
## 123                  0.479  26       1
## 124                  0.586  51       1
## 125                  0.686  23       1
## 126                  0.446  22       0
## 127                  0.329  29       0
## 128                  0.427  23       0
## 129                  0.282  34       0
## 130                  0.238  25       0
## 131                  0.543  21       1
## 132                  1.353  51       1
## 133                  0.612  24       0
## 134                  0.200  63       0
## 135                  0.226  35       1
## 136                  0.997  43       0
## 137                  0.933  25       1
## 138                  1.101  24       0
## 139                  1.136  38       1
## 140                  0.422  21       0
## 141                  0.251  52       0
## 142                  0.677  25       0
## 143                  0.334  28       1
## 144                  0.280  39       0
## 145                  0.262  37       0
## 146                  0.619  34       0
## 147                  0.808  29       1
## 148                  0.263  33       0
## 149                  0.434  21       0
## 150                  0.757  25       1
```

```
## 151                    1.224  31       1
## 152                    0.613  24       1
## 153                    0.692  28       0
## 154                    0.412  46       1
## 155                    0.839  30       1
## 156                    0.156  35       0
## 157                    0.209  28       1
## 158                    0.215  29       0
## 159                    0.875  30       1
## 160                    0.605  22       0
## 161                    1.127  43       1
## 162                    0.315  26       0
## 163                    0.150  28       0
## 164                    0.148  21       0
## 165                    0.692  30       1
## 166                    0.200  37       0
## 167                    0.127  23       1
## 168                    0.166  25       0
## 169                    0.282  41       1
## 170                    0.259  26       0
## 171                    0.932  44       0
## 172                    0.893  33       1
## 173                    0.331  41       1
## 174                    0.389  22       0
## 175                    0.290  33       0
## 176                    0.485  57       0
## 177                    0.349  49       0
## 178                    0.346  37       1
## 179                    0.237  29       0
## 180                    0.243  46       0
## 181                    0.559  21       0
## 182                    0.962  28       1
## 183                    0.569  44       1
## 184                    0.378  48       0
## 185                    0.875  29       1
## 186                    0.305  65       0
## 187                    0.520  67       1
## 188                    0.385  30       0
## 189                    0.499  30       0
## 190                    0.234  45       1
## 191                    2.137  25       1
## 192                    0.545  21       0
## 193                    0.225  25       0
## 194                    0.816  28       0
## 195                    0.528  58       1
## 196                    0.509  22       0
## 197                    0.238  32       1
## 198                    1.021  35       0
## 199                    0.660  35       1
## 200                    0.239  45       1
## 201                    0.452  58       1
## 202                    0.444  42       0
## 203                    0.340  27       1
## 204                    0.803  31       1
```

```
## 205                  0.196  22       1
## 206                  0.241  25       1
## 207                  0.161  31       1
## 208                  0.286  35       1
## 209                  0.135  41       1
## 210                  0.520  26       0
## 211                  0.702  28       1
## 212                  0.674  28       0
## 213                  0.528  25       0
## 214                  1.076  22       0
## 215                  0.534  21       1
## 216                  0.258  22       1
## 217                  0.554  37       1
## 218                  0.507  26       0
## 219                  0.496  21       0
## 220                  0.516  36       1
## 221                  0.264  31       1
## 222                  0.328  38       1
## 223                  0.284  26       0
## 224                  0.233  43       1
## 225                  0.205  29       1
## 226                  0.244  41       0
## 227                  0.727  31       0
## 228                  0.435  41       1
## 229                  0.497  22       0
## 230                  0.230  24       0
## 231                  2.420  25       1
## 232                  0.330  26       0
## 233                  0.510  22       1
## 234                  0.381  25       0
## 235                  0.498  24       0
## 236                  0.212  38       1
## 237                  1.001  51       1
## 238                  0.705  39       0
## 239                  0.600  25       0
## 240                  0.571  27       0
## 241                  0.607  28       0
## 242                  0.170  22       0
## 243                  0.259  22       0
## 244                  0.711  29       1
## 245                  0.344  35       1
## 246                  0.197  29       0
## 247                  0.233  23       0
## 248                  0.630  31       1
## 249                  0.365  24       1
## 250                  0.536  21       0
## 251                  1.159  58       0
## 252                  0.629  24       0
## 253                  0.292  42       0
## 254                  0.145  33       0
## 255                  0.267  28       0
## 256                  0.727  41       1
## 257                  0.738  41       0
## 258                  0.238  40       0
```

```
## 259                  0.263  38       0
## 260                  0.314  35       1
## 261                  0.304  51       0
## 262                  0.180  41       0
## 263                  0.305  26       0
## 264                  0.652  45       1
## 265                  0.686  24       0
## 266                  0.917  29       0
## 267                  1.251  24       0
## 268                  0.302  23       1
## 269                  0.804  23       0
## 270                  0.968  32       1
## 271                  0.661  43       1
## 272                  0.549  27       1
## 273                  0.825  56       1
## 274                  0.159  25       0
## 275                  0.365  29       0
## 276                  0.423  37       1
## 277                  1.034  53       1
## 278                  0.160  28       0
## 279                  0.341  50       0
## 280                  0.471  28       0
## 281                  0.218  30       0
## 282                  0.126  42       0
## 283                  0.121  54       1
## 284                  0.502  28       1
## 285                  0.401  24       0
## 286                  0.601  27       0
## 287                  0.412  21       0
## 288                  0.085  46       0
## 289                  0.203  33       1
## 290                  0.270  39       0
## 291                  0.198  22       0
## 292                  0.280  25       0
## 293                  0.693  21       1
## 294                  0.575  62       1
## 295                  0.371  21       1
## 296                  0.190  42       0
## 297                  0.129  41       1
## 298                  1.154  52       1
## 299                  0.925  45       1
## 300                  0.175  24       0
## 301                  0.402  44       1
## 302                  0.733  34       0
## 303                  0.682  22       1
## 304                  0.194  46       0
## 305                  0.088  38       1
## 306                  0.692  54       1
## 307                  0.514  21       0
## 308                  1.258  22       1
## 309                  0.270  27       0
## 310                  0.593  36       1
## 311                  0.787  40       1
## 312                  0.878  26       0
```

```
## 313                  0.557  50       1
## 314                  0.141  24       1
## 315                  0.246  28       0
## 316                  1.461  45       0
## 317                  0.347  21       0
## 318                  0.362  29       0
## 319                  0.393  21       0
## 320                  0.144  45       0
## 321                  0.238  24       0
## 322                  0.871  32       1
## 323                  0.303  24       0
## 324                  0.134  30       0
## 325                  0.455  22       1
## 326                  0.466  27       0
## 327                  0.269  28       0
## 328                  0.142  22       0
## 329                  0.240  25       1
## 330                  1.162  41       0
## 331                  0.190  51       0
## 332                  1.292  27       1
## 333                  1.394  22       1
## 334                  0.165  43       1
## 335                  0.637  40       1
## 336                  0.245  40       1
## 337                  0.217  24       0
## 338                  0.235  70       1
## 339                  0.430  43       0
## 340                  0.631  49       0
## 341                  0.285  47       0
## 342                  0.880  22       0
## 343                  0.587  68       0
## 344                  0.263  25       0
## 345                  0.127  25       1
## 346                  0.364  26       1
## 347                  0.366  22       0
## 348                  0.536  27       1
## 349                  0.591  25       0
## 350                  0.335  46       1
## 351                  0.257  44       1
## 352                  0.886  23       0
## 353                  0.439  43       1
## 354                  0.598  28       0
## 355                  0.904  26       0
## 356                  0.483  26       0
## 357                  0.905  52       1
## 358                  0.304  41       0
## 359                  0.177  28       0
## 360                  0.176  22       0
## 361                  0.148  45       1
## 362                  0.674  23       1
## 363                  0.441  38       1
## 364                  0.826  34       1
## 365                  0.970  31       1
## 366                  0.415  24       0
```

```
## 367                    0.378  52       1
## 368                    0.289  21       0
## 369                    0.251  42       0
## 370                    0.265  45       0
## 371                    0.236  38       0
## 372                    0.496  25       0
## 373                    0.433  22       0
## 374                    0.646  24       1
## 375                    0.284  28       0
## 376                    0.600  42       0
## 377                    0.453  21       0
## 378                    0.293  42       1
## 379                    0.785  48       1
## 380                    0.734  45       1
## 381                    1.174  39       0
## 382                    0.358  27       1
## 383                    1.096  32       0
## 384                    0.408  36       1
## 385                    0.261  28       0
## 386                    0.222  26       1
## 387                    0.443  45       1
## 388                    1.057  37       1
## 389                    0.391  39       0
## 390                    0.258  52       1
## 391                    0.197  26       0
## 392                    0.278  66       1
## 393                    0.403  43       1
## 394                    0.171  63       0
## 395                    0.340  27       0
```

Identify the dependent & independent variables and use reshaping techniques and create a new data frame by joining those variables from your dataset.

```r
# Extracting the relevant variables
dependent_var <- data$Outcome
independent_vars <- data[, c("Pregnancies", "Glucose", "BloodPressure",
                             "SkinThickness", "Insulin", "BMI",
                             "DiabetesPedigreeFunction", "Age")]

# Creating a new data frame by joining dependent and independent variables
new_data <- cbind(dependent_var, independent_vars)

# Printing the first few rows of the new data frame
head(new_data)
```

```
##   dependent_var Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1             1           6     148            72            35       0 33.6
## 2             0           1      85            66            29       0 26.6
## 3             1           8     183            64             0       0 23.3
## 4             0           1      89            66            23      94 28.1
## 5             1           0     137            40            35     168 43.1
## 6             0           5     116            74             0       0 25.6
```

```
##   DiabetesPedigreeFunction Age
## 1                    0.627  50
## 2                    0.351  31
## 3                    0.672  32
## 4                    0.167  21
## 5                    2.288  33
## 6                    0.201  30
```

Remove missing values in your dataset.

```
data[data == 0] <- NA

# Remove rows with any NA values
cleaned_data <- na.omit(data)

# Check the dimensions of the cleaned data
dim(cleaned_data)
```

```
## [1] 111   9
```

```
dim(data)
```

```
## [1] 768   9
```

Identify and remove duplicated data in your dataset

```
duplicated_rows <- duplicated(data)

# View which rows are duplicated
duplicated_indices <- which(duplicated_rows)

# Remove duplicates and create a new cleaned dataset
cleaned_data <- unique(data)
head(cleaned_data)
```

```
##   Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1           6     148            72            35      NA 33.6
## 2           1      85            66            29      NA 26.6
## 3           8     183            64            NA      NA 23.3
## 4           1      89            66            23      94 28.1
## 5          NA     137            40            35     168 43.1
## 6           5     116            74            NA      NA 25.6
##   DiabetesPedigreeFunction Age Outcome
## 1                    0.627  50       1
## 2                    0.351  31      NA
## 3                    0.672  32       1
## 4                    0.167  21      NA
## 5                    2.288  33       1
## 6                    0.201  30      NA
```

Reorder multiple rows in descending order

```
# Convert Glucose column to numeric
data$Glucose <- as.numeric(data$Glucose)

# Reorder rows based on Glucose in descending order
ordered_data <- data[order(-data$Glucose), ]

# Print reordered dataset
print(ordered_data)
```

```
##     Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 662           1     199            76            43      NA 42.9
## 562          NA     198            66            32     274 41.3
## 9             2     197            70            45     543 30.5
## 229           4     197            70            39     744 36.7
## 409           8     197            74            NA      NA 25.9
## 580           2     197            70            99      NA 34.7
## 23            7     196            90            NA      NA 39.8
## 207           8     196            76            29     280 37.5
## 360           1     196            76            36     249 36.5
## 499           7     195            70            33     145 25.1
## 676           6     195            70            NA      NA 30.9
## 186           7     194            68            28      NA 35.9
## 320           6     194            78            NA      NA 23.5
## 490           8     194            80            NA      NA 26.1
## 259           1     193            50            16     375 25.9
## 400           3     193            70            31      NA 34.9
## 261           3     191            68            15     130 30.9
## 760           6     190            92            NA      NA 35.5
## 14            1     189            60            23     846 30.1
## 361           5     189            64            33     325 31.2
## 441          NA     189           104            25      NA 34.3
## 550           4     189           110            31      NA 28.5
## 155           8     188            78            NA      NA 47.9
## 596          NA     188            82            14     185 32.0
## 57            7     187            68            39     304 37.7
## 547           5     187            76            27     207 43.6
## 716           7     187            50            33     392 33.9
## 749           3     187            70            22     200 36.4
## 546           8     186            90            35     225 34.5
## 210           7     184            84            33      NA 35.5
## 246           9     184            85            15      NA 30.0
## 426           4     184            78            39     277 37.0
## 3             8     183            64            NA      NA 23.3
## 605           4     183            NA            NA      NA 28.4
## 623           6     183            94            NA      NA 40.8
## 318           3     182            74            NA      NA 30.5
## 187           8     181            68            36     495 30.1
## 237           7     181            84            21     192 35.9
## 428           1     181            64            30     180 34.1
## 607           1     181            78            42     293 40.0
## 754          NA     181            88            44     510 43.3
```

```
## 41          3     180          64          25      70 34.0
## 46         NA     180          66          39      NA 42.0
## 333         1     180          NA          NA      NA 43.3
## 446        NA     180          78          63      14 59.4
## 507        NA     180          90          26      90 36.5
## 176         8     179          72          42     130 32.7
## 213         7     179          95          31      NA 34.2
## 238        NA     179          90          27      NA 44.1
## 328        10     179          70          NA      NA 35.1
## 648        NA     179          50          36     159 37.8
## 340         7     178          84          NA      NA 39.9
## 221        NA     177          60          29     478 34.6
## 54          8     176          90          34     300 33.7
## 589         3     176          86          27     156 33.3
## 456        14     175          62          30      NA 33.6
## 729         2     175          88          NA      NA 22.9
## 612         3     174          58          22     194 32.9
## 733         2     174          88          37     120 44.5
## 131         4     173          70          14     168 29.7
## 371         3     173          82          48     465 38.4
## 416         3     173          84          33     474 35.7
## 488        NA     173          78          32     265 46.5
## 599         1     173          74          NA      NA 36.8
## 717         3     173          78          39     185 33.8
## 410         1     172          68          49     579 42.4
## 44          9     171         110          24     240 45.4
## 111         3     171          72          33     135 33.3
## 236         4     171          72          NA      NA 43.6
## 133         3     170          64          37     225 34.5
## 762         9     170          74          31      NA 44.0
## 697         3     169          74          19     125 29.9
## 12         10     168          74          NA      NA 38.0
## 405         5     168          64          NA      NA 32.9
## 613         7     168          88          42     321 38.2
## 703         1     168          88          29      NA 35.0
## 301        NA     167          NA          NA      NA 32.3
## 647         1     167          74          17     144 23.4
## 663         8     167         106          46     231 37.6
## 15          5     166          72          19     175 25.8
## 392         5     166          76          NA      NA 45.7
## 496         6     166          74          NA      NA 26.6
## 248        NA     165          90          33     680 52.3
## 336        NA     165          76          43     255 47.9
## 356         9     165          88          NA      NA 30.4
## 671         6     165          68          26     168 33.6
## 239         9     164          84          21      NA 30.8
## 549         1     164          82          43      67 32.8
## 709         9     164          78          NA      NA 32.8
## 101         1     163          72          NA      NA 39.0
## 160        17     163          72          41     114 40.9
## 516         3     163          70          18     105 31.6
## 121        NA     162          76          56     100 53.2
## 208         5     162         104          NA      NA 37.7
## 228         3     162          52          38      NA 37.2
```

```
## 661          10     162          84          NA      NA 27.7
## 682          NA     162          76          36      NA 49.6
## 750           6     162          62          NA      NA 24.3
## 284           7     161          86          NA      NA 30.4
## 295          NA     161          50          NA      NA 21.9
## 307          10     161          68          23     132 25.5
## 115           7     160          54          32     175 30.5
## 45            7     159          64          NA      NA 27.4
## 193           7     159          66          NA      NA 30.4
## 32            3     158          76          36     245 31.6
## 196           5     158          84          41     210 39.4
## 222           2     158          90          NA      NA 31.6
## 362           5     158          70          NA      NA 29.8
## 395           4     158          78          NA      NA 32.9
## 481           3     158          70          30     328 35.5
## 692          13     158         114          NA      NA 42.3
## 711           3     158          64          13     387 31.2
## 326           1     157          72          21     168 25.6
## 646           2     157          74          35     440 39.4
## 153           9     156          86          28     155 34.3
## 379           4     156          75          NA      NA 48.3
## 677           9     156          86          NA      NA 24.8
## 112           8     155          62          26     495 34.0
## 260          11     155          76          28     150 33.3
## 287           5     155          84          44     545 38.7
## 313           2     155          74          17      96 26.6
## 656           2     155          52          27     540 38.7
## 145           4     154          62          31     284 32.8
## 470           6     154          78          41     140 46.1
## 500           6     154          74          32     193 29.3
## 569           4     154          72          29     126 31.3
## 670           9     154          78          30     100 30.9
## 755           8     154          78          32      NA 32.4
## 154           1     153          82          42     485 40.6
## 745          13     153          88          37     140 40.6
## 156           7     152          88          44      NA 50.0
## 324          13     152          90          33      29 26.8
## 339           9     152          78          34     171 34.2
## 609          NA     152          82          39     272 41.5
## 102           1     151          60          NA      NA 26.1
## 161           4     151          90          38      NA 29.7
## 216          12     151          70          40     271 41.8
## 296           6     151          62          31     120 35.5
## 425           8     151          78          32     210 42.9
## 581          NA     151          90          46      NA 42.1
## 55            7     150          66          42     342 34.7
## 305           3     150          76          NA      NA 21.0
## 604           7     150          78          29     126 35.2
## 723           1     149          68          29     127 29.3
## 1             6     148          72          35      NA 33.6
## 167           3     148          66          25      NA 32.5
## 200           4     148          60          27     318 30.9
## 459          10     148          84          48     237 37.6
## 27            7     147          76          NA      NA 39.4
```

```
## 149          5     147          78          NA      NA 33.7
## 212         NA     147          85          54      NA 42.8
## 365          4     147          74          25     293 34.9
## 438          5     147          75          NA      NA 29.9
## 643          6     147          80          NA      NA 29.5
## 747          1     147          94          41      NA 49.3
## 47           1     146          56          NA      NA 29.7
## 59          NA     146          82          NA      NA 40.5
## 70           4     146          85          27     100 28.9
## 116          4     146          92          NA      NA 31.2
## 245          2     146          76          35     194 38.2
## 270          2     146          NA          NA      NA 27.5
## 281         NA     146          70          NA      NA 37.9
## 297          2     146          70          38     360 28.0
## 364          4     146          78          NA      NA 38.5
## 29          13     145          82          19     110 22.2
## 485         NA     145          NA          NA      NA 44.2
## 517          9     145          88          34     165 30.3
## 664          9     145          80          46     130 37.9
## 667          4     145          82          18      NA 32.5
## 96           6     144          72          27     228 33.9
## 108          4     144          58          28     140 29.5
## 302          2     144          58          33     135 31.6
## 389          5     144          82          26     285 32.0
## 418          4     144          82          32      NA 38.5
## 471          1     144          82          40      NA 41.3
## 690          1     144          82          46     180 46.1
## 25          11     143          94          33     146 36.6
## 179          5     143          78          NA      NA 45.0
## 413          1     143          84          23     310 42.4
## 414          1     143          74          22      61 26.2
## 575          1     143          86          30     330 30.1
## 587          8     143          66          NA      NA 34.9
## 95           2     142          82          18      64 24.7
## 224          7     142          60          33     190 28.8
## 231          4     142          86          NA      NA 44.0
## 264          3     142          80          15      NA 32.4
## 696          7     142          90          24     480 30.4
## 64           2     141          58          34     128 25.4
## 185          4     141          74          NA      NA 27.6
## 262          3     141          NA          NA      NA 30.0
## 436         NA     141          NA          NA      NA 42.4
## 728         NA     141          84          26      NA 32.4
## 214         NA     140          65          26     130 42.6
## 376         12     140          82          43     325 39.2
## 437         12     140          85          33      NA 37.4
## 689          1     140          74          26     180 24.1
## 744          9     140          94          NA      NA 32.7
## 13          10     139          80          NA      NA 27.1
## 72           5     139          64          35     140 28.6
## 190          5     139          80          35     160 31.6
## 243          3     139          54          NA      NA 25.6
## 347          1     139          46          19      83 28.7
## 434          2     139          75          NA      NA 25.6
```

```
## 487    1   139   62   41  480 40.7
## 512   NA   139   62   17  210 22.1
## 37    11   138   76   NA   NA 33.2
## 202    1   138   82   NA   NA 40.1
## 267   NA   138   NA   NA   NA 36.3
## 415   NA   138   60   35  167 34.6
## 615   11   138   74   26  144 36.1
## 5     NA   137   40   35  168 43.1
## 85     5   137  108   NA   NA 48.8
## 308   NA   137   68   14  148 24.8
## 352    4   137   84   NA   NA 31.2
## 402    6   137   61   NA   NA 24.2
## 472   NA   137   70   38   NA 33.2
## 476   NA   137   84   27   NA 27.3
## 757    7   137   90   41   NA 32.0
## 89    15   136   70   32  110 37.1
## 151    1   136   74   50  204 37.4
## 286    7   136   74   26  135 26.0
## 403    5   136   84   41   88 35.0
## 474    7   136   90   NA   NA 29.9
## 649   11   136   84   35  130 28.3
## 685    5   136   82   NA   NA   NA
## 751    4   136   70   NA   NA 31.2
## 194   11   135   NA   NA   NA 52.3
## 429   NA   135   94   46  145 40.6
## 457    1   135   54   NA   NA 26.7
## 486   NA   135   68   42  250 42.3
## 94     4   134   72   NA   NA 23.8
## 172    6   134   70   23  130 35.4
## 232    6   134   80   37  370 46.2
## 452    2   134   70   NA   NA 28.9
## 460    9   134   74   33   60 25.9
## 714   NA   134   58   20  291 26.4
## 42     7   133   84   NA   NA 40.2
## 62     8   133   72   NA   NA 32.9
## 283    7   133   88   15  155 32.4
## 370    1   133  102   28  140 32.8
## 579   10   133   68   NA   NA 27.0
## 124    5   132   80   NA   NA 26.8
## 480    4   132   86   31   NA 28.0
## 536    4   132   NA   NA   NA 32.9
## 593    3   132   80   NA   NA 34.4
## 628   NA   132   78   NA   NA 32.4
## 79    NA   131   NA   NA   NA 43.2
## 165   NA   131   88   NA   NA 31.6
## 393    1   131   64   14  415 23.7
## 398   NA   131   66   40   NA 34.3
## 548    4   131   68   21  166 33.1
## 180    5   130   82   NA   NA 39.1
## 341    1   130   70   13  105 25.9
## 508    1   130   60   23  170 28.6
## 524    9   130   70   NA   NA 34.2
## 572    2   130   96   NA   NA 22.6
## 687    3   130   64   NA   NA 23.1
```

```
## 731          3     130          78          23      79 28.4
## 74           4     129          86          20     270 35.1
## 139         NA     129          80          NA      NA 31.2
## 178         NA     129         110          46     130 67.1
## 252          2     129          84          NA      NA 28.0
## 282         10     129          76          28     122 35.9
## 321          4     129          60          12     231 27.5
## 358         13     129          NA          30      NA 39.9
## 420          3     129          64          29     115 26.4
## 520          6     129          90           7     326 19.6
## 540          3     129          92          49     155 36.4
## 686          2     129          74          26     205 33.2
## 694          7     129          68          49     125 38.5
## 704          2     129          NA          NA      NA 38.5
## 713         10     129          62          36      NA 41.2
## 141          3     128          78          NA      NA 21.1
## 188          1     128          98          41      58 32.0
## 268          2     128          64          42      NA 40.0
## 293          2     128          78          37     182 43.3
## 294          1     128          48          45     194 40.5
## 309         NA     128          68          19     180 30.5
## 542          3     128          72          25     190 32.4
## 629          5     128          80          NA      NA 34.6
## 634          1     128          82          17     183 27.5
## 642          4     128          70          NA      NA 34.3
## 756          1     128          88          39     110 36.5
## 396          2     127          58          24     275 27.7
## 539         NA     127          80          37     210 36.3
## 659         11     127         106          NA      NA 39.0
## 699          4     127          88          11     155 34.5
## 708          2     127          46          21     335 34.4
## 21           3     126          88          41     235 39.3
## 73          13     126          90          NA      NA 43.4
## 106          1     126          56          29     152 28.7
## 298         NA     126          84          29     215 30.7
## 346          8     126          88          36     108 38.5
## 479          8     126          74          38      75 25.9
## 712          5     126          78          27      22 29.6
## 737         NA     126          86          27     120 27.4
## 767          1     126          60          NA      NA 30.1
## 10           8     125          96          NA      NA   NA
## 26          10     125          70          26     115 31.1
## 103         NA     125          96          NA      NA 22.5
## 136          2     125          60          20     140 33.8
## 218          6     125          68          30     120 30.0
## 357          1     125          50          40     167 33.3
## 385          1     125          70          24     110 24.3
## 494          4     125          70          18     122 28.9
## 518          7     125          86          NA      NA 37.6
## 525          3     125          58          NA      NA 31.6
## 561          6     125          76          NA      NA 33.8
## 627         NA     125          68          NA      NA 24.7
## 684          4     125          80          NA      NA 32.3
## 702          6     125          78          31      NA 27.6
```

```
## 117          5     124          74          NA      NA 34.0
## 249          9     124          70          33     402 35.4
## 310          2     124          68          28     205 32.9
## 323         NA     124          70          20      NA 27.4
## 367          6     124          72          NA      NA 27.6
## 466         NA     124          56          13     105 21.8
## 522          3     124          80          33     130 33.2
## 556          7     124          70          33     215 25.5
## 585          8     124          76          24     600 28.7
## 603          1     124          74          36      NA 27.8
## 606          1     124          60          32      NA 35.8
## 92           4     123          80          15     176 32.0
## 192          9     123          70          44      94 33.1
## 265          4     123          62          NA      NA 32.0
## 406          2     123          48          32     165 42.1
## 482         NA     123          88          37      NA 35.2
## 595          6     123          72          45     230 33.6
## 653          5     123          74          40      77 34.1
## 674          3     123         100          35     240 57.3
## 758         NA     123          72          NA      NA 36.3
## 35          10     122          78          31      NA 27.6
## 100          1     122          90          51     220 49.7
## 132          9     122          56          NA      NA 33.3
## 234          4     122          68          NA      NA 35.0
## 247         10     122          68          NA      NA 31.2
## 273          3     122          78          NA      NA 23.0
## 327          1     122          64          32     156 35.1
## 344          5     122          86          NA      NA 34.7
## 375          2     122          52          43     158 36.2
## 531          2     122          60          18     106 29.8
## 701          2     122          76          27     200 35.9
## 765          2     122          70          27      NA 36.8
## 570         NA     121          66          30     165 34.3
## 583         12     121          78          17      NA 26.5
## 679          3     121          52          NA      NA 36.0
## 693          2     121          70          32      95 39.1
## 752          1     121          78          39      74 39.0
## 766          5     121          72          23     112 26.2
## 127          3     120          70          30     135 42.9
## 168          4     120          68          NA      NA 29.6
## 306          2     120          76          37     105 39.7
## 450         NA     120          74          18      63 30.5
## 461          9     120          72          22      56 20.8
## 469          8     120          NA          NA      NA 30.0
## 510          8     120          78          NA      NA 25.0
## 654          2     120          54          NA      NA 26.8
## 658          1     120          80          48     200 38.9
## 732          8     120          86          NA      NA 28.4
## 741         11     120          80          37     150 42.3
## 24           9     119          80          35      NA 29.0
## 182         NA     119          64          18      92 34.9
## 223          7     119          NA          NA      NA 25.2
## 244          6     119          50          22     176 27.1
## 288          1     119          86          39     220 45.6
```

```
## 386          1     119          54          13      50 22.3
## 421          1     119          88          41     170 45.3
## 454          2     119          NA          NA      NA 19.6
## 473         NA     119          66          27      NA 38.8
## 576          1     119          44          47      63 35.5
## 620         NA     119          NA          NA      NA 32.4
## 17          NA     118          84          47     230 45.8
## 128          1     118          58          36      94 33.3
## 331          8     118          72          19      NA 23.1
## 372         NA     118          64          23      89   NA
## 578          2     118          80          NA      NA 42.9
## 700          4     118          70          NA      NA 44.5
## 30           5     117          92          NA      NA 34.1
## 129          1     117          88          24     145 34.5
## 230         NA     117          80          31      53 45.2
## 337         NA     117          NA          NA      NA 33.8
## 443          4     117          64          27     120 33.2
## 445          4     117          62          12      NA 29.7
## 501          2     117          90          19      71 25.2
## 529         NA     117          66          31     188 30.8
## 617          6     117          96          NA      NA 28.7
## 652          1     117          60          23     106 33.8
## 724          5     117          86          30     105 39.1
## 6            5     116          74          NA      NA 25.6
## 348          3     116          NA          NA      NA 23.5
## 387          5     116          74          29      NA 32.3
## 394          4     116          72          12      87 22.1
## 528          3     116          74          15     105 26.3
## 551          1     116          70          28      NA 27.4
## 727          1     116          78          29     180 36.1
## 8           10     115          NA          NA      NA 35.3
## 20           1     115          70          30      96 34.6
## 304          5     115          98          NA      NA 52.9
## 319          3     115          66          39     140 38.1
## 338          5     115          76          NA      NA 31.2
## 407          4     115          72          NA      NA 28.9
## 424          2     115          64          22      NA 30.8
## 465         10     115          98          NA      NA 24.0
## 665          6     115          60          39      NA 33.7
## 707         10     115          NA          NA      NA   NA
## 65           7     114          66          NA      NA 32.8
## 152          4     114          65          NA      NA 21.9
## 163         NA     114          80          34     285 44.2
## 258          2     114          68          22      NA 28.7
## 279          5     114          74          NA      NA 24.9
## 475          4     114          64          NA      NA 28.9
## 478          7     114          76          17     110 23.8
## 523          6     114          NA          NA      NA   NA
## 553          6     114          88          NA      NA 27.8
## 631          7     114          64          NA      NA 27.4
## 722          1     114          66          36     200 38.1
## 81           3     113          44          13      NA 22.4
## 125         NA     113          76          NA      NA 33.3
## 201         NA     113          80          16      NA 31.0
```

```
## 256          1     113          64          35      NA 33.6
## 314          3     113          50          10      85 29.5
## 80           2     112          66          22      NA 25.0
## 215          9     112          82          32     175 34.2
## 220          5     112          66          NA      NA 37.8
## 300          8     112          72          NA      NA 23.6
## 316          2     112          68          22      94 34.1
## 322          3     112          74          30      NA 31.6
## 325          2     112          75          32      NA 35.7
## 412          1     112          72          30     176 34.4
## 592          2     112          78          50     140 39.4
## 619          9     112          82          24      NA 28.2
## 621          2     112          86          42     160 38.4
## 666          1     112          80          45     132 34.8
## 726          4     112          78          40      NA 39.4
## 40           4     111          72          47     207 37.1
## 122          6     111          64          39      NA 34.2
## 170          3     111          90          12      78 28.4
## 191          3     111          62          NA      NA 22.6
## 206          5     111          72          28      NA 23.9
## 250          1     111          86          19      NA 30.1
## 257          3     111          56          39      NA 30.1
## 530         NA     111          65          NA      NA 24.6
## 573          3     111          58          31      44 29.5
## 591         11     111          84          40      NA 46.8
## 610          1     111          62          13     182 24.0
## 633          2     111          60          NA      NA 26.2
## 668         10     111          70          27      NA 27.5
## 725          1     111          94          NA      NA 32.8
## 11           4     110          92          NA      NA 37.6
## 86           2     110          74          29     125 32.4
## 169          4     110          66          NA      NA 31.9
## 497          5     110          68          NA      NA 26.0
## 558          8     110          76          NA      NA 27.8
## 705          4     110          76          20     100 28.4
## 31           5     109          75          26      NA 36.0
## 67          NA     109          88          30      NA 32.5
## 68           2     109          92          NA      NA 42.7
## 158          1     109          56          21     135 25.2
## 189          8     109          76          39     114 27.9
## 199          4     109          64          44      99 34.8
## 217          5     109          62          41     129 35.8
## 315          7     109          80          31      NA 35.9
## 383          1     109          60           8     182 25.4
## 582          6     109          60          27      NA 25.0
## 600          1     109          38          18     120 23.1
## 743          1     109          58          18     116 28.5
## 143          2     108          52          26      63 32.5
## 144         10     108          66          NA      NA 32.4
## 203         NA     108          68          20      NA 27.3
## 272          2     108          62          32      56 25.2
## 280          2     108          62          10     278 25.3
## 285          2     108          80          NA      NA 27.0
## 290          5     108          72          43      75 36.1
```

```
## 444          8     108          70          NA      NA 30.5
## 577          6     108          44          20     130 24.0
## 601          1     108          88          19      NA 27.1
## 625          2     108          64          NA      NA 30.8
## 719          1     108          60          46     178 35.5
## 753          3     108          62          24      NA 26.0
## 18           7     107          74          NA      NA 29.6
## 90           1     107          68          19      NA 26.5
## 123          2     107          74          30     100 33.6
## 198          3     107          62          13      48 22.9
## 292         NA     107          62          30      74 36.6
## 381          1     107          72          30      82 30.8
## 440          6     107          88          NA      NA 36.8
## 532         NA     107          76          NA      NA 45.3
## 650         NA     107          60          25      NA 26.4
## 688          1     107          50          19      NA 28.3
## 691          8     107          80          NA      NA 24.6
## 43           7     106          92          18      NA 22.7
## 87          13     106          72          54      NA 36.6
## 142          5     106          82          30      NA 39.5
## 148          2     106          64          35     119 30.5
## 251          9     106          52          NA      NA 31.2
## 275         13     106          70          NA      NA 34.2
## 277          7     106          60          24      NA 26.5
## 312         NA     106          70          37     148 39.4
## 334         12     106          80          NA      NA 23.6
## 611          3     106          54          21     158 30.9
## 616          3     106          72          NA      NA 25.8
## 655          1     106          70          28     135 34.2
## 734          2     106          56          27     165 29.0
## 759          1     106          76          NA      NA 37.5
## 50           7     105          NA          NA      NA   NA
## 60          NA     105          64          41     142 41.5
## 130         NA     105          84          NA      NA 27.9
## 140          5     105          72          29     325 36.9
## 197          1     105          58          NA      NA 24.3
## 330          6     105          70          32      68 30.8
## 374          2     105          58          40      94 34.9
## 382         NA     105          68          22      NA 20.0
## 388          8     105         100          36      NA 43.3
## 477          2     105          80          45     191 33.7
## 537         NA     105          90          NA      NA 29.6
## 614          6     105          80          28      NA 32.5
## 735          2     105          75          NA      NA 23.3
## 166          6     104          74          18     156 29.9
## 240         NA     104          76          NA      NA 18.4
## 278         NA     104          64          23     116 27.8
## 449         NA     104          64          37      64 33.6
## 636         13     104          72          NA      NA 31.2
## 637          5     104          74          NA      NA 28.8
## 19           1     103          30          38      83 43.3
## 36           4     103          60          33     192 24.0
## 49           7     103          66          32      NA 39.1
## 51           1     103          80          11      82 19.4
```

```
## 205    6  103  72  32  190 37.7
## 363    5  103 108  37   NA 39.2
## 559   11  103  68  40   NA 46.2
## 588    6  103  66  NA   NA 24.3
## 645    3  103  72  30  152 27.6
## 38     9  102  76  37   NA 32.9
## 146   NA  102  75  23   NA   NA
## 162    7  102  74  40  105 37.2
## 171    6  102  82  NA   NA 30.8
## 269   NA  102  52  NA   NA 25.1
## 329    2  102  86  36  120 45.5
## 411    6  102  90  39   NA 35.7
## 423   NA  102  64  46   78 40.6
## 632   NA  102  78  40   90 34.5
## 641   NA  102  86  17  105 29.3
## 715    3  102  74  NA   NA 29.5
## 740    1  102  74  NA   NA 39.5
## 742    3  102  44  20   94 30.8
## 52     1  101  50  15   36 24.2
## 84    NA  101  65  28   NA 24.6
## 227   NA  101  76  NA   NA 35.7
## 271   10  101  86  37   NA 45.6
## 368   NA  101  64  17   NA 21.0
## 408   NA  101  62  NA   NA 21.9
## 657    2  101  58  35   90 21.8
## 680    2  101  58  17  265 24.2
## 764   10  101  76  48  180 32.9
## 16     7  100  NA  NA   NA 30.0
## 58    NA  100  88  60  110 46.8
## 71     2  100  66  20   90 32.9
## 88     2  100  68  25   71 38.5
## 137   NA  100  70  26   50 30.8
## 164    2  100  64  23   NA 29.7
## 225    1  100  66  15   56 23.6
## 276    2  100  70  52   57 40.5
## 299   14  100  78  25  184 36.6
## 390    3  100  68  23   81 31.6
## 391    1  100  66  29  196 32.0
## 447    1  100  72  12   70 25.3
## 455    2  100  54  28  105 37.8
## 541    8  100  74  40  215 39.4
## 584    8  100  76  NA   NA 38.7
## 640    1  100  74  12   46 19.5
## 746   12  100  84  33  105 30.0
## 22     8   99  84  NA   NA 35.4
## 66     5   99  74  27   NA 29.0
## 120    4   99  76  15   51 23.2
## 157    2   99  52  15   94 24.6
## 204    2   99  70  16   44 20.4
## 317    3   99  80  11   64 19.3
## 349    3   99  62  19   74 21.8
## 366    5   99  54  28   83 34.0
## 431    2   99  NA  NA   NA 22.2
## 489    4   99  72  17   NA 25.6
```

```
## 493          4      99           68           38      NA 32.8
## 515          3      99           54           19      86 25.6
## 564          6      99           60           19      54 26.9
## 567          1      99           72           30      18 38.6
## 672          1      99           58           10      NA 25.4
## 698         NA      99           NA           NA      NA 25.0
## 739          2      99           60           17     160 36.6
## 377         NA      98           82           15      84 25.2
## 574          2      98           60           17     120 34.7
## 669          6      98           58           33     190 34.0
## 28           1      97           66           15     140 23.2
## 119          4      97           60           23      NA 28.2
## 417          1      97           68           21      NA 27.2
## 439          1      97           70           15      NA 18.2
## 468         NA      97           64           36     100 36.8
## 527          1      97           64           19      82 18.2
## 557          1      97           70           40      NA 38.1
## 639          7      97           76           32      91 40.9
## 720          5      97           76           27      NA 35.6
## 107          1      96          122           NA      NA 22.4
## 135          2      96           68           13      49 21.1
## 209          1      96           64           27      87 33.2
## 266          5      96           74           18      67 33.6
## 289          4      96           56           17      49 20.8
## 397          3      96           56           34     115 24.7
## 505          3      96           78           39      NA 37.3
## 602          6      96           NA           NA      NA 23.7
## 69           1      95           66           13      38 19.6
## 78           5      95           72           33      NA 37.7
## 110         NA      95           85           25      36 37.4
## 263          4      95           70           32      NA 32.1
## 335          1      95           60           18      58 23.9
## 342          1      95           74           21      73 25.9
## 345          8      95           72           NA      NA 36.8
## 401          4      95           64           NA      NA 32.0
## 430          1      95           82           25     180 35.0
## 448         NA      95           80           45      92 36.5
## 566          2      95           54           14      88 26.1
## 683         NA      95           64           39     105 44.6
## 736          4      95           60           32      NA 35.4
## 422          2      94           68           18      76 26.0
## 427         NA      94           NA           NA      NA   NA
## 504          7      94           64           25      79 33.3
## 624         NA      94           70           27     115 43.5
## 630          4      94           65           22      NA 24.7
## 638          2      94           76           18      66 31.6
## 718         10      94           72           18      NA 23.1
## 99           6      93           50           30      64 28.7
## 138         NA      93           60           25      92 28.7
## 380         NA      93          100           39      72 43.4
## 586          1      93           56           11      NA 22.5
## 678         NA      93           60           NA      NA 35.3
## 710          2      93           64           32     160 38.0
## 768          1      93           70           31      NA 30.4
```

```
## 34           6      92           92           NA      NA 19.9
## 97           2      92           62           28      NA 31.6
## 255         12      92           62            7     258 27.6
## 351          4      92           80           NA      NA 42.2
## 568          6      92           62           32     126 32.0
## 608          1      92           62           25      41 19.5
## 622          2      92           76           20      NA 24.2
## 635         10      92           62           NA      NA 25.9
## 730          2      92           52           NA      NA 30.1
## 241          1      91           64           24      NA 29.2
## 242          4      91           70           32      88 33.1
## 453         NA      91           68           32     210 39.9
## 513          9      91           68           NA      NA 24.2
## 514          2      91           62           NA      NA 27.3
## 534          6      91           NA           NA      NA 29.8
## 565         NA      91           80           NA      NA 32.4
## 651          1      91           54           25     100 25.2
## 675          8      91           82           NA      NA 35.6
## 39           2      90           68           42      NA 38.2
## 150          2      90           70           17      NA 27.3
## 253          2      90           80           14      55 24.4
## 354          1      90           62           12      43 27.2
## 355          3      90           78           NA      NA 42.7
## 384          1      90           62           18      59 25.1
## 435          1      90           68            8      NA 24.5
## 543         10      90           85           32      NA 34.9
## 626          4      90           88           47      54 37.7
## 644          4      90           NA           NA      NA 28.0
## 695          2      90           60           NA      NA 23.5
## 4            1      89           66           23      94 28.1
## 113          1      89           76           34      37 31.2
## 432          3      89           74           16      85 30.4
## 492          2      89           90           30      NA 33.5
## 598          1      89           24           19      25 27.8
## 763          9      89           62           NA      NA 22.5
## 33           3      88           58           11      54 24.8
## 53           5      88           66           21      23 24.4
## 126          1      88           30           42      99 55.0
## 159          2      88           74           19      53 29.0
## 359         12      88           74           40      54 35.3
## 464          5      88           78           30      NA 27.6
## 545          1      88           78           29      76 32.0
## 554          1      88           62           24      44 29.9
## 761          2      88           58           26      16 28.4
## 173          2      87           NA           23      NA 28.9
## 181          6      87           80           NA      NA 23.2
## 226          1      87           78           27      32 34.6
## 332          2      87           58           16      52 32.7
## 378          1      87           60           37      75 37.2
## 526          3      87           60           18      NA 21.8
## 563          1      87           68           34      77 37.6
## 254         NA      86           68           32      NA 35.8
## 458          5      86           68           28      71 30.2
## 533          1      86           66           52      65 41.3
```

```
## 2          1      85          66          29      NA 26.6
## 105        2      85          65          NA      NA 39.6
## 177        6      85          78          NA      NA 31.2
## 195        8      85          55          20      NA 24.4
## 219        5      85          74          22      NA 29.0
## 483        4      85          58          22      49 27.8
## 560       11      85          74          NA      NA 30.1
## 61         2      84          NA          NA      NA   NA
## 134        8      84          74          31      NA 38.3
## 373       NA      84          64          22      66 35.8
## 484       NA      84          82          31     125 38.2
## 502        3      84          72          32      NA 37.2
## 509        2      84          50          23      76 30.4
## 511       12      84          72          31      NA 29.7
## 544        4      84          90          23      56 39.5
## 552        3      84          68          30     106 31.9
## 555        1      84          64          23     115 36.9
## 83         7      83          78          26      71 29.3
## 109        3      83          58          31      18 34.3
## 419        1      83          68          NA      NA 18.2
## 442        2      83          66          23      50 32.2
## 491        2      83          65          28      66 36.8
## 721        4      83          86          19      NA 29.3
## 399        3      82          70          NA      NA 21.1
## 451        1      82          64          13      95 21.2
## 594        2      82          52          22     115 28.5
## 93         7      81          78          40      48 46.7
## 104        1      81          72          18      40 26.6
## 211        2      81          60          22      NA 27.7
## 369        3      81          86          16      66 27.5
## 498        2      81          72          15      76 30.1
## 748        1      81          74          41      57 46.3
## 91         1      80          55          NA      NA 19.1
## 311        6      80          66          30      NA 26.2
## 433        1      80          74          11      60 30.0
## 495        3      80          NA          NA      NA   NA
## 660        3      80          82          31      70 34.2
## 706        6      80          80          36      NA 39.8
## 75         1      79          75          30      NA 32.0
## 174        1      79          60          42      48 43.5
## 233        1      79          80          25      37 25.4
## 7          3      78          50          32      88 31.0
## 118        5      78          48          NA      NA 33.7
## 291       NA      78          88          29      40 36.9
## 571        3      78          70          NA      NA 32.5
## 303        5      77          82          41      42 35.8
## 535        1      77          56          30      56 33.3
## 114        4      76          62          NA      NA 34.0
## 519       13      76          60          NA      NA 32.8
## 175        2      75          64          24      55 29.7
## 506       10      75          82          NA      NA 33.3
## 82         2      74          NA          NA      NA   NA
## 235        3      74          68          28      45 29.7
## 463        8      74          70          40      49 35.3
```

```
## 467          NA      74           52           10      36 27.8
## 56            1      73           50           10      NA 23.0
## 184           5      73           60           NA      NA 26.8
## 590          NA      73           NA           NA      NA 21.1
## 404           9      72           78           25      NA 31.6
## 48            2      71           70           27      NA 28.0
## 98            1      71           48           18      76 20.4
## 274           1      71           78           50      45 33.2
## 462           1      71           62           NA      NA 21.8
## 521           2      68           70           32      66 25.0
## 618           2      68           62           13      15 20.1
## 673          10      68          106           23      49 35.5
## 597          NA      67           76           NA      NA 45.3
## 738           8      65           72           23      NA 32.0
## 77            7      62           78           NA      NA 32.6
## 353           3      61           82           28      NA 34.4
## 147           9      57           80           37      NA 32.8
## 538          NA      57           60           NA      NA 21.7
## 681           2      56           56           28      45 24.2
## 63            5      44           62           NA      NA 25.0
## 76            1      NA           48           20      NA 24.7
## 183           1      NA           74           20      23 27.7
## 343           1      NA           68           35      NA 32.0
## 350           5      NA           80           32      NA 41.0
## 503           6      NA           68           41      NA 39.0
##     DiabetesPedigreeFunction Age Outcome
## 662                    1.394  22       1
## 562                    0.502  28       1
## 9                      0.158  53       1
## 229                    2.329  31      NA
## 409                    1.191  39       1
## 580                    0.575  62       1
## 23                     0.451  41       1
## 207                    0.605  57       1
## 360                    0.875  29       1
## 499                    0.163  55       1
## 676                    0.328  31       1
## 186                    0.745  41       1
## 320                    0.129  59       1
## 490                    0.551  67      NA
## 259                    0.655  24      NA
## 400                    0.241  25       1
## 261                    0.299  34      NA
## 760                    0.278  66       1
## 14                     0.398  59       1
## 361                    0.583  29       1
## 441                    0.435  41       1
## 550                    0.680  37      NA
## 155                    0.137  43       1
## 596                    0.682  22       1
## 57                     0.254  41       1
## 547                    1.034  53       1
## 716                    0.826  34       1
## 749                    0.408  36       1
```

```
## 546                 0.423  37       1
## 210                 0.355  41       1
## 246                 1.213  49       1
## 426                 0.264  31       1
## 3                   0.672  32       1
## 605                 0.212  36       1
## 623                 1.461  45      NA
## 318                 0.345  29       1
## 187                 0.615  60       1
## 237                 0.586  51       1
## 428                 0.328  38       1
## 607                 1.258  22       1
## 754                 0.222  26       1
## 41                  0.271  26      NA
## 46                  1.893  25       1
## 333                 0.282  41       1
## 446                 2.420  25       1
## 507                 0.314  35       1
## 176                 0.719  36       1
## 213                 0.164  60      NA
## 238                 0.686  23       1
## 328                 0.200  37      NA
## 648                 0.455  22       1
## 340                 0.331  41       1
## 221                 1.072  21       1
## 54                  0.467  58       1
## 589                 1.154  52       1
## 456                 0.212  38       1
## 729                 0.326  22      NA
## 612                 0.593  36       1
## 733                 0.646  24       1
## 131                 0.361  33       1
## 371                 2.137  25       1
## 416                 0.258  22       1
## 488                 1.159  58      NA
## 599                 0.088  38       1
## 717                 0.970  31       1
## 410                 0.702  28       1
## 44                  0.721  54       1
## 111                 0.199  24       1
## 236                 0.479  26       1
## 133                 0.356  30       1
## 762                 0.403  43       1
## 697                 0.268  31       1
## 12                  0.537  34       1
## 405                 0.135  41       1
## 613                 0.787  40       1
## 703                 0.905  52       1
## 301                 0.839  30       1
## 647                 0.447  33       1
## 663                 0.165  43       1
## 15                  0.587  51       1
## 392                 0.340  27       1
## 496                 0.304  66      NA
```

```
## 248                0.427  23      NA
## 336                0.259  26      NA
## 356                0.302  49       1
## 671                0.631  49      NA
## 239                0.831  32       1
## 549                0.341  50      NA
## 709                0.148  45       1
## 101                1.222  33       1
## 160                0.817  47       1
## 516                0.268  28       1
## 121                0.759  25       1
## 208                0.151  52       1
## 228                0.652  24       1
## 661                0.182  54      NA
## 682                0.364  26       1
## 750                0.178  50       1
## 284                0.165  47       1
## 295                0.254  65      NA
## 307                0.326  47       1
## 115                0.588  39       1
## 45                 0.294  40      NA
## 193                0.383  36       1
## 32                 0.851  28       1
## 196                0.395  29       1
## 222                0.805  66       1
## 362                0.207  63      NA
## 395                0.803  31       1
## 481                0.344  35       1
## 692                0.257  44       1
## 711                0.295  24      NA
## 326                0.123  24      NA
## 646                0.134  30      NA
## 153                1.189  42       1
## 379                0.238  32       1
## 677                0.230  53       1
## 112                0.543  46       1
## 260                1.353  51       1
## 287                0.619  34      NA
## 313                0.433  27       1
## 656                0.240  25       1
## 145                0.237  23      NA
## 470                0.571  27      NA
## 500                0.839  39      NA
## 569                0.338  37      NA
## 670                0.164  45      NA
## 755                0.443  45       1
## 154                0.687  23      NA
## 745                1.174  39      NA
## 156                0.337  36       1
## 324                0.731  43       1
## 339                0.893  33       1
## 609                0.270  27      NA
## 102                0.179  22      NA
## 161                0.294  36      NA
```

```
## 216                 0.742  38       1
## 296                 0.692  28      NA
## 425                 0.516  36       1
## 581                 0.371  21       1
## 55                  0.718  42      NA
## 305                 0.207  37      NA
## 604                 0.692  54       1
## 723                 0.349  42       1
## 1                   0.627  50       1
## 167                 0.256  22      NA
## 200                 0.150  29       1
## 459                 1.001  51       1
## 27                  0.257  43       1
## 149                 0.218  65      NA
## 212                 0.375  24      NA
## 365                 0.385  30      NA
## 438                 0.434  28      NA
## 643                 0.178  50       1
## 747                 0.358  27       1
## 47                  0.564  29      NA
## 59                  1.781  44      NA
## 70                  0.189  27      NA
## 116                 0.539  61       1
## 245                 0.329  29      NA
## 270                 0.240  28       1
## 281                 0.334  28       1
## 297                 0.337  29       1
## 364                 0.520  67       1
## 29                  0.245  57      NA
## 485                 0.630  31       1
## 517                 0.771  53       1
## 664                 0.637  40       1
## 667                 0.235  70       1
## 96                  0.255  40      NA
## 108                 0.287  37      NA
## 302                 0.422  25       1
## 389                 0.452  58       1
## 418                 0.554  37       1
## 471                 0.607  28      NA
## 690                 0.335  46       1
## 25                  0.254  51       1
## 179                 0.190  47      NA
## 413                 1.076  22      NA
## 414                 0.256  21      NA
## 575                 0.892  23      NA
## 587                 0.129  41       1
## 95                  0.761  21      NA
## 224                 0.687  61      NA
## 231                 0.645  22       1
## 264                 0.200  63      NA
## 696                 0.128  43       1
## 64                  0.699  24      NA
## 185                 0.244  40      NA
## 262                 0.761  27       1
```

```
## 436                  0.205  29       1
## 728                  0.433  22      NA
## 214                  0.431  24       1
## 376                  0.528  58       1
## 437                  0.244  41      NA
## 689                  0.828  23      NA
## 744                  0.734  45       1
## 13                   1.441  57      NA
## 72                   0.411  26      NA
## 190                  0.361  25       1
## 243                  0.402  22       1
## 347                  0.654  22      NA
## 434                  0.167  29      NA
## 487                  0.536  21      NA
## 512                  0.207  21      NA
## 37                   0.420  35      NA
## 202                  0.236  28      NA
## 267                  0.933  25       1
## 415                  0.534  21       1
## 615                  0.557  50       1
## 5                    2.288  33       1
## 85                   0.227  37       1
## 308                  0.143  21      NA
## 352                  0.252  30      NA
## 402                  0.151  55      NA
## 472                  0.170  22      NA
## 476                  0.231  59      NA
## 757                  0.391  39      NA
## 89                   0.153  43       1
## 151                  0.399  24      NA
## 286                  0.647  51      NA
## 403                  0.286  35       1
## 474                  0.210  50      NA
## 649                  0.260  42       1
## 685                  0.640  69      NA
## 751                  1.182  22       1
## 194                  0.578  40       1
## 429                  0.284  26      NA
## 457                  0.687  62      NA
## 486                  0.365  24       1
## 94                   0.277  60       1
## 172                  0.542  29       1
## 232                  0.238  46       1
## 452                  0.542  23       1
## 460                  0.460  81      NA
## 714                  0.352  21      NA
## 42                   0.696  37      NA
## 62                   0.270  39       1
## 283                  0.262  37      NA
## 370                  0.234  45       1
## 579                  0.245  36      NA
## 124                  0.186  69      NA
## 480                  0.419  63      NA
## 536                  0.302  23       1
```

```
## 593                 0.402  44       1
## 628                 0.393  21      NA
## 79                  0.270  26       1
## 165                 0.743  32       1
## 393                 0.389  21      NA
## 398                 0.196  22       1
## 548                 0.160  28      NA
## 180                 0.956  37       1
## 341                 0.472  22      NA
## 508                 0.692  21      NA
## 524                 0.652  45       1
## 572                 0.268  21      NA
## 687                 0.314  22      NA
## 731                 0.323  34       1
## 74                  0.231  23      NA
## 139                 0.703  29      NA
## 178                 0.319  26       1
## 252                 0.284  27      NA
## 282                 0.280  39      NA
## 321                 0.527  31      NA
## 358                 0.569  44       1
## 420                 0.219  28       1
## 520                 0.582  60      NA
## 540                 0.968  32       1
## 686                 0.591  25      NA
## 694                 0.439  43       1
## 704                 0.304  41      NA
## 713                 0.441  38       1
## 141                 0.268  55      NA
## 188                 1.321  33       1
## 268                 1.101  24      NA
## 293                 1.224  31       1
## 294                 0.613  24       1
## 309                 1.391  25       1
## 542                 0.549  27       1
## 629                 0.144  45      NA
## 634                 0.115  22      NA
## 642                 0.303  24      NA
## 756                 1.057  37       1
## 396                 1.600  25      NA
## 539                 0.804  23      NA
## 659                 0.190  51      NA
## 699                 0.598  28      NA
## 708                 0.176  22      NA
## 21                  0.704  27      NA
## 73                  0.583  42       1
## 106                 0.801  21      NA
## 298                 0.520  24      NA
## 346                 0.349  49      NA
## 479                 0.162  39      NA
## 712                 0.439  40      NA
## 737                 0.515  21      NA
## 767                 0.349  47       1
## 10                  0.232  54       1
```

```
## 26                   0.205  41       1
## 103                  0.262  21      NA
## 136                  0.088  31      NA
## 218                  0.464  32      NA
## 357                  0.962  28       1
## 385                  0.221  25      NA
## 494                  1.144  45       1
## 518                  0.304  51      NA
## 525                  0.151  24      NA
## 561                  0.121  54       1
## 627                  0.206  21      NA
## 684                  0.536  27       1
## 702                  0.565  49       1
## 117                  0.220  38       1
## 249                  0.282  34      NA
## 310                  0.875  30       1
## 323                  0.254  36       1
## 367                  0.368  29       1
## 466                  0.452  21      NA
## 522                  0.305  26      NA
## 556                  0.161  37      NA
## 585                  0.687  52       1
## 603                  0.100  30      NA
## 606                  0.514  21      NA
## 92                   0.443  34      NA
## 192                  0.374  40      NA
## 265                  0.226  35       1
## 406                  0.520  26      NA
## 482                  0.197  29      NA
## 595                  0.733  34      NA
## 653                  0.269  28      NA
## 674                  0.880  22      NA
## 758                  0.258  52       1
## 35                   0.512  45      NA
## 100                  0.325  31       1
## 132                  1.114  33       1
## 234                  0.394  29      NA
## 247                  0.258  41      NA
## 273                  0.254  40      NA
## 327                  0.692  30       1
## 344                  0.290  33      NA
## 375                  0.816  28      NA
## 531                  0.717  22      NA
## 701                  0.483  26      NA
## 765                  0.340  27      NA
## 570                  0.203  33       1
## 583                  0.259  62      NA
## 679                  0.127  25       1
## 693                  0.886  23      NA
## 752                  0.261  28      NA
## 766                  0.245  30      NA
## 127                  0.452  30      NA
## 168                  0.709  34      NA
## 306                  0.215  29      NA
```

```
## 450                  0.285  26      NA
## 461                  0.733  48      NA
## 469                  0.183  38       1
## 510                  0.409  64      NA
## 654                  0.455  27      NA
## 658                  1.162  41      NA
## 732                  0.259  22       1
## 741                  0.785  48       1
## 24                   0.263  29       1
## 182                  0.725  23      NA
## 223                  0.209  37      NA
## 244                  1.318  33       1
## 288                  0.808  29       1
## 386                  0.205  24      NA
## 421                  0.507  26      NA
## 454                  0.832  72      NA
## 473                  0.259  22      NA
## 576                  0.280  25      NA
## 620                  0.141  24       1
## 17                   0.551  31       1
## 128                  0.261  23      NA
## 331                  1.476  46      NA
## 372                  1.731  21      NA
## 578                  0.693  21       1
## 700                  0.904  26      NA
## 30                   0.337  38      NA
## 129                  0.403  40       1
## 230                  0.089  24      NA
## 337                  0.932  44      NA
## 443                  0.230  24      NA
## 445                  0.380  30       1
## 501                  0.313  21      NA
## 529                  0.493  22      NA
## 617                  0.157  30      NA
## 652                  0.466  27      NA
## 724                  0.251  42      NA
## 6                    0.201  30      NA
## 348                  0.187  23      NA
## 387                  0.660  35       1
## 394                  0.463  37      NA
## 528                  0.107  24      NA
## 551                  0.204  21      NA
## 727                  0.496  25      NA
## 8                    0.134  29      NA
## 20                   0.529  32       1
## 304                  0.209  28       1
## 319                  0.150  28      NA
## 338                  0.343  44       1
## 407                  0.376  46       1
## 424                  0.421  21      NA
## 465                  1.022  34      NA
## 665                  0.245  40       1
## 707                  0.261  30       1
## 65                   0.258  42       1
```

```
## 152                 0.432  37      NA
## 163                 0.167  27      NA
## 258                 0.092  25      NA
## 279                 0.744  57      NA
## 475                 0.126  24      NA
## 478                 0.466  31      NA
## 523                 0.189  26      NA
## 553                 0.247  66      NA
## 631                 0.732  34       1
## 722                 0.289  21      NA
## 81                  0.140  22      NA
## 125                 0.278  23       1
## 201                 0.874  21      NA
## 256                 0.543  21       1
## 314                 0.626  25      NA
## 80                  0.307  24      NA
## 215                 0.260  36       1
## 220                 0.261  41       1
## 300                 0.840  58      NA
## 316                 0.315  26      NA
## 322                 0.197  25       1
## 325                 0.148  21      NA
## 412                 0.528  25      NA
## 592                 0.175  24      NA
## 619                 1.282  50       1
## 621                 0.246  28      NA
## 666                 0.217  24      NA
## 726                 0.236  38      NA
## 40                  1.390  56       1
## 122                 0.260  24      NA
## 170                 0.495  29      NA
## 191                 0.142  21      NA
## 206                 0.407  27      NA
## 250                 0.143  23      NA
## 257                 0.557  30      NA
## 530                 0.660  31      NA
## 573                 0.430  22      NA
## 591                 0.925  45       1
## 610                 0.138  23      NA
## 633                 0.343  23      NA
## 668                 0.141  40       1
## 725                 0.265  45      NA
## 11                  0.191  30      NA
## 86                  0.698  27      NA
## 169                 0.471  29      NA
## 497                 0.292  30      NA
## 558                 0.237  58      NA
## 705                 0.118  27      NA
## 31                  0.546  60      NA
## 67                  0.855  38       1
## 68                  0.845  54      NA
## 158                 0.833  23      NA
## 189                 0.640  31       1
## 199                 0.905  26       1
```

```
## 217                  0.514  25       1
## 315                  1.127  43       1
## 383                  0.947  21      NA
## 582                  0.206  27      NA
## 600                  0.407  26      NA
## 743                  0.219  22      NA
## 143                  0.318  22      NA
## 144                  0.272  42       1
## 203                  0.787  32      NA
## 272                  0.128  21      NA
## 280                  0.881  22      NA
## 285                  0.259  52       1
## 290                  0.263  33      NA
## 444                  0.955  33       1
## 577                  0.813  35      NA
## 601                  0.400  24      NA
## 625                  0.158  21      NA
## 719                  0.415  24      NA
## 753                  0.223  25      NA
## 18                   0.254  31       1
## 90                   0.165  24      NA
## 123                  0.404  23      NA
## 198                  0.678  23       1
## 292                  0.757  25       1
## 381                  0.821  24      NA
## 440                  0.727  31      NA
## 532                  0.686  24      NA
## 650                  0.133  23      NA
## 688                  0.181  29      NA
## 691                  0.856  34      NA
## 43                   0.235  48      NA
## 87                   0.178  45      NA
## 142                  0.286  38      NA
## 148                  1.400  34      NA
## 251                  0.380  42      NA
## 275                  0.251  52      NA
## 277                  0.296  29       1
## 312                  0.605  22      NA
## 334                  0.137  44      NA
## 611                  0.292  24      NA
## 616                  0.207  27      NA
## 655                  0.142  22      NA
## 734                  0.426  22      NA
## 759                  0.197  26      NA
## 50                   0.305  24      NA
## 60                   0.173  22      NA
## 130                  0.741  62       1
## 140                  0.159  28      NA
## 197                  0.187  21      NA
## 330                  0.122  37      NA
## 374                  0.225  25      NA
## 382                  0.236  22      NA
## 388                  0.239  45       1
## 477                  0.711  29       1
```

```
## 537                0.197  46      NA
## 614                0.878  26      NA
## 735                0.560  53      NA
## 166                0.722  41       1
## 240                0.582  27      NA
## 278                0.454  23      NA
## 449                0.510  22       1
## 636                0.465  38       1
## 637                0.153  48      NA
## 19                 0.183  33      NA
## 36                 0.966  33      NA
## 49                 0.344  31       1
## 51                 0.491  22      NA
## 205                0.324  55      NA
## 363                0.305  65      NA
## 559                0.126  42      NA
## 588                0.249  29      NA
## 645                0.730  27      NA
## 38                 0.665  46       1
## 146                0.572  21      NA
## 162                0.204  45      NA
## 171                0.180  36       1
## 269                0.078  21      NA
## 329                0.127  23       1
## 411                0.674  28      NA
## 423                0.496  21      NA
## 632                0.238  24      NA
## 641                0.695  27      NA
## 715                0.121  32      NA
## 740                0.293  42       1
## 742                0.400  26      NA
## 52                 0.526  26      NA
## 84                 0.237  22      NA
## 227                0.198  26      NA
## 271                1.136  38       1
## 368                0.252  21      NA
## 408                0.336  25      NA
## 657                0.155  22      NA
## 680                0.614  23      NA
## 764                0.171  63      NA
## 16                 0.484  32       1
## 58                 0.962  31      NA
## 71                 0.867  28       1
## 88                 0.324  26      NA
## 137                0.597  21      NA
## 164                0.368  21      NA
## 225                0.666  26      NA
## 276                0.677  25      NA
## 299                0.412  46       1
## 390                0.949  28      NA
## 391                0.444  42      NA
## 447                0.658  28      NA
## 455                0.498  24      NA
## 541                0.661  43       1
```

```
## 584                  0.190  42      NA
## 640                  0.149  28      NA
## 746                  0.488  46      NA
## 22                   0.388  50      NA
## 66                   0.203  32      NA
## 120                  0.223  21      NA
## 157                  0.637  21      NA
## 204                  0.235  27      NA
## 317                  0.284  30      NA
## 349                  0.279  26      NA
## 366                  0.499  30      NA
## 431                  0.108  23      NA
## 489                  0.294  28      NA
## 493                  0.145  33      NA
## 515                  0.154  24      NA
## 564                  0.497  32      NA
## 567                  0.412  21      NA
## 672                  0.551  21      NA
## 698                  0.253  22      NA
## 739                  0.453  21      NA
## 377                  0.299  22      NA
## 574                  0.198  22      NA
## 669                  0.430  43      NA
## 28                   0.487  22      NA
## 119                  0.443  22      NA
## 417                  1.095  22      NA
## 439                  0.147  21      NA
## 468                  0.600  25      NA
## 527                  0.299  21      NA
## 557                  0.218  30      NA
## 639                  0.871  32       1
## 720                  0.378  52       1
## 107                  0.207  27      NA
## 135                  0.647  26      NA
## 209                  0.289  21      NA
## 266                  0.997  43      NA
## 289                  0.340  26      NA
## 397                  0.944  39      NA
## 505                  0.238  40      NA
## 602                  0.190  28      NA
## 69                   0.334  25      NA
## 78                   0.370  27      NA
## 110                  0.247  24       1
## 263                  0.612  24      NA
## 335                  0.260  22      NA
## 342                  0.673  36      NA
## 345                  0.485  57      NA
## 401                  0.161  31       1
## 430                  0.233  43       1
## 448                  0.330  26      NA
## 566                  0.748  22      NA
## 683                  0.366  22      NA
## 736                  0.284  28      NA
## 422                  0.561  21      NA
```

```
## 427                  0.256  25      NA
## 504                  0.738  41      NA
## 624                  0.347  21      NA
## 630                  0.148  21      NA
## 638                  0.649  23      NA
## 718                  0.595  56      NA
## 99                   0.356  23      NA
## 138                  0.532  22      NA
## 380                  1.021  35      NA
## 586                  0.417  22      NA
## 678                  0.263  25      NA
## 710                  0.674  23       1
## 768                  0.315  23      NA
## 34                   0.188  28      NA
## 97                   0.130  24      NA
## 255                  0.926  44       1
## 351                  0.237  29      NA
## 568                  0.085  46      NA
## 608                  0.482  25      NA
## 622                  1.698  28      NA
## 635                  0.167  31      NA
## 730                  0.141  22      NA
## 241                  0.192  21      NA
## 242                  0.446  22      NA
## 453                  0.381  25      NA
## 513                  0.200  58      NA
## 514                  0.525  22      NA
## 534                  0.501  31      NA
## 565                  0.601  27      NA
## 651                  0.234  23      NA
## 675                  0.587  68      NA
## 39                   0.503  27       1
## 150                  0.085  22      NA
## 253                  0.249  24      NA
## 354                  0.580  24      NA
## 355                  0.559  21      NA
## 384                  1.268  25      NA
## 435                  1.138  36      NA
## 543                  0.825  56       1
## 626                  0.362  29      NA
## 644                  0.610  31      NA
## 695                  0.191  25      NA
## 4                    0.167  21      NA
## 113                  0.192  23      NA
## 432                  0.551  38      NA
## 492                  0.292  42      NA
## 598                  0.559  21      NA
## 763                  0.142  33      NA
## 33                   0.267  22      NA
## 53                   0.342  30      NA
## 126                  0.496  26       1
## 159                  0.229  22      NA
## 359                  0.378  48      NA
## 464                  0.258  37      NA
```

```
## 545                  0.365  29      NA
## 554                  0.422  23      NA
## 761                  0.766  22      NA
## 173                  0.773  25      NA
## 181                  0.084  32      NA
## 226                  0.101  22      NA
## 332                  0.166  25      NA
## 378                  0.509  22      NA
## 526                  0.444  21      NA
## 563                  0.401  24      NA
## 254                  0.238  25      NA
## 458                  0.364  24      NA
## 533                  0.917  29      NA
## 2                    0.351  31      NA
## 105                  0.930  27      NA
## 177                  0.382  42      NA
## 195                  0.136  42      NA
## 219                  1.224  32       1
## 483                  0.306  28      NA
## 560                  0.300  35      NA
## 61                   0.304  21      NA
## 134                  0.457  39      NA
## 373                  0.545  21      NA
## 484                  0.233  23      NA
## 502                  0.267  28      NA
## 509                  0.968  21      NA
## 511                  0.297  46       1
## 544                  0.159  25      NA
## 552                  0.591  25      NA
## 555                  0.471  28      NA
## 83                   0.767  36      NA
## 109                  0.336  25      NA
## 419                  0.624  27      NA
## 442                  0.497  22      NA
## 491                  0.629  24      NA
## 721                  0.317  34      NA
## 399                  0.389  25      NA
## 451                  0.415  23      NA
## 594                  1.699  25      NA
## 93                   0.261  42      NA
## 104                  0.283  24      NA
## 211                  0.290  25      NA
## 369                  0.306  22      NA
## 498                  0.547  25      NA
## 748                  1.096  32      NA
## 91                   0.258  21      NA
## 311                  0.313  41      NA
## 433                  0.527  22      NA
## 495                  0.174  22      NA
## 660                  1.292  27       1
## 706                  0.177  28      NA
## 75                   0.396  22      NA
## 174                  0.678  23      NA
## 233                  0.583  22      NA
```

```
## 7                    0.248  26       1
## 118                  0.654  25      NA
## 291                  0.434  21      NA
## 571                  0.270  39      NA
## 303                  0.156  35      NA
## 535                  1.251  24      NA
## 114                  0.391  25      NA
## 519                  0.180  41      NA
## 175                  0.370  33      NA
## 506                  0.263  38      NA
## 82                   0.102  22      NA
## 235                  0.293  23      NA
## 463                  0.705  39      NA
## 467                  0.269  22      NA
## 56                   0.248  21      NA
## 184                  0.268  27      NA
## 590                  0.342  25      NA
## 404                  0.280  38      NA
## 48                   0.586  22      NA
## 98                   0.323  22      NA
## 274                  0.422  21      NA
## 462                  0.416  26      NA
## 521                  0.187  25      NA
## 618                  0.257  23      NA
## 673                  0.285  47      NA
## 597                  0.194  46      NA
## 738                  0.600  42      NA
## 77                   0.391  41      NA
## 353                  0.243  46      NA
## 147                  0.096  41      NA
## 538                  0.735  67      NA
## 681                  0.332  22      NA
## 63                   0.587  36      NA
## 76                   0.140  22      NA
## 183                  0.299  21      NA
## 343                  0.389  22      NA
## 350                  0.346  37       1
## 503                  0.727  41       1
```

Rename some of the column names in your dataset

```r
colnames(data) <- c("Pregnancies", "GlucoseLevel", "BloodPressure", "SkinThickness",
                    "InsulinLevel", "BMI", "DiabetesPedigree", "Age", "DiabetesOutcome")

# Print the updated column names
print(colnames(data))
```

```
## [1] "Pregnancies"      "GlucoseLevel"     "BloodPressure"    "SkinThickness"
## [5] "InsulinLevel"     "BMI"              "DiabetesPedigree" "Age"
## [9] "DiabetesOutcome"
```

Add new variables in your data frame by using a mathematical function (for e.g. – multiply an existing column by 2 and add it as a new variable to your data frame)

```
# Example: Multiply 'GlucoseLevel' by 2 and add as a new variable 'DoubleGlucose'
data <- data %>%
  mutate(DoubleGlucose = GlucoseLevel * 2)

# View the updated data frame
head(data)
```

```
##   Pregnancies GlucoseLevel BloodPressure SkinThickness InsulinLevel  BMI
## 1           6          148            72            35           NA 33.6
## 2           1           85            66            29           NA 26.6
## 3           8          183            64            NA           NA 23.3
## 4           1           89            66            23           94 28.1
## 5          NA          137            40            35          168 43.1
## 6           5          116            74            NA           NA 25.6
##   DiabetesPedigree Age DiabetesOutcome DoubleGlucose
## 1            0.627  50               1           296
## 2            0.351  31              NA           170
## 3            0.672  32               1           366
## 4            0.167  21              NA           178
## 5            2.288  33               1           274
## 6            0.201  30              NA           232
```

Create a training set using random number generator engine.

```
# Number of rows in your dataset
num_rows <- nrow(data)

# Number of rows for training set (e.g., 80% of the data)
train_size <- 0.8 * num_rows

# Generate indices for training set
train_indices <- sample(num_rows, train_size, replace = FALSE)

# Create training set
train_data <- data[train_indices, ]

# View the first few rows of the training set
head(train_data)
```

```
##     Pregnancies GlucoseLevel BloodPressure SkinThickness InsulinLevel  BMI
## 471           1          144            82            40           NA 41.3
## 518           7          125            86            NA           NA 37.6
## 117           5          124            74            NA           NA 34.0
## 612           3          174            58            22          194 32.9
## 682          NA          162            76            36           NA 49.6
## 458           5           86            68            28           71 30.2
```

```
##     DiabetesPedigree Age DiabetesOutcome DoubleGlucose
## 471            0.607  28              NA           288
## 518            0.304  51              NA           250
## 117            0.220  38               1           248
## 612            0.593  36               1           348
## 682            0.364  26               1           324
## 458            0.364  24              NA           172
```

Print the summary statistics of your dataset

```
summary(data)
```

```
##   Pregnancies      GlucoseLevel   BloodPressure    SkinThickness
##  Min.   : 1.000   Min.   : 44.0   Min.   : 24.00   Min.   : 7.00
##  1st Qu.: 2.000   1st Qu.: 99.0   1st Qu.: 64.00   1st Qu.:22.00
##  Median : 4.000   Median :117.0   Median : 72.00   Median :29.00
##  Mean   : 4.495   Mean   :121.7   Mean   : 72.41   Mean   :29.15
##  3rd Qu.: 7.000   3rd Qu.:141.0   3rd Qu.: 80.00   3rd Qu.:36.00
##  Max.   :17.000   Max.   :199.0   Max.   :122.00   Max.   :99.00
##  NA's   :111      NA's   :5       NA's   :35       NA's   :227
##   InsulinLevel         BMI        DiabetesPedigree      Age
##  Min.   : 14.00   Min.   :18.20   Min.   :0.0780   Min.   :21.00
##  1st Qu.: 76.25   1st Qu.:27.50   1st Qu.:0.2437   1st Qu.:24.00
##  Median :125.00   Median :32.30   Median :0.3725   Median :29.00
##  Mean   :155.55   Mean   :32.46   Mean   :0.4719   Mean   :33.24
##  3rd Qu.:190.00   3rd Qu.:36.60   3rd Qu.:0.6262   3rd Qu.:41.00
##  Max.   :846.00   Max.   :67.10   Max.   :2.4200   Max.   :81.00
##  NA's   :374      NA's   :11
##  DiabetesOutcome DoubleGlucose
##  Min.   :1       Min.   : 88.0
##  1st Qu.:1       1st Qu.:198.0
##  Median :1       Median :234.0
##  Mean   :1       Mean   :243.4
##  3rd Qu.:1       3rd Qu.:282.0
##  Max.   :1       Max.   :398.0
##  NA's   :500     NA's   :5
```

Use any of the numerical variables from the dataset and perform the following statistical functions

Mean • Median • Mode • Range

```
# Remove rows with NA values in GlucoseLevel
data <- na.omit(data)

# Mean calculation
mean_glucose <- mean(data$GlucoseLevel, na.rm = TRUE)

# Median calculation
median_glucose <- median(data$GlucoseLevel, na.rm = TRUE)
```

```r
# Mode calculation (custom function)
get_mode <- function(x) {
  ux <- unique(x)
  ux[which.max(tabulate(match(x, ux)))]
}
mode_glucose <- get_mode(data$GlucoseLevel)

# Range calculation
range_glucose <- range(data$GlucoseLevel)

# Print the results
cat("Mean Glucose Level:", mean_glucose, "\n")
```

```
## Mean Glucose Level: 144.8468
```

```r
cat("Median Glucose Level:", median_glucose, "\n")
```

```
## Median Glucose Level: 145
```

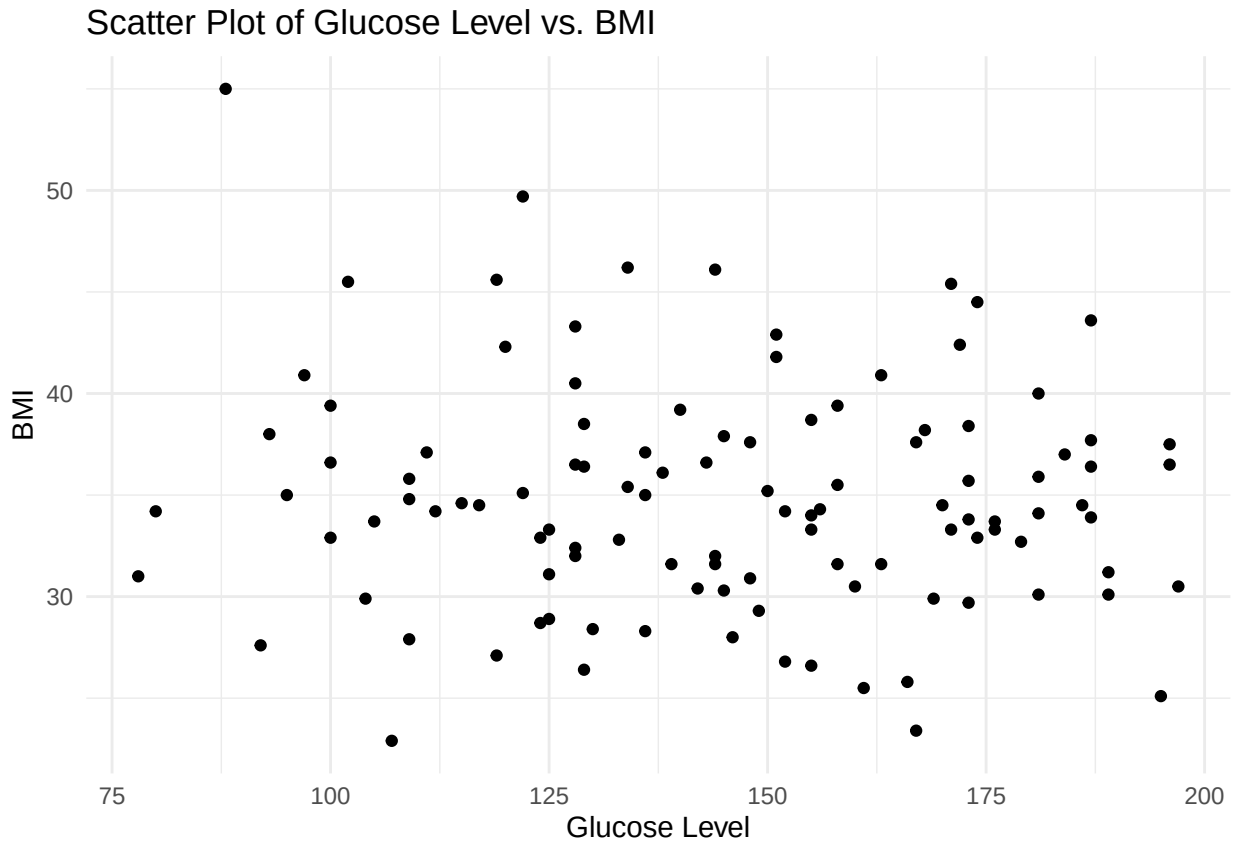
```r
cat("Mode Glucose Level:", mode_glucose, "\n")
```

```
## Mode Glucose Level: 128
```

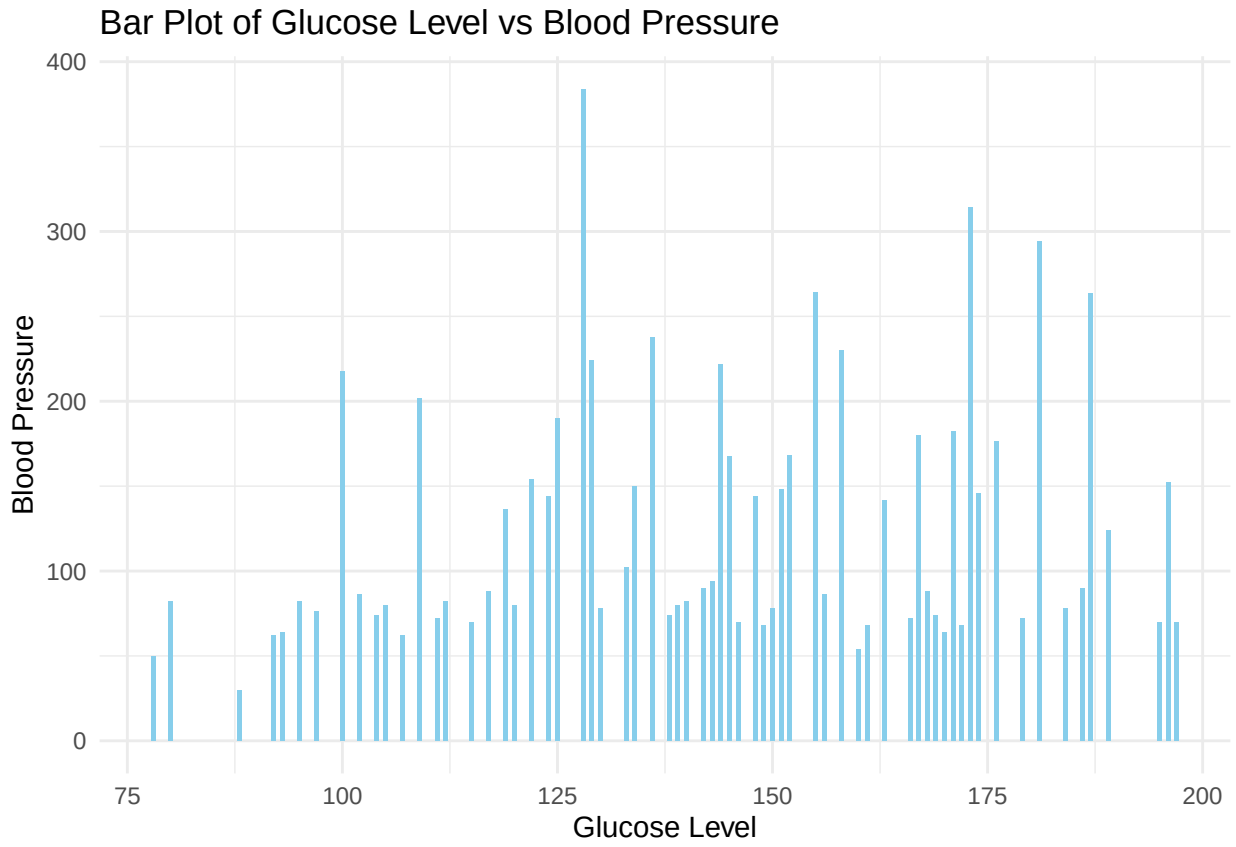
```r
cat("Range of Glucose Level:", range_glucose[1], "to", range_glucose[2], "\n")
```

```
## Range of Glucose Level: 78 to 197
```

Plot a scatter plot for any 2 variables in your dataset



Plot a bar plot for any 2 variables in your dataset



Find the correlation between any 2 variables by applying Pearson correlation

```
# Calculate Pearson correlation between GlucoseLevel and BloodPressure
correlation <- cor(data$GlucoseLevel, data$BloodPressure, method = "pearson")

# Print the correlation coefficient
cat("Pearson correlation coefficient between GlucoseLevel and BloodPressure:", correlation, "\n")
```

```
## Pearson correlation coefficient between GlucoseLevel and BloodPressure: 0.1112076
```