Programing in R, Fundamentals of Data Science

Introduction to integers, objects, and factors

```
x <- 1
x ##This is an automatic print
```

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

```
b <- 1:20  ##Creates a series of integers
c <- 0:6
class(c) ##Shows you what class c is
```

```
## [1] "integer"
```

```
as.numeric(c)  ##Changes the list of integers into mnumeric values
```

```
## [1] 0 1 2 3 4 5 6
```

```
as.logical(c)  ##Changes the list of numerics into logical values of True and False
```

```
## [1] FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
```

```
d <- list(1, "a", TRUE, 1+4i)  #Creates a list of different classes within same vector
print(d)
```

```
## [[1]]
## [1] 1
##
## [[2]]
## [1] "a"
##
## [[3]]
## [1] TRUE
##
## [[4]]
## [1] 1+4i
```

```
e <- matrix(1:6, nrow = 2, ncol = 3)  #This is one way of creating a matrix of two rows and three colum

x <- 1:3
y <- 10:12
cbind(x,y) ##This utilized the above vectors for x and y and combines them on columns
```

```
##      x  y
## [1,] 1 10
## [2,] 2 11
## [3,] 3 12
```

```
rbind(x, y) #Does the same thing as column bind, but for rows [both are matrix functions]
```

```
##   [,1] [,2] [,3]
## x    1    2    3
## y   10   11   12
```

```
f <- factor(c("yes", "yes", "no", "yes", "no"))  #creates the factor
f  #Prints the factor, the levels as well
```

```
## [1] yes yes no  yes no
## Levels: no yes
```

```
table(f) ##shows you the levels, and how many of each
```

```
## f
##  no yes
##   2   3
```

```
unclass(f)  ##Prints out how R considers the factor- as a simplified vector of integers
```

```
## [1] 2 2 1 2 1
## attr(,"levels")
## [1] "no"  "yes"
```

```
f <- factor(c("yes", "yes", "no", "yes", "no"),
    levels = c("yes", "no"))  ##This changes the baseline to the elements attributes
```

Reading tables, data.frames, and NA values

```
is.na(x) ##is used to determine if there are missing values within a vector. This will happen if more th
```

```
## [1] FALSE FALSE FALSE
```

```
    # read.table() ## is used to read data for a data table.
    # read.csv() ##Does the same as read.table for csv files
g <- data.frame(foo = 1:4, bar = c(T, T, F, F))
g   #This prints out a data frame with column headers foo and bar, and gives row.names as default 1, 2,
```

```
##   foo   bar
## 1   1  TRUE
## 2   2  TRUE
## 3   3 FALSE
## 4   4 FALSE
```

```
h <- 1:3
names(h) <- c("fucka", "aya", "ducka") ##This attaches names to a vector/object
i <- c("a", "b", "c", "d", "e", "a", "b")
i[3] ##based on the vector i above, we subset the third element of i
```

```
## [1] "c"
```

```
i[2:4] ## sub-setting a sequence of elements
```

```
## [1] "b" "c" "d"
```

```
i[i > "c"]  ##alphabet is sequential, so we can subset logically for anything greater than "c"
```

```
## [1] "d" "e"
```

```
j <- i > "c"  ##Logical index that will show true of false whether elements in the vector area greater
j  ##prints
```

```
## [1] FALSE FALSE FALSE  TRUE  TRUE FALSE FALSE
```

```
k <- list(shit = 1:4, face = 0.6) ## creating a simple list of length 2
k[1] ##Single bracket subset of the first elements with it's title
```

```
## $shit
## [1] 1 2 3 4
```

```
k[[1]] ## double bracket subsets only the element, not the title
```

```
## [1] 1 2 3 4
```

```
k$face  ## extracts by name, just the information related to the second element, i.e. face
```

```
## [1] 0.6
```

```
l <- c(1, 2, NA, 4, 5, NA, 7)
bad <- is.na(l)
l[!bad]  ##This expression takes a vector or data frame, and removes the NA using the is.na function
```

```
## [1] 1 2 4 5 7
```

```
na.omit(read.csv("./data/Respiration_2012_combined_demo.csv")) ##Real example that works with existing
```

```
##     Species Location Sample.. Plot   Mass Season Root.Age Manual.O2.in
## 1     beech     mono        1    2  9.180   fall      <20       213.96
## 2     beech     mono        2    2 10.730   fall      <20       249.38
## 4     beech     mono        4    2  9.330   fall      <20       240.78
## 5     beech     mono        5    3  5.590   fall      <20       401.59
## 6     beech     mono          6     3  7.690   fall       <20       241.92
## 8     beech     mono          8     3  7.680   fall       <20       236.77
## 9     beech     mono          9     4 10.090   fall       <20       357.56
## 10    beech     mono         10     4 12.620   fall       <20       235.19
## 11    beech     mono         11     4 10.410   fall       <20       380.13
## 12    beech     mono         12     4 10.210   fall       <20       318.60
## 13   spruce     mono         13     2 13.960   fall       <20       377.47
## 14   spruce     mono         14     2  4.330   fall       <20       297.86
## 15   spruce     mono         15     2  9.420   fall       <20       388.53
## 16   spruce     mono         16     2 11.220   fall       <20       258.98
## 17   spruce     mono         17     3  8.930   fall       <20       380.79
## 18   spruce     mono         18     3  9.640   fall       <20       247.94
## 19   spruce     mono         19     3 13.610   fall       <20       377.91
## 20   spruce     mono         20     3 10.240   fall       <20       249.09
## 21   spruce     mono         21     4 11.040   fall       <20       355.34
## 22   spruce     mono         22     4 14.600   fall       <20       240.78
## 23   spruce     mono         23     4  8.540   fall       <20       371.27
## 24   spruce     mono         24     4 15.420   fall       <20       238.91
## 25   spruce      mix         25     2  3.840   fall       <20       395.17
## 26   spruce      mix         26     2 21.850   fall       <20       271.31
## 27   spruce      mix         27     2  6.590   fall       <20       398.27
## 28   spruce      mix         28     2  9.210   fall       <20       270.59
## 29    beech      mix         29     2  4.820   fall       <20       386.32
## 30    beech      mix         30     2  4.930   fall       <20       267.58
## 31    beech      mix         31     2  5.550   fall       <20       384.77
## 32    beech      mix         32     2 11.130   fall       <20       266.15
## 33   spruce      mix         33     3  9.040   fall       <20       353.57
## 34   spruce      mix         34     3  6.110   fall       <20       222.15
## 35   spruce      mix         35     3 11.380   fall       <20       337.64
## 36   spruce      mix         36     3  5.420   fall       <20       251.81
## 37    beech      mix         37     3  5.780   fall       <20       382.78
## 38    beech      mix         38     3  4.360   fall       <20       228.17
## 39    beech      mix         39     3  5.110   fall       <20       380.57
## 40    beech      mix         40     3  1.900   fall       <20       387.21
## 41    beech      mix         41     4  2.400   fall       <20       369.73
## 42    beech      mix         42     4  4.070   fall       <20       367.96
## 43    beech      mix         43     4  7.330   fall       <20       356.89
## 44   spruce      mix         44     4 11.600   fall       <20       367.07
## 45   spruce      mix         45     4  6.140   fall       <20       354.90
## 46   spruce      mix         46     4  4.480   fall       <20       359.11
## 47   spruce     mono          1     5 16.050 spring       <20       333.70
## 48   spruce     mono          2     5  9.750 spring       <20       335.67
## 49   spruce     mono          3     5 17.830 spring       <20       365.98
## 50   spruce     mono          4     5 22.900 spring       <20       273.45
## 51   spruce     mono          5     1  9.640 spring       <20       467.77
## 52   spruce     mono          6     1  9.440 spring       <20       456.54
## 53   spruce     mono          7     1 10.450 spring       <20       489.62
## 54   spruce     mono          8     1 13.660 spring       <20       486.86
## 55    beech     mono          9     5 13.990 spring       <20       432.92
## 56    beech     mono         10     5  8.920 spring       <20       414.41
## 57    beech     mono         11     5 17.110 spring       <20       412.64
## 58    beech     mono         12     5 13.600 spring       <20       418.15
## 59    beech     mono         13     1  7.350 spring       <20       413.04
## 60    beech     mono         14     1 10.901 spring       <20       466.98
## 61    beech     mono       15    1 21.700 spring      <20       459.10
## 62    beech     mono       16    1 14.630 spring      <20       461.66
## 63   spruce     mono       17    8  4.820 spring      <20       466.39
## 64   spruce     mono       18    8  6.160 spring      <20       467.57
## 65   spruce     mono       19    8  1.797 spring      <20       456.94
## 66   spruce     mono       20    8  4.296 spring      <20       457.33
## 67    beech     mono       21    8  6.324 spring      <20       437.64
## 68    beech     mono       22    8  4.520 spring      <20       439.02
## 69    beech     mono       23    8  5.720 spring      <20       439.42
## 70    beech     mono       24    8  8.360 spring      <20       432.72
## 71   spruce     mono       25    9  4.688 spring      <20       437.45
## 72   spruce     mono       26    9  2.980 spring      <20       378.98
## 73   spruce     mono       27    9  3.205 spring      <20       424.45
## 74   spruce     mono       28    9  3.710 spring      <20       414.81
## 75    beech     mono       29    9 11.245 spring      <20       414.22
## 76    beech     mono       30    9  5.890 spring      <20       416.78
## 77    beech     mono       31    9 16.690 spring      <20       415.00
## 78    beech     mono       32    9 17.003 spring      <20       419.93
## 79   spruce     mono       33    2  4.373 spring      <20       434.50
## 80   spruce     mono       34    2  5.630 spring      <20       442.57
## 81    beech     mono       35    2 10.601 spring      <20       441.39
## 82    beech     mono       36    2  8.870 spring      <20       432.13
## 83   spruce      mix       37    5 11.090 spring      <20       275.65
## 84   spruce      mix       38    5  5.850 spring      <20       279.66
## 85   spruce      mix       39    5  6.060 spring      <20       288.72
## 86   spruce      mix       40    1  6.700 spring      <20       294.64
## 87   spruce      mix       41    1  8.190 spring      <20       299.35
## 88   spruce      mix       42    1 13.710 spring      <20       309.45
## 89    beech      mix       43    5 10.340 spring      <20       313.11
## 90    beech      mix       44    5  8.130 spring      <20       297.43
## 91    beech      mix       45    5  4.630 spring      <20       290.98
## 92    beech      mix       46    1 17.630 spring      <20       286.63
## 93    beech      mix       47    1  5.050 spring      <20       283.49
## 94    beech      mix       48    1 17.280 spring      <20       288.37
## 95   spruce      mix       49    8  5.680 spring      <20       278.09
## 96   spruce      mix       50    8 10.440 spring      <20       278.44
## 97   spruce      mix       51    8 10.390 spring      <20       274.95
## 98   spruce      mix       52    9  8.720 spring      <20       276.00
## 99   spruce      mix       53    9  7.510 spring      <20       279.14
## 100  spruce      mix       54    9  9.390 spring      <20       278.27
## 101   beech      mix       55    8  2.916 spring      <20       279.14
## 102   beech      mix       56    8  4.370 spring      <20       277.22
## 103   beech      mix       57    8  1.770 spring      <20       278.61
## 104   beech      mix       58    9  2.743 spring      <20       277.92
## 105   beech      mix       59    9  2.490 spring      <20       276.52
## 106   beech      mix       60    9  5.380 spring      <20       279.14
## 107   beech      mix       61    2  7.090 spring      <20       277.92
## 108   beech      mix       62    2  5.830 spring      <20       274.43
## 109   beech      mix       63    2  5.320 spring      <20       274.43
## 110  spruce      mix       64    2 12.780 spring      <20       272.17
## 111  spruce      mix       65    2  7.230 spring      <20       271.82
## 112  spruce      mix       66    2 11.500 spring      <20       268.16
##     Manual.O2.out Time Manual.O2..nmol.sec. Vol..ml. Rate..nmol.sec.
## 1          178.11  500              0.07170      2.5         0.17925
## 2          206.67  500              0.08542      2.5         0.21355
## 4          212.11  500              0.05734      2.5         0.14335
## 5          356.89  500              0.08940      2.5         0.22350
## 6          203.51  500              0.07682      2.5         0.19205
## 8          204.23  500              0.06508      2.5         0.16270
## 9          230.77  500              0.25358      2.5         0.63395
## 10         167.54  500              0.13530      2.5         0.33825
## 11         305.56  500              0.14914      2.5         0.37285
## 12         239.92  500              0.15736      2.5         0.39340
## 13         291.81  500              0.17132      2.5         0.42830
## 14         248.95  500              0.09782      2.5         0.24455
## 15         346.49  500              0.08408      2.5         0.21020
## 16         214.55  500              0.08886      2.5         0.22215
## 17         328.13  500              0.10532      2.5         0.26330
## 18         207.53  500              0.08082      2.5         0.20205
## 19         305.12  500              0.14558      2.5         0.36395
## 20         208.67  500              0.08084      2.5         0.20210
## 21         291.18  500              0.12832      2.5         0.32080
## 22         189.33  500              0.10290      2.5         0.25725
## 23         315.74  500              0.11106      2.5         0.27765
## 24         170.98  500              0.13586      2.5         0.33965
## 25         384.33  500              0.02168      2.5         0.05420
## 26         255.54  500              0.03154      2.5         0.07885
## 27         383.67  500              0.02920      2.5         0.07300
## 28         254.11  500              0.03296      2.5         0.08240
## 29         340.96  500              0.09072      2.5         0.22680
## 30         235.33  500              0.06450      2.5         0.16125
## 31         359.11  500              0.05132      2.5         0.12830
## 32         225.59  500              0.08112      2.5         0.20280
## 33         295.38  500              0.11638      2.5         0.29095
## 34         178.15  500              0.08800      2.5         0.22000
## 35         239.62  500              0.19604      2.5         0.49010
## 36         225.16  500              0.05330      2.5         0.13325
## 37         370.61  500              0.02434      2.5         0.06085
## 38         216.99  500              0.02236      2.5         0.05590
## 39         368.18  500              0.02478      2.5         0.06195
## 40         362.20  500              0.05002      2.5         0.12505
## 41         340.74  500              0.05798      2.5         0.14495
## 42         330.78  500              0.07436      2.5         0.18590
## 43         302.91  500              0.10796      2.5         0.26990
## 44         329.90  500              0.07434      2.5         0.18585
## 45         297.15  500              0.11550      2.5         0.28875
## 46         331.01  500              0.05620      2.5         0.14050
## 47         199.82  500              0.26780      2.5         0.66940
## 48         250.03  500              0.17130      2.5         0.42820
## 49         284.28  500              0.16300      2.5         0.40850
## 50         188.80  500              0.16900      2.5         0.42325
## 51         386.66  500              0.16220      2.5         0.40555
## 52         382.32  500              0.14840      2.5         0.37110
## 53         399.65  500              0.17990      2.5         0.44985
## 54         345.31  500              0.28300      2.5         0.70775
## 55         341.57  500              0.18300      2.5         0.45675
## 56         318.54  500              0.19170      2.5         0.47935
## 57         241.36  500              0.34260      2.5         0.85640
## 58          253.18  500              0.32990      2.5         0.82485
## 59          361.06  500              0.10400      2.5         0.25990
## 60          416.38  500              0.10100      2.5         0.25300
## 61          381.34  500              0.15550      2.5         0.38880
## 62          392.56  500              0.13800      2.5         0.34550
## 63          443.35  500              0.04608      2.5         0.11520
## 64          397.68  500              0.13980      2.5         0.34945
## 65          429.38  500              0.05510      2.5         0.13780
## 66          406.93  500              0.10100      2.5         0.25200
## 67          353.78  500              0.16770      2.5         0.41930
## 68          371.10  500              0.13580      2.5         0.33960
## 69          344.33  500              0.19020      2.5         0.47545
## 70          376.22  500              0.11000      2.5         0.28250
## 71          388.62  500              0.09770      2.5         0.24415
## 72          320.51  500              0.11690      2.5         0.29235
## 73          367.36  500              0.11420      2.5         0.28545
## 74          344.13  500              0.14140      2.5         0.35340
## 75          283.30  500              0.26180      2.5         0.65460
## 76          315.78  500              0.20000      2.5         0.50500
## 77          269.52  500              0.29100      2.5         0.72740
## 78          232.51  500              0.37480      2.5         0.93710
## 79          398.47  500              0.07206      2.5         0.18015
## 80          388.23  500              0.10870      2.5         0.27170
## 81          336.65  500              0.20950      2.5         0.52370
## 82          340.59  500              0.18310      2.5         0.45770
## 83          246.55  500              0.05820      2.5         0.14550
## 84          237.49  500              0.08430      2.5         0.21085
## 85          268.86  500              0.03970      2.5         0.09930
## 86          231.22  500              0.12680      2.5         0.31710
## 87          265.20  500              0.06830      2.5         0.17075
## 88          263.80  500              0.09100      2.5         0.22825
## 89          288.55  500              0.04910      2.5         0.12280
## 90          276.35  500              0.04220      2.5         0.10540
## 91          278.27  500              0.02542      2.5         0.06355
## 92          268.33  500              0.03700      2.5         0.09150
## 93          272.69  500              0.02200      2.5         0.05400
## 94          266.24  500              0.04430      2.5         0.11065
## 95          248.12  500              0.05994      2.5         0.14985
## 96          244.11  500              0.06870      2.5         0.17165
## 97          242.02  500              0.06590      2.5         0.16465
## 98          253.17  500              0.04570      2.5         0.11415
## 99          259.27  500              0.03970      2.5         0.09935
## 100         235.58  500              0.08538      2.5         0.21345
## 101         270.77  500              0.01670      2.5         0.04185
## 102         260.84  500              0.03276      2.5         0.08190
## 103         269.73  500              0.01780      2.5         0.04440
## 104         272.34  500              0.01116      2.5         0.02790
## 105         271.99  500              0.00906      2.5         0.02265
## 106         269.90  500              0.01850      2.5         0.04620
## 107         261.71  500              0.03242      2.5         0.08105
## 108         263.11  500              0.02260      2.5         0.05660
## 109         266.42  500              0.01600      2.5         0.04005
## 110         198.46  500              0.14740      2.5         0.36855
## 111         225.12  500              0.09300      2.5         0.23350
## 112        163.27  500              0.20980      2.5         0.52445
##    Respiration.Rate..nmol.mg.s.  nmol.g.s
## 1                    0.019526144 19.526144
## 2                    0.019902144 19.902144
## 4                    0.015364416 15.364416
## 5                    0.039982111 39.982111
## 6                    0.024973992 24.973992
## 8                    0.021184896 21.184896
## 9                    0.062829534 62.829534
## 10                   0.026802694 26.802694
## 11                   0.035816523 35.816523
## 12                   0.038530852 38.530852
## 13                   0.030680516 30.680516
## 14                   0.056478060 56.478060
## 15                   0.022314225 22.314225
## 16                   0.019799465 19.799465
## 17                   0.029484882 29.484882
## 18                   0.020959544 20.959544
## 19                   0.026741367 26.741367
## 20                   0.019736328 19.736328
## 21                   0.029057971 29.057971
## 22                   0.017619863 17.619863
## 23                   0.032511710 32.511710
## 24                   0.022026589 22.026589
## 25                   0.014114583 14.114583
## 26                   0.003608696  3.608696
## 27                   0.011077390 11.077390
## 28                   0.008946797  8.946797
## 29                   0.047053942 47.053942
## 30                   0.032707911 32.707911
## 31                   0.023117117 23.117117
## 32                   0.018221024 18.221024
## 33                   0.032184735 32.184735
## 34                   0.036006547 36.006547
## 35                   0.043066784 43.066784
## 36                   0.024584871 24.584871
## 37                   0.010527682 10.527682
## 38                   0.012821101 12.821101
## 39                   0.012123288 12.123288
## 40                   0.065815789 65.815789
## 41                   0.060395833 60.395833
## 42                   0.045675676 45.675676
## 43                   0.036821282 36.821282
## 44                   0.016021552 16.021552
## 45                   0.047027687 47.027687
## 46                   0.031361607 31.361607
## 47                   0.041707165 41.707165
## 48                   0.043917949 43.917949
## 49                   0.022910824 22.910824
## 50                   0.018482533 18.482533
## 51                   0.042069502 42.069502
## 52                   0.039311441 39.311441
## 53                   0.043047847 43.047847
## 54                   0.051811859 51.811859
## 55                   0.032648320 32.648320
## 56                   0.053738789 53.738789
## 57                   0.050052601 50.052601
## 58                   0.060650735 60.650735
## 59                   0.035360544 35.360544
## 60                   0.023208880 23.208880
## 61                   0.017917051 17.917051
## 62                   0.023615858 23.615858
## 63                   0.023900415 23.900415
## 64                   0.056728896 56.728896
## 65                   0.076683361 76.683361
## 66                   0.058659218 58.659218
## 67                   0.066302973 66.302973
## 68                   0.075132743 75.132743
## 69                   0.083120629 83.120629
## 70                   0.033791866 33.791866
## 71                   0.052079778 52.079778
## 72                   0.098104027 98.104027
## 73                   0.089063963 89.063963
## 74                   0.095256065 95.256065
## 75                   0.058212539 58.212539
## 76                   0.085738540 85.738540
## 77                   0.043582984 43.582984
## 78                   0.055113803 55.113803
## 79                   0.041195975 41.195975
## 80                   0.048259325 48.259325
## 81                   0.049401000 49.401000
## 82                   0.051600902 51.600902
## 83                   0.013119928 13.119928
## 84                   0.036042735 36.042735
## 85                   0.016386139 16.386139
## 86                   0.047328358 47.328358
## 87                   0.020848596 20.848596
## 88                   0.016648432 16.648432
## 89                   0.011876209 11.876209
## 90                   0.012964330 12.964330
## 91                   0.013725702 13.725702
## 92                   0.005190017  5.190017
## 93                   0.010693069 10.693069
## 94                   0.006403356  6.403356
## 95                   0.026382042 26.382042
## 96                   0.016441571 16.441571
## 97                   0.015846968 15.846968
## 98                   0.013090596 13.090596
## 99                   0.013229028 13.229028
## 100                  0.022731629 22.731629
## 101                  0.014351852 14.351852
## 102                  0.018741419 18.741419
## 103                  0.025084746 25.084746
## 104                  0.010171345 10.171345
## 105                  0.009096386  9.096386
## 106                  0.008587361  8.587361
## 107                  0.011431594 11.431594
## 108                  0.009708405  9.708405
## 109                  0.007528195  7.528195
## 110                  0.028838028 28.838028
## 111                  0.032295989 32.295989
## 112                  0.045604348 45.604348
```

```
m <- 1:4; n <- 5:8  ## below are the examples of how two processes can run simultaneously, i.e. vectori
m + n
```

```
## [1]  6  8 10 12
```

```
m * n
```

```
## [1]  5 12 21 32
```

```
m >= 2
```

```
## [1] FALSE  TRUE  TRUE  TRUE
```

```
m/n
```

```
## [1] 0.2000000 0.3333333 0.4285714 0.5000000
```

Cleaning and summarizing data.frames

```
data <- na.omit(read.csv("./data/hw1_data.csv")) ## assigning the imported csv file to the string "data
colMeans(data)  ## taking the mean of each of the columns of the "data" table. colMeans(x) does not wor
```

```
##      Ozone    Solar.R       Wind       Temp      Month        Day
##  42.099099 184.801802   9.939640  77.792793   7.216216  15.945946
```

```
table <- read.csv("./data/hw1_data.csv")  ##Imports the data frame
table[is.na(table)] <- ""   ##identifies anything that is NA, and the expression assigns ""

library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
table <- na.omit(read.csv("./data/hw1_data.csv"))  #Imports the data table/data frame
subs <- filter(table, Ozone > 31 & Temp > 90)  ##assigns subs to a filtered "table" dataset, filtering i
str(subs)  ##summarizes new data
```

```
## 'data.frame':    10 obs. of  6 variables:
##  $ Ozone  : int  97 97 76 118 84 85 96 78 73 91
##  $ Solar.R: int  267 272 203 225 237 188 167 197 183 189
##  $ Wind   : num  6.3 5.7 9.7 2.3 6.3 6.3 6.9 5.1 2.8 4.6
##  $ Temp   : int  92 92 97 94 96 94 91 92 93 93
##  $ Month  : int  7 7 8 8 8 8 9 9 9 9
##  $ Day    : int  8 9 28 29 30 31 1 2 3 4
##  - attr(*, "na.action")= 'omit' Named int [1:42] 5 6 10 11 25 26 27 32 33 34 ...
##   ..- attr(*, "names")= chr [1:42] "5" "6" "10" "11" ...
```

```r
colMeans(subs)  ##takes the mean of subs
```

```
##   Ozone Solar.R    Wind    Temp   Month     Day
##    89.5   212.8     5.6    93.4     8.2    14.5
```

```r
table <- na.omit(read.csv("./data/hw1_data.csv")) ##assigns table to the data frame
subs <- filter(table, Month == 5)  ## assigns subs to a subset via the filter from dplyr
subs <- arrange(subs, Ozone)  ##arranges subs in ascending order
head(select(subs, Ozone), 3)  ##shows the top values for subs, column ozone, and returns three elements
```

```
##   Ozone
## 1     1
## 2     4
## 3     6
```

```r
tail(select(subs, Ozone), 3)  ##shows the bottom values for subs, column ozone, and returns three elemen
```

```
##    Ozone
## 22    41
## 23    45
## 24   115
```

```r
table <- read.csv("./data/hw1_data.csv")
table [is.na(table)] <- ""  ## This is a way of removing all NA without removing any rows from the data
table
```

```
##     Ozone Solar.R Wind Temp Month Day
## 1      41     190  7.4   67     5   1
## 2      36     118  8.0   72     5   2
## 3      12     149 12.6   74     5   3
## 4      18     313 11.5   62     5   4
## 5                 14.3   56     5   5
## 6      28         14.9   66     5   6
## 7      23     299  8.6   65     5   7
## 8      19      99 13.8   59     5   8
## 9       8      19 20.1   61     5   9
## 10          194  8.6   69     5  10
## 11       7        6.9   74     5  11
## 12      16     256  9.7   69     5  12
## 13      11     290  9.2   66     5  13
## 14      14     274 10.9   68     5  14
## 15      18      65 13.2   58     5  15
## 16      14     334 11.5   64     5  16
## 17      34     307 12.0   66     5  17
## 18       6      78 18.4   57     5  18
## 19      30     322 11.5   68     5  19
## 20      11      44  9.7   62     5  20
## 21       1       8  9.7   59     5  21
## 22      11     320 16.6   73     5  22
## 23       4      25  9.7   61     5  23
## 24      32      92 12.0   61     5  24
## 25              66 16.6   57     5  25
## 26             266 14.9   58     5  26
## 27                  8.0   57     5  27
## 28      23      13 12.0   67     5  28
## 29      45     252 14.9   81     5  29
## 30     115     223  5.7   79     5  30
## 31      37     279  7.4   76     5  31
## 32             286  8.6   78     6   1
## 33             287  9.7   74     6   2
## 34             242 16.1   67     6   3
## 35             186  9.2   84     6   4
## 36             220  8.6   85     6   5
## 37             264 14.3   79     6   6
## 38      29     127  9.7   82     6   7
## 39             273  6.9   87     6   8
## 40      71     291 13.8   90     6   9
## 41      39     323 11.5   87     6  10
## 42             259 10.9   93     6  11
## 43             250  9.2   92     6  12
## 44      23     148  8.0   82     6  13
## 45             332 13.8   80     6  14
## 46             322 11.5   79     6  15
## 47      21     191 14.9   77     6  16
## 48      37     284 20.7   72     6  17
## 49      20      37  9.2   65     6  18
## 50      12     120 11.5   73     6  19
## 51      13     137 10.3   76     6  20
## 52             150  6.3   77     6  21
## 53              59  1.7   76     6  22
## 54              91  4.6   76     6  23
## 55             250  6.3   76     6  24
## 56             135  8.0   75     6  25
## 57             127  8.0   78     6  26
## 58              47 10.3   73     6  27
## 59              98 11.5   80     6  28
## 60              31 14.9   77     6  29
## 61             138  8.0   83     6  30
## 62     135     269  4.1   84     7   1
## 63      49     248  9.2   85     7   2
## 64     32     236  9.2   81     7   3
## 65            101 10.9   84     7   4
## 66     64     175  4.6   83     7   5
## 67     40     314 10.9   83     7   6
## 68     77     276  5.1   88     7   7
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 71     85     175  7.4   89     7  10
## 72            139  8.6   82     7  11
## 73     10     264 14.3   73     7  12
## 74     27     175 14.9   81     7  13
## 75            291 14.9   91     7  14
## 76      7      48 14.3   80     7  15
## 77     48     260  6.9   81     7  16
## 78     35     274 10.3   82     7  17
## 79     61     285  6.3   84     7  18
## 80     79     187  5.1   87     7  19
## 81     63     220 11.5   85     7  20
## 82     16       7  6.9   74     7  21
## 83            258  9.7   81     7  22
## 84            295 11.5   82     7  23
## 85     80     294  8.6   86     7  24
## 86    108     223  8.0   85     7  25
## 87     20      81  8.6   82     7  26
## 88     52      82 12.0   86     7  27
## 89     82     213  7.4   88     7  28
## 90     50     275  7.4   86     7  29
## 91     64     253  7.4   83     7  30
## 92     59     254  9.2   81     7  31
## 93     39      83  6.9   81     8   1
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 96     78          6.9   86     8   4
## 97     35          7.4   85     8   5
## 98     66          4.6   87     8   6
## 99    122     255  4.0   89     8   7
## 100    89     229 10.3   90     8   8
## 101   110     207  8.0   90     8   9
## 102           222  8.6   92     8  10
## 103           137 11.5   86     8  11
## 104    44     192 11.5   86     8  12
## 105    28     273 11.5   82     8  13
## 106    65     157  9.7   80     8  14
## 107            64 11.5   79     8  15
## 108    22      71 10.3   77     8  16
## 109    59      51  6.3   79     8  17
## 110    23     115  7.4   76     8  18
## 111    31     244 10.9   78     8  19
## 112    44     190 10.3   78     8  20
## 113    21     259 15.5   77     8  21
## 114     9      36 14.3   72     8  22
## 115           255 12.6   75     8  23
## 116    45     212  9.7   79     8  24
## 117   168     238  3.4   81     8  25
## 118    73     215  8.0   86      8  26
## 119           153  5.7   88      8  27
## 120    76     203  9.7   97      8  28
## 121   118     225  2.3   94      8  29
## 122    84     237  6.3   96      8  30
## 123    85     188  6.3   94      8  31
## 124    96     167  6.9   91      9   1
## 125    78     197  5.1   92      9   2
## 126    73     183  2.8   93      9   3
## 127    91     189  4.6   93      9   4
## 128    47      95  7.4   87      9   5
## 129    32      92 15.5   84      9   6
## 130    20     252 10.9   80      9   7
## 131    23     220 10.3   78      9   8
## 132    21     230 10.9   75      9   9
## 133    24     259  9.7   73      9  10
## 134    44     236 14.9   81      9  11
## 135    21     259 15.5   76      9  12
## 136    28     238  6.3   77      9  13
## 137     9      24 10.9   71      9  14
## 138    13     112 11.5   71      9  15
## 139    46     237  6.9   78      9  16
## 140    18     224 13.8   67      9  17
## 141    13      27 10.3   76      9  18
## 142    24     238 10.3   68      9  19
## 143    16     201  8.0   82      9  20
## 144    13     238 12.6   64      9  21
## 145    23      14  9.2   71      9  22
## 146    36     139 10.3   81      9  23
## 147     7      49 10.3   69      9  24
## 148    14      20 16.6   63      9  25
## 149    30     193  6.9   70      9  26
## 150           145 13.2   77      9  27
## 151    14     191 14.3   75      9  28
## 152    18     131  8.0   76      9  29
## 153    20     223 11.5   68      9  30
```

```
thing <- read.csv("./data/hw1_data.csv") ##for removing na without removing the complete row.
thing[is.na(thing)] <- ""
```

Control Structures and Conditional Statements

```
x <- c("a", "b", "c", "d")  ##This is an example of a control structure demonstrating "for". Used to cr
for(i in 1:4) {
      print(x[i])
}
```

```
## [1] "a"
## [1] "b"
## [1] "c"
## [1] "d"
```

```
count <- 0
while(count < 10) {   ##This is an example of a control structure, loop called while. It's infinite so 
      print(count)
      count <- count+1
}
```

```
## [1] 0
## [1] 1
## [1] 2
## [1] 3
## [1] 4
## [1] 5
## [1] 6
## [1] 7
## [1] 8
## [1] 9
```

```
z <- 5
while(z >= 1 && z <= 10) { ## an example of more than one condition in a single test.
      print(z)
        coin <- rbinom(1,1,0.5)  #This expression assigns a random binomial to "coin" where when it's 1
      if(coin ==1) {
          z <- z+1
      } else {
          z <- z-1
      }
}
```

```
## [1] 5
## [1] 6
## [1] 5
## [1] 4
## [1] 3
## [1] 4
## [1] 5
## [1] 4
## [1] 5
## [1] 4
## [1] 5
## [1] 6
## [1] 5
## [1] 4
## [1] 5
## [1] 4
## [1] 3
## [1] 2
## [1] 3
## [1] 2
## [1] 1
## [1] 2
## [1] 3
## [1] 2
## [1] 1
## [1] 2
## [1] 3
## [1] 2
## [1] 1
```

###Introduction to functions

```
add2 <- function(x, y) {  ## Basic function that adds 2 values. Function directive has two values, so n
      x + y
}
add2(2, 3) ##uses the function above to perform the function
```

```
## [1] 5
```

```
above10 <- function(x) {
    numbers <- x > 10   ## logical statement that figures out which elements are larger than 10. 10 is
    x[numbers]  ## sub -setting the vector x with a logical vector that are larger than 10, otherwise e
}

mydata <- rnorm(100)
sd(x = mydata, na.rm = FALSE) ##the standard deviation of 100 random normal variables where NA values a
```

```
## [1] 1.060327
```

```
      #search()  ## this opens up the list of environments in order
```

Finding column mean from a data.table function

```
data <- read.csv("./data/hw1_data.csv")
columnmean <- function(x, removeNA = TRUE) {  ##assigning the function to columnmean where x is your in
      nc <- ncol(x) ## assigning the number and order of columns to arbitrary string nc (ncol is a func
      means <- numeric(nc)  ##assigning numeric values of our nc vector to match the number of columns.
      for(i in 1:nc) {   ##using a for loop to move through the columns. integer vector starting at 1 a
          means[i] <- mean(x[, i], na.rm = removeNA) ##for loop to each mean of i which is a function o
      }
      means
}
columnmean(data)
```

```
## [1]  42.129310 185.931507   9.957516  77.882353   6.993464  15.803922
```

Finding column median from a data.table function

```
data <- read.csv("./data/hw1_data.csv")
columnmedian <- function(x, removeNA = TRUE) {  ##assigning the function to columnmedian where x is you
    nc <- ncol(x) ## assigning the number and order of columns to arbitrary string nc (ncol is a functi
    medians <- numeric(nc)  ##assigning numeric values of our nc vector to match the number of columns.
    for(i in 1:nc) {   ##using a for loop to move through the columns. integer vector starting at 1 and
```

```
       medians[i] <- median(x[, i], na.rm = removeNA) ##for loop to each median of i which is a functio
    }
    medians
}
columnmedian(data)
```

```
## [1]  31.5 205.0   9.7  79.0   7.0  16.0
```

###Importing and collating multiple .csv files from one folder

```
library(data.table)
```

```
##
## Attaching package: 'data.table'

## The following objects are masked from 'package:dplyr':
##
##     between, first, last
```

```
combinedata <- function( id = 1:x) {  ##This is a function for combining multiple csv's for data analys
  fileslist <- list.files("./data/R Tutorials/R_4_DataScience/specdata", full.names = TRUE) ##Not actua
  masterdata <- data.frame()   ## means the output will be a new data frame
  x = sequence(length(fileslist))  ##This defines how many files are in a folder, where it's looking at
  for (i in id) {
    masterdata <- rbind(masterdata, na.omit(read.csv(fileslist[i]), header = TRUE))  ##This is omitting
    print(masterdata)
  }  ## You can choose to import all files in a folder (specdata in this case) by entering x as the sec
}
```

Dates, calculating dates, &/or

```
x <- as.Date("2022-08-30")
x
```

```
## [1] "2022-08-30"
```

```
unclass(x)  ##Gives you the date in reference to the stored internal date of 1970-01-01
```

```
## [1] 19234
```

```
x <- Sys.time()  ## descsribes the current time on the system you are working in.
x
```

```
## [1] "2022-11-07 14:18:01 PST"
```

```
datestring <-  c("January 10, 2012 10:40", "December 9, 2011 9:10")  ## Dates written in character stri
x <- strptime(datestring, "%B %d, %Y %H:%M")  ## strptime function works here- passed a format string.
x
```

```
## [1] "2012-01-10 10:40:00 PST" "2011-12-09 09:10:00 PST"
```

```
x <- as.Date("2022-08-30")  ##defining the data and assigning it to x
y <- strptime("9 Jan 2021 11:34:21", "%d $B $Y %H:%M:%S")  ## assigning a POSIXlt formatted date and ti
x <- as.POSIXlt(x) ##changing date into POSIXlt format for calculations.
x-y
```

```
## Time difference of NA secs
```

```
x <- as.Date("2012-03-01")
y <- as.Date("2012-02-28")
x-y   ## a calculation for the time difference between two days. Making sure to change strings to date
```

```
## Time difference of 2 days
```

```
x <- as.POSIXct("2012-10-25 01:00:00")
y <- as.POSIXct("2012-10-25 09:00:00", tz = "GMT")  ## Calculating the difference in hours (integer) ba
y-x
```

```
## Time difference of 1 hours
```

```
FALSE & c(TRUE, TRUE, TRUE) ## The & (and) operator recycles FALSE across each concatenated element wit
```

```
## [1] FALSE FALSE FALSE
```

```
TRUE | c(TRUE, FALSE, FALSE) ## The | (or) operator looks at the expression, and if either are true, the
```

```
## [1] TRUE TRUE TRUE
```

```
## The & operator is evaluated before the |


##____________________

d1 <- date()  ##assigns today's data to d1

d2 <- Sys.Date()
class(d2)  ##sys.date is now a date variable, which can be easier to use.
```

```
## [1] "Date"
```

```
format(d2, "%a %b %d")
```

```
## [1] "Mon Nov 07"
```

```
# %d = day as number (0-31), %a = abbreviated weekday, %A = unabbreviated weekday, %m = month (00-12), 

library(lubridate); ymd("20140108") ##will always look for year, month and date when lubridate package 
```

```
##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:data.table':
##
##     hour, isoweek, mday, minute, month, quarter, second, wday, week,
##     yday, year

## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union

## [1] "2014-01-08"
```

```
mdy("08/04/2022")
```

```
## [1] "2022-08-04"
```

```
ymd_hms("2022-09-28 16:34:22")
```

```
## [1] "2022-09-28 16:34:22 UTC"
```

apply, sapply, lapply and splits

```
x <- list (a = 1:10, b = rnorm(10,2))  ## an example of lapply, where the two arguments, x and the func
lapply (x, mean) ## applies to x, the mean to everything listed above in a, as well as b.
```

```
## $a
## [1] 5.5
##
## $b
## [1] 2.384864
```

```
x <- matrix(rnorm(200), 20, 10) ## 200 random normally distributed variables between around 0, 20 rows,
apply (x, 2, mean) ##This preserves the 10 columns, and takes the average for each column.
```

```
##  [1]  0.16925837  0.09567373 -0.12469095 -0.15097618  0.01657262 -0.18285697
##  [7] -0.07856214  0.14955416 -0.08234193 -0.05985576
```

```
## rnorm(n observations, mean of normal distribution, standard deviation) - this expression has three a
apply (x, 1, mean) ##This preserves the 20 rows, and takes the average for each row
```

```
##  [1] -0.39925995 -0.12171829  0.05162170 -0.34168197  0.21644658  0.05287821
##  [7] -0.01816712 -0.28529166  0.20312748 -0.28980203 -0.01316857 -0.16896944
## [13]  0.30981319 -0.22091525  0.05987151 -0.24568603  0.66993045 -0.09723613
## [19]  0.32566305 -0.18390583
```

```
    library(datasets) ##loads a generic dataset avaialbel in r as a library. We will use this for a dat
    head(airquality)  ##shows the airquality dataset from the above library.
```

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

```
    s <- split(airquality, airquality$Month)  ##splitting the dataset airquality by the month - a good
    lapply(s, function(x) colMeans(x[, c("Ozone", "Solar.R", "Wind")])) ##This applies an anonymous fun
```

```
## $`5`
##    Ozone  Solar.R     Wind
##       NA       NA 11.62258
##
## $`6`
##     Ozone   Solar.R      Wind
##        NA 190.16667  10.26667
##
## $`7`
##      Ozone    Solar.R       Wind
##         NA 216.483871   8.941935
##
## $`8`
##    Ozone  Solar.R     Wind
##       NA       NA 8.793548
##
## $`9`
##    Ozone  Solar.R     Wind
##       NA 167.4333  10.1800
```

```
    ## This is a way to take summary data, column means in this example, grouped/split by month.

    s <- split(airquality, airquality$Month)  ##splitting the dataset airquality by the month - a good
    sapply(s, function(x) colMeans(x[, c("Ozone", "Solar.R", "Wind")], na.rm = TRUE)) ##This turns the
```

```
##                 5         6          7          8         9
## Ozone    23.61538  29.44444  59.115385  59.961538  31.44828
## Solar.R 181.29630 190.16667 216.483871 171.857143 167.43333
## Wind     11.62258  10.26667   8.941935   8.793548  10.18000
```

```
library(datasets)
    data(iris)  ##loads the r library of datasets, one of which is iris. More info can be found by runn
s <- split(iris, iris$Species)  ##splitting the dataset iris by the species - a good way to get summary
sapply(s, function(x) colMeans(x[, c("Sepal.Length", "Sepal.Width")], na.rm = TRUE)) ##finds the means
```

```
##              setosa versicolor virginica
## Sepal.Length  5.006      5.936     6.588
## Sepal.Width   3.428      2.770     2.974
```

```
apply(iris[, 1:4], 2, mean)##calculates the mean of columns 1 through 4 of a data.frame
```

```
## Sepal.Length  Sepal.Width Petal.Length  Petal.Width
##     5.843333     3.057333     3.758000     1.199333
```

```
data(mtcars)
head(mtcars)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
s <- split(mtcars, mtcars$cyl)  ##splitting the dataset mtcars by the # of cylinders - a good way to get
sapply(s, function(x) colMeans(x[, c("mpg", "disp")], na.rm = TRUE)) ##Long way of calculating for avera
```

```
##              4         6     8
## mpg   26.66364  19.74286  15.1
## disp 105.13636 183.31429 353.1
```

```
##This is the short way of performing the same calculation
with(mtcars, tapply(mpg, cyl, mean))  ## for tapply, tapply( list, index = factor or filterable variabl
```

```
##        4        6        8
## 26.66364 19.74286 15.10000
```

```
## The with() looks for with( data, expr) where the data is a data.frame environment, and expr is the ex
tapply(mtcars$mpg, mtcars$cyl, mean)  ##another way of writing the above expression.
```

```
##        4        6        8
## 26.66364 19.74286 15.10000
```

«- Operator (values to objects) and matrix/vector caching

```
##Matrix example
makeCacheMatrix <- function( x = matrix()) {
      inv <- NULL  ##Assigns inv initially as empty
      set <- function (y) {
            x <<- y  ## the double assignment operator can be thought of as, x is assigned once (parent
            inv <<- NULL
      }
      get <- function() x  ##This function defaults to an un-described function, and refers to x, where
      setinverse <- function(inverse) inv <<- inverse
      ##This sets the elements of the inverse matrix, where the function is an inverse, and that inverse
      getinverse <- function() inv ##This function defaults to an un-described function, and refers to i
```

```
   list(set = set, get = get,
       setinverse = setinverse,
       getinverse = getinverse)
} ##The makeCacheMatrix has three nested functions that can be used- get, setinverse, and getinverse.



cacheinverse <- function (x, ...) {  ## This function pulls from the cache of matrices, looks for x, and
   inv <- x$getinverse()
   if(!is.null(inv)) {
     message("getting cached data")
     return(inv)
   }
   invertedMatrix <- x$get()
   inv <- solve(invertedMatrix, ...)
   x$setinverse(inv)
   inv
}

##To test that we are storing/caching a matrix, we can run the following:
MatrixExample <- makeCacheMatrix(matrix(1:4, 2, 2))
MatrixExample$get()  ##This is used to pull/print the matrix for review
```

```
##      [,1] [,2]
## [1,]    1    3
## [2,]    2    4
```

```
cacheinverse(MatrixExample)  ##This tests the inverse of the matrix we just cached
```

```
##      [,1] [,2]
## [1,]   -2  1.5
## [2,]    1 -0.5
```

```
## running it again should show us the messaage "getting cached data"
cacheinverse(MatrixExample)
```

```
## getting cached data
```

```
##      [,1] [,2]
## [1,]   -2  1.5
## [2,]    1 -0.5
```

```
##Mean example
makeVector <- function(x = numeric()) {
   m <- NULL
   set <- function(y) {
     x <<- y
     m <<- NULL
   }
   get <- function() x
   setmean <- function(mean) m <<- mean
```

```
      getmean <- function() m
      list(set = set, get = get, setmean = setmean, getmean = getmean)
}

cachemean <- function(x, ...) {
    m <- x$getmean()
    if(!is.null(m)) {
        message("getting cached data")
        return(m)
    }
    data <- x$get()
    m <- mean(data, ...)
    x$setmean(m)
    m
}

testmean <- makeVector(c(1,2,3,4,5)) #a vector of numeric values
cachemean(testmean) ##takes the mean, and stores it in the cache.
```

```
## [1] 3
```

```
cachemean(testmean) ##should return the mean, plus the message.
```

```
## getting cached data
```

```
## [1] 3
```

Simulation, str and more…

###Simulating random numbers, and str()

```
## using str to look at the arguments of functions.
x <- rnorm(100, 2, 4)
summary(x) ## str is like summary, but not.
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
## -10.0934  -0.2253   2.6663   2.3295   4.8291  10.9685
```

```
str(x) #This will return a one line output, where x is a numeric vector, it contains 100 elements, and
```

```
##  num [1:100] 1.317 -0.856 -1.34 6.667 2.271 ...
```

```
str(rnorm)  #Will give you an output which shows the arguments for the rnorm function.
```

```
## function (n, mean = 0, sd = 1)
```

```
##Different example looking at some standard dataframes
library(datasets)
head(airquality) ##One of the standard datasets
```

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

```
str(airquality)  #gives you an output that shows 153 objects, and 6 variables
```

```
## 'data.frame':    153 obs. of  6 variables:
##  $ Ozone  : int  41 36 12 18 NA 28 23 19 8 NA ...
##  $ Solar.R: int  190 118 149 313 NA NA 299 99 19 194 ...
##  $ Wind   : num  7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
##  $ Temp   : int  67 72 74 62 56 66 65 59 61 69 ...
##  $ Month  : int  5 5 5 5 5 5 5 5 5 5 ...
##  $ Day    : int  1 2 3 4 5 6 7 8 9 10 ...
```

```
##str can also be used on subsets of a dataframe to gather information on characteristics of the datafr
s <- split(airquality, airquality$Month)
str(s) ##Cals str on the subset (the split) of the airquality dataset, focus on month.
```

```
## List of 5
##  $ 5:'data.frame':   31 obs. of  6 variables:
##   ..$ Ozone  : int [1:31] 41 36 12 18 NA 28 23 19 8 NA ...
##   ..$ Solar.R: int [1:31] 190 118 149 313 NA NA 299 99 19 194 ...
##   ..$ Wind   : num [1:31] 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
##   ..$ Temp   : int [1:31] 67 72 74 62 56 66 65 59 61 69 ...
##   ..$ Month  : int [1:31] 5 5 5 5 5 5 5 5 5 5 ...
##   ..$ Day    : int [1:31] 1 2 3 4 5 6 7 8 9 10 ...
##  $ 6:'data.frame':   30 obs. of  6 variables:
##   ..$ Ozone  : int [1:30] NA NA NA NA NA NA 29 NA 71 39 ...
##   ..$ Solar.R: int [1:30] 286 287 242 186 220 264 127 273 291 323 ...
##   ..$ Wind   : num [1:30] 8.6 9.7 16.1 9.2 8.6 14.3 9.7 6.9 13.8 11.5 ...
##   ..$ Temp   : int [1:30] 78 74 67 84 85 79 82 87 90 87 ...
##   ..$ Month  : int [1:30] 6 6 6 6 6 6 6 6 6 6 ...
##   ..$ Day    : int [1:30] 1 2 3 4 5 6 7 8 9 10 ...
##  $ 7:'data.frame':   31 obs. of  6 variables:
##   ..$ Ozone  : int [1:31] 135 49 32 NA 64 40 77 97 97 85 ...
##   ..$ Solar.R: int [1:31] 269 248 236 101 175 314 276 267 272 175 ...
##   ..$ Wind   : num [1:31] 4.1 9.2 9.2 10.9 4.6 10.9 5.1 6.3 5.7 7.4 ...
##   ..$ Temp   : int [1:31] 84 85 81 84 83 83 88 92 92 89 ...
##   ..$ Month  : int [1:31] 7 7 7 7 7 7 7 7 7 7 ...
##   ..$ Day    : int [1:31] 1 2 3 4 5 6 7 8 9 10 ...
##  $ 8:'data.frame':   31 obs. of  6 variables:
##   ..$ Ozone  : int [1:31] 39 9 16 78 35 66 122 89 110 NA ...
##   ..$ Solar.R: int [1:31] 83 24 77 NA NA NA 255 229 207 222 ...
##   ..$ Wind   : num [1:31] 6.9 13.8 7.4 6.9 7.4 4.6 4 10.3 8 8.6 ...
##   ..$ Temp   : int [1:31] 81 81 82 86 85 87 89 90 90 92 ...
##   ..$ Month  : int [1:31] 8 8 8 8 8 8 8 8 8 8 ...
##   ..$ Day    : int [1:31] 1 2 3 4 5 6 7 8 9 10 ...
##  $ 9:'data.frame':   30 obs. of  6 variables:
##   ..$ Ozone  : int [1:30] 96 78 73 91 47 32 20 23 21 24 ...
##   ..$ Solar.R: int [1:30] 167 197 183 189 95 92 252 220 230 259 ...
##   ..$ Wind   : num [1:30] 6.9 5.1 2.8 4.6 7.4 15.5 10.9 10.3 10.9 9.7 ...
##   ..$ Temp   : int [1:30] 91 92 93 93 87 84 80 78 75 73 ...
##   ..$ Month  : int [1:30] 9 9 9 9 9 9 9 9 9 9 ...
##   ..$ Day    : int [1:30] 1 2 3 4 5 6 7 8 9 10 ...
```

```
##Examples of returns for qnorm, pnorm...
x <- rnorm(10, 20, 2)
x
```

```
##  [1] 19.04478 19.37751 20.56920 22.38037 21.56876 17.82217 21.08486 21.13511
##  [9] 22.23938 19.46904
```

```
## when generating random numbers, important to set.seed
set.seed(1) ##The seed can be any integer
rnorm(5)
```

```
## [1] -0.6264538  0.1836433 -0.8356286  1.5952808  0.3295078
```

```
rnorm(5)
```

```
## [1] -0.8204684  0.4874291  0.7383247  0.5757814 -0.3053884
```

```
set.seed(1) ##This allows you to reproduce random numbers you generated above.
rnorm(5)
```

```
## [1] -0.6264538  0.1836433 -0.8356286  1.5952808  0.3295078
```

```
##Generating poisson distribution data as opposed to normal
rpois(10,1) ##here, you have n numbers returned, and the second argument is lambda (can be thought of a
```

```
##  [1] 0 0 1 1 2 1 1 4 1 2
```

```
rpois(10,2)
```

```
##  [1] 4 1 2 0 1 1 0 1 4 1
```

```
rpois(10,20)
```

```
##  [1] 19 19 24 23 22 24 23 20 11 22
```

```
ppois(2, 2) ## this looks at the cumulative distribution.
```

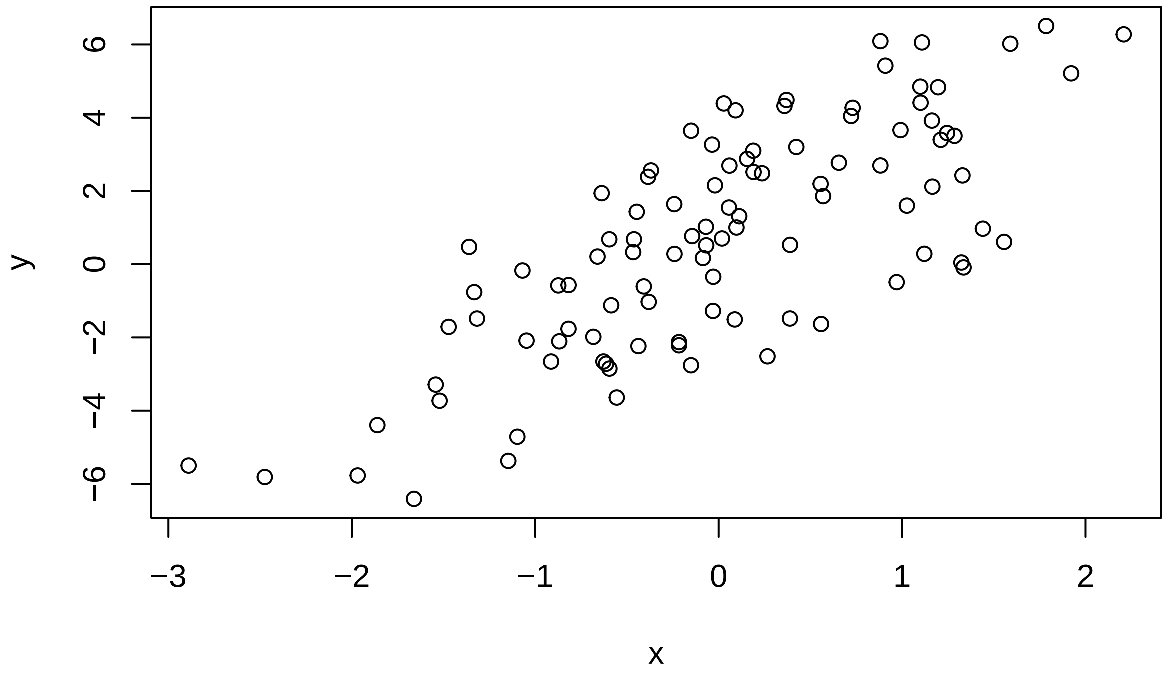
```
## [1] 0.6766764
```

###Simulating linear models

```
set.seed(20)
x <- rnorm(100) ##defining the inputs or the independant variable x
e <-rnorm(100, 0, 2)
y <- 0.5 + 2*x + e ##This is the linear equation with the intercept set at 0.5, and the slope is 2
summary (y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -6.4084 -1.5402  0.6789  0.6893  2.9303  6.5052
```

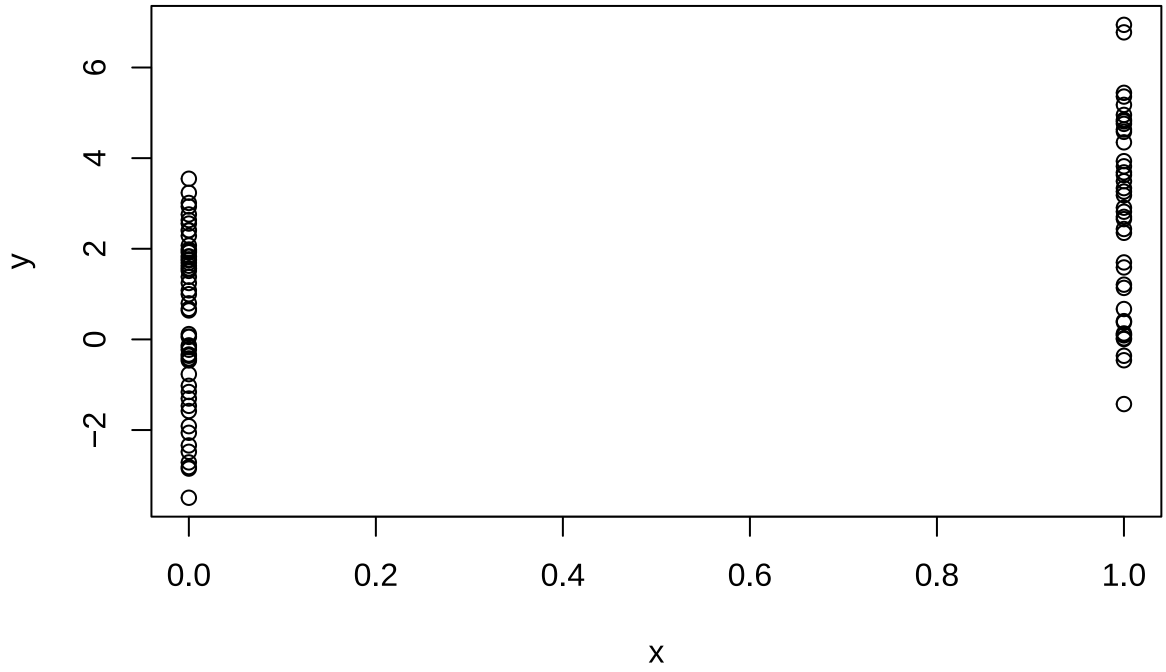
```
plot(x, y) ##plots the relationship between x and y, which is quite linear
```



```
## Binomial example- such as gender, or preferences
set.seed(10) ##This example below is a linear model looking at something like gender, which is binomial
x <- rbinom(100, 1, 0.5)  ##creates a vector of 100 binomial outputs, where the "size" is limited to 0
e <- rnorm(100,0,2)
y <- 0.5 + 2*x + e  ## same linear model where the intercept is set to 0.5, and the slope is 2
summary(y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.4936 -0.1409  1.5767  1.4322  2.8397  6.9410
```

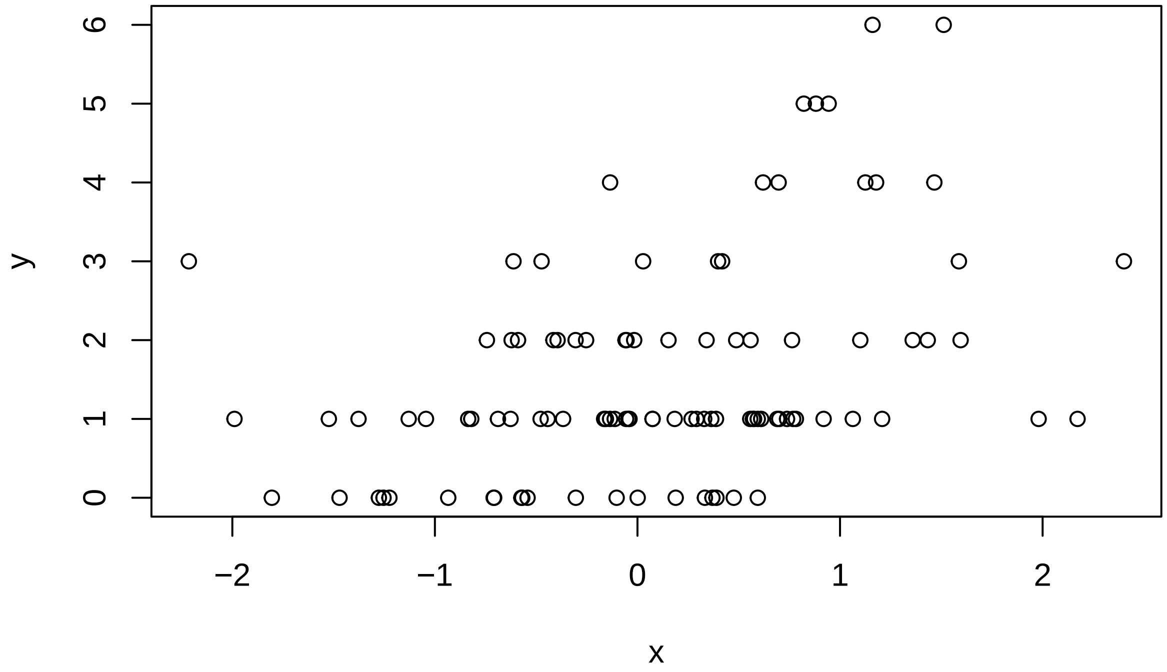
```
plot(x, y)
```



```r
##Example where the data has a poisson distribution, and not a "normal" one.
set.seed(1)
x <- rnorm(100)
log.mu <- 0.5 + 0.3*x  ##This is the linear model for the log of mu, where mu is the mean
y <- rpois(100, exp(log.mu))  ##here, the exp is taking e^x on in this instance, e^(log.mu) and e is Eu
summary(y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    1.00    1.00    1.55    2.00    6.00
```

```r
plot(x,y)
```



###Random Sampling

```
set.seed(2)
sample(1:10, 4)
```

```
## [1] 5 6 9 1
```

```
sample(letters, 5)
```

```
## [1] "q" "l" "i" "r" "k"
```

```
sample(1:10) ##a permutation
```

```
##  [1]  1  3  6  2  9 10  7  5  4  8
```

```
sample(1:10, replace = TRUE) ##This allows for random sampling of numbers, and it can now repeat some.
```

```
##  [1] 6 9 8 6 3 9 7 8 6 2
```

Taking a First Look at DATA and Cleaning it

```
ls(iris) ##Shows you all of the variables in your "workspace", which is everything that was assigned. c
```

```
## [1] "Petal.Length" "Petal.Width"  "Sepal.Length" "Sepal.Width"  "Species"
```

```
class(iris) ## tells you whether you have a vector, data.frame, matrix, etc...
```

```
## [1] "data.frame"
```

```
dim(iris)  ## shows you how many 1) rows, and 2) columns you have in your data.frame. The dimensions.
```

```
## [1] 150   5
```

```
nrow(iris)  ##Shows the number of rows in a data.frame
```

```
## [1] 150
```

```
ncol(iris) ##shows the number of columns in a data.frame
```

```
## [1] 5
```

```
object.size(iris) ##shows you the number of bytes being used by this data.frame
```

```
## 7256 bytes
```

```
names(iris)  ##gives you a return of the column names of the data.frame
```

```
## [1] "Sepal.Length" "Sepal.Width"  "Petal.Length" "Petal.Width"  "Species"
```

```
head(iris, 10)  ##shows the first few rows of a data.frame so that not all observations are returned. T
```

```
##    Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1           5.1         3.5          1.4         0.2  setosa
## 2           4.9         3.0          1.4         0.2  setosa
## 3           4.7         3.2          1.3         0.2  setosa
## 4           4.6         3.1          1.5         0.2  setosa
## 5           5.0         3.6          1.4         0.2  setosa
## 6           5.4         3.9          1.7         0.4  setosa
## 7           4.6         3.4          1.4         0.3  setosa
## 8           5.0         3.4          1.5         0.2  setosa
## 9           4.4         2.9          1.4         0.2  setosa
## 10          4.9         3.1          1.5         0.1  setosa
```

```
tail(iris)  ##can be used in the same way as head, except it looks at the bottom of the data.frame,
##     Sepal.Length Sepal.Width Petal.Length Petal.Width   Species
## 145          6.7         3.3          5.7         2.5 virginica
## 146          6.7         3.0          5.2         2.3 virginica
## 147          6.3         2.5          5.0         1.9 virginica
## 148          6.5         3.0          5.2         2.0 virginica
## 149          6.2         3.4          5.4         2.3 virginica
## 150          5.9         3.0          5.1         1.8 virginica
```

```
summary(iris) ##gives you a brief overview of each column's data.
```

```
##   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width   
##  Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100  
##  1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300  
##  Median :5.800   Median :3.000   Median :4.350   Median :1.300  
##  Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199  
##  3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800  
##  Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500  
##        Species  
##  setosa    :50  
##  versicolor:50  
##  virginica :50  
##                 
##                 
##                 
```

```
table(iris$Species)  ##In this expression, you can get summary data from a column containing categorica
```

```
## 
##     setosa versicolor  virginica 
##         50         50         50 
```

```
##_________________________________________________
##Using the Iris dataset

head(iris, n = 3)  #heads and returns the first three rows.
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1          5.1         3.5          1.4         0.2  setosa
## 2          4.9         3.0          1.4         0.2  setosa
## 3          4.7         3.2          1.3         0.2  setosa
```

```
summary(iris)  ##one form of summary
```

```
##   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width   
##  Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100  
##  1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300  
##  Median :5.800   Median :3.000   Median :4.350   Median :1.300  
##  Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199  
##  3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800  
##  Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500  
##        Species  
##  setosa    :50
##  versicolor:50
##  virginica :50
##
##
##
```

```
str(iris)  ##Another form of summary, describes the object class for each column.
```

```
## 'data.frame':    150 obs. of  5 variables:
##  $ Sepal.Length: num  5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...
##  $ Sepal.Width : num  3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...
##  $ Petal.Length: num  1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...
##  $ Petal.Width : num  0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...
##  $ Species     : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 1 ...
```

```
quantile(iris$Sepal.Length, na.rm= TRUE)  ## a way of breaking up data per column into quantiles.
```

```
##   0%  25%  50%  75% 100%
##  4.3  5.1  5.8  6.4  7.9
```

```
quantile(iris$Sepal.Length, probs = c(0.5, 0.8, 0.9))  ##quantile data with defined percentages
```

```
##  50%  80%  90%
## 5.80 6.52 6.90
```

```
##_________________________________________________

table(iris$Petal.Length, useNA="ifany")  ##summarizes number of observations per variable for column of
```

```
##
##   1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.9   3 3.3 3.5 3.6 3.7 3.8 3.9   4 4.1 4.2 4.3
##   1   1   2   7  13  13   7   4   2   1   2   2   1   1   1   3   5   3   4   2
## 4.4 4.5 4.6 4.7 4.8 4.9   5 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9   6 6.1 6.3 6.4
##   4   8   3   5   4   5   4   8   2   2   2   3   6   3   3   2   2   3   1   1
## 6.6 6.7 6.9
##   1   2   1
```

```
table(iris$Petal.Length, iris$Petal.Width)  ##returns a two dimension matrix with the number of observa
```

```
##
##      0.1 0.2 0.3 0.4 0.5 0.6 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2
##   1    0   1   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.1  1   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.2  0   2   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.3  0   4   2   1   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.4  2   8   3   0   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.5  2   7   1   3   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.6  0   5   0   1   0   1 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.7  0   1   1   1   1   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   1.9   0   1   0   1   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##   3     0   0   0   0   0   0 0   1   0   0   0   0   0   0   0   0 0   0   0
##   3.3   0   0   0   0   0   0 2   0   0   0   0   0   0   0   0   0 0   0   0
##   3.5   0   0   0   0   0   0 2   0   0   0   0   0   0   0   0   0 0   0   0
##   3.6   0   0   0   0   0   0 0   0   0   1   0   0   0   0   0   0 0   0   0
##   3.7   0   0   0   0   0   0 1   0   0   0   0   0   0   0   0   0 0   0   0
##   3.8   0   0   0   0   0   0 0   1   0   0   0   0   0   0   0   0 0   0   0
##   3.9   0   0   0   0   0   0 0   1   1   0   1   0   0   0   0   0 0   0   0
##   4     0   0   0   0   0   0 1   0   1   3   0   0   0   0   0   0 0   0   0
##   4.1   0   0   0   0   0   0 1   0   0   2   0   0   0   0   0   0 0   0   0
##   4.2   0   0   0   0   0   0 0   0   1   2   0   1   0   0   0   0 0   0   0
##   4.3   0   0   0   0   0   0 0   0   0   2   0   0   0   0   0   0 0   0   0
##   4.4   0   0   0   0   0   0 0   0   1   1   2   0   0   0   0   0 0   0   0
##   4.5   0   0   0   0   0   0 0   0   0   1   0   5   1   1   0   0 0   0   0
##   4.6   0   0   0   0   0   0 0   0   0   1   1   1   0   0   0   0 0   0   0
##   4.7   0   0   0   0   0   0 0   0   1   0   2   1   1   0   0   0 0   0   0
##   4.8   0   0   0   0   0   0 0   0   0   0   1   0   0   0   3   0 0   0   0
##   4.9   0   0   0   0   0   0 0   0   0   0   0   2   0   0   2   0 1   0   0
##   5     0   0   0   0   0   0 0   0   0   0   0   1   0   1   0   1 1   0   0
##   5.1   0   0   0   0   0   0 0   0   0   0   0   1   1   0   1   2 1   0   0
##   5.2   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 1   0   0
##   5.3   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   1 0   0   0
##   5.4   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   1   0
##   5.5   0   0   0   0   0   0 0   0   0   0   0   0   0   0   2   0 0   1   0
##   5.6   0   0   0   0   0   0 0   0   0   0   1   0   0   0   1   0 0   1   1
##   5.7   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   1   0
##   5.8   0   0   0   0   0   0 0   0   0   0   0   0   1   0   1   0 0   0   1
##   5.9   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   1   0
##   6     0   0   0   0   0   0 0   0   0   0   0   0   0   0   1   0 0   0   0
##   6.1   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   1 0   0   0
##   6.3   0   0   0   0   0   0 0   0   0   0   0   0   0   0   1   0 0   0   0
##   6.4   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 1   0   0
##   6.6   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   1   0
##   6.7   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 1   0   1
##   6.9   0   0   0   0   0   0 0   0   0   0   0   0   0   0   0   0 0   0   0
##
##       2.3 2.4 2.5
##   1     0   0   0
##   1.1   0   0   0
##   1.2   0   0   0
##   1.3   0   0   0
##   1.4   0   0   0
##   1.5   0   0   0
##   1.6   0   0   0
##   1.7   0   0   0
##   1.9   0   0   0
##   3     0   0   0
##   3.3   0   0   0
##   3.5   0   0   0
##   3.6   0   0   0
##   3.7   0   0   0
##   3.8   0   0   0
##   3.9   0   0   0
##   4     0   0   0
##   4.1   0   0   0
##   4.2   0   0   0
##   4.3   0   0   0
##   4.4   0   0   0
##   4.5   0   0   0
##   4.6   0   0   0
##   4.7   0   0   0
##   4.8   0   0   0
##   4.9   0   0   0
##   5     0   0   0
##   5.1   1   1   0
##   5.2   1   0   0
##   5.3   1   0   0
##   5.4   1   0   0
##   5.5   0   0   0
##   5.6   0   2   0
##   5.7   1   0   1
##   5.8   0   0   0
##   5.9   1   0   0
##   6     0   0   1
##   6.1   1   0   1
##   6.3   0   0   0
##   6.4   0   0   0
##   6.6   0   0   0
##   6.7   0   0   0
##   6.9   1   0   0
```

```
##_________________________________________________
      sum(is.na(iris$Sepal.Length))  ##This checks for whether or not there are any NA in the selected
```

```
## [1] 0
```

```
      all(iris$Sepal.Length > 0)  #This checks for whether there may be bad data, i.e. a length less th
```

```
## [1] TRUE
```

```
##_________________________________________________

table(iris$Sepal.Length %in% c("4.5", "4.6"))  ##sets a limit on a column variable and looks at the "pe
```

```
##
## FALSE  TRUE
##   145     5
```

```
##Row sub-setting by desired values - two column example, but can limit to one.
suby <- iris[iris$Sepal.Length %in% c("4.5", "4.6", "4.7") & iris$Petal.Length %in% c("1.4"),]
suby
```

```
##    Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 7           4.6         3.4          1.4         0.3  setosa
## 48          4.6         3.2          1.4         0.2  setosa
```

```
##_________________________________________________

## XTabs
data(UCBAdmissions)
berkely = as.data.frame(UCBAdmissions)
summary(berkely)
```

```
##       Admit       Gender   Dept       Freq
##  Admitted:12   Male  :12   A:4   Min.   :  8.0
##  Rejected:12   Female:12   B:4   1st Qu.: 80.0
##                            C:4   Median :170.0
##                            D:4   Mean   :188.6
##                            E:4   3rd Qu.:302.5
##                            F:4   Max.   :512.0
```

```
    xt <- xtabs(Freq ~ Gender + Admit, data= berkely) ##This table will return the frequencies, which i
    xt
```

```
##         Admit
## Gender   Admitted Rejected
##   Male       1198     1493
##   Female      557     1278
```

```
 ##_________________________________________________
        xt2 <- xtabs(Freq ~ ., data= berkely)  ## here, the frequency is presented for "." all of the o
        xt2
```

```
## , , Dept = A
##
##            Gender
## Admit      Male Female
##   Admitted  512     89
##   Rejected  313     19
##
## , , Dept = B
##
##            Gender
## Admit      Male Female
##   Admitted  353     17
##   Rejected  207      8
##
## , , Dept = C
##
##            Gender
## Admit      Male Female
##   Admitted  120    202
##   Rejected  205    391
##
## , , Dept = D
##
##            Gender
## Admit      Male Female
##   Admitted  138    131
##   Rejected  279    244
##
## , , Dept = E
##
##           Gender
## Admit      Male Female
##   Admitted   53     94
##   Rejected  138    299
##
## , , Dept = F
##
##           Gender
## Admit      Male Female
##   Admitted   22     24
##   Rejected  351    317
```

```
        ftable(xt2)  ##This flattens out the list of tables from the expression xt2, which would otherw
```

```
##                 Dept   A   B   C   D   E   F
## Admit    Gender
## Admitted Male        512 353 120 138  53  22
##          Female       89  17 202 131  94  24
## Rejected Male        313 207 205 279 138 351
##          Female       19   8 391 244 299 317
```

```
##_________________________________________________
##Sequencing data
s1 <- seq(1,10, by=2) ; s1  ##defined sequence where you have the min (1) and the max (10), and then th
```

```
## [1] 1 3 5 7 9
```

```
s2 <- seq(1,10, length=3); s2  ##defined sequence where the length of the sequence returns is three, i.
```

```
## [1]  1.0  5.5 10.0
```

```
x<- c(1, 3, 8, 25, 100); seq(along = x)
```

```
## [1] 1 2 3 4 5
```

```
##_________________________________________________
##Common Data transformations
abs(x) #absolute value
```

```
## [1]   1   3   8  25 100
```

```
sqrt(x) #square root
```

```
## [1]  1.000000  1.732051  2.828427  5.000000 10.000000
```

```
ceiling(x) #The ceiling of 3.457 is 4
```

```
## [1]   1   3   8  25 100
```

```
floor(x) #The floor of 3.457 is 3
```

```
## [1]   1   3   8  25 100
```

```
round(x, digits = n)  #round up the value x, with n= number of decimal points.
```

```
## [1]   1   3   8  25 100
```

```
signif(x, digits = n) #Rounds up, and shortens the quantity to n number of numbers AND decmials.
```

```
## [1]   1   3   8  25 100
```

```
cos(x); sin(x);  tan(x)
```

```
## [1]  0.5403023 -0.9899925 -0.1455000  0.9912028  0.8623189
```

```
## [1]  0.8414710  0.1411200  0.9893582 -0.1323518 -0.5063656
```

```
## [1]  1.5574077 -0.1425465 -6.7997115 -0.1335264 -0.5872139
```

```
log(x) #natural log transformation
```

```
## [1] 0.000000 1.098612 2.079442 3.218876 4.605170
```

```
log2(x); log10(x) ##examples of other common logs.
```

```
## [1] 0.000000 1.584963 3.000000 4.643856 6.643856
```

```
## [1] 0.0000000 0.4771213 0.9030900 1.3979400 2.0000000
```

```
exp(x) #is e^x
```

```
## [1] 2.718282e+00 2.008554e+01 2.980958e+03 7.200490e+10 2.688117e+43
```

###Data ReShaping

```
#install.packages("reshape2") ##needed here for melt of a data.frame.
library(reshape2)
```

```
##
## Attaching package: 'reshape2'
```

```
## The following objects are masked from 'package:data.table':
##
##     dcast, melt
```

```
head(mtcars)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
mtcars$carname <- rownames(mtcars)  ##inserts a new row, which is the carname row, and that row takes i
head(mtcars)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
##                             carname
## Mazda RX4                 Mazda RX4
## Mazda RX4 Wag         Mazda RX4 Wag
## Datsun 710               Datsun 710
## Hornet 4 Drive       Hornet 4 Drive
## Hornet Sportabout Hornet Sportabout
## Valiant                     Valiant
```

```
carMelt <- melt(mtcars, id=c("carname", "gear", "cyl"), measure.vars = c("mpg", "hp"))  ##the daata.fra
head(carMelt, n=3)
```

```
##         carname gear cyl variable value
## 1     Mazda RX4    4   6      mpg  21.0
## 2 Mazda RX4 Wag    4   6      mpg  21.0
## 3    Datsun 710    4   4      mpg  22.8
```

```
tail(carMelt, n=5)
```

```
##           carname gear cyl variable value
## 60   Lotus Europa    5   4       hp   113
## 61 Ford Pantera L    5   8       hp   264
## 62   Ferrari Dino    5   6       hp   175
## 63  Maserati Bora    5   8       hp   335
## 64     Volvo 142E    4   4       hp   109
```

```
##________________________________
##dcasting and reshaping data, cont...

clyData <- dcast(carMelt, cyl ~ variable, mean)  ##uses dcast to reshape the data.frame where cyl or cy
clyData
```

```
##   cyl      mpg        hp
## 1   4 26.66364  82.63636
## 2   6 19.74286 122.28571
## 3   8 15.10000 209.21429
```

```
##________________________________
head(InsectSprays)
```

```
##   count spray
## 1    10     A
## 2     7     A
## 3    20     A
## 4    14     A
## 5    14     A
## 6    12     A
```

```
tapply(InsectSprays$count, InsectSprays$spray, sum) ## A way os summarizing, where count is the row, an
```

```
##   A   B   C   D   E   F
## 174 184  25  59  42 200
```

```
##Plyr package can perform similar functions ion terms of summing data from data.frame (See above).
library(plyr)
```

```
## ------------------------------------------------------------------------------

## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)

## ------------------------------------------------------------------------------

##
## Attaching package: 'plyr'

## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
ddply(InsectSprays, .(spray), summarize, sum=sum(count))
```

```
##   spray sum
## 1     A 174
## 2     B 184
## 3     C  25
## 4     D  59
## 5     E  42
## 6     F 200
```

###Manipulating data.frames using dplyr

```
str(mtcars)
```

```
## 'data.frame':    32 obs. of  12 variables:
##  $ mpg    : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
##  $ cyl    : num  6 6 4 6 8 6 8 4 4 6 ...
##  $ disp   : num  160 160 108 258 360 ...
##  $ hp     : num  110 110 93 110 175 105 245 62 95 123 ...
##  $ drat   : num  3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
##  $ wt     : num  2.62 2.88 2.32 3.21 3.44 ...
##  $ qsec   : num  16.5 17 18.6 19.4 17 ...
##  $ vs     : num  0 0 1 1 0 1 0 1 1 1 ...
##  $ am     : num  1 1 1 0 0 0 0 0 0 0 ...
##  $ gear   : num  4 4 4 3 3 3 3 4 4 4 ...
##  $ carb   : num  4 4 1 1 2 1 4 2 2 4 ...
##  $ carname: chr  "Mazda RX4" "Mazda RX4 Wag" "Datsun 710" "Hornet 4 Drive" ...
```

```
names(mtcars)  ##returns column names
```

```
##  [1] "mpg"     "cyl"     "disp"    "hp"      "drat"    "wt"      "qsec"
##  [8] "vs"      "am"      "gear"    "carb"    "carname"
```

```
head(select(mtcars, wt:carname)) ##example of SELECT function, which requires first the data.frame, and
```

```
##                      wt  qsec vs am gear carb           carname
## Mazda RX4         2.620 16.46  0  1    4    4         Mazda RX4
## Mazda RX4 Wag     2.875 17.02  0  1    4    4     Mazda RX4 Wag
## Datsun 710        2.320 18.61  1  1    4    1        Datsun 710
## Hornet 4 Drive    3.215 19.44  1  0    3    1    Hornet 4 Drive
## Hornet Sportabout 3.440 17.02  0  0    3    2 Hornet Sportabout
## Valiant           3.460 20.22  1  0    3    1           Valiant
```

```
weight <- filter(mtcars, wt > 3.0) ##example of the FILTER function, which requires the data.frame firs
head(weight, n=5)
```

```
##                    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
## Hornet 4 Drive    21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
## Duster 360        14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
## Merc 240D         24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
##                             carname
## Hornet 4 Drive       Hornet 4 Drive
## Hornet Sportabout Hornet Sportabout
## Valiant                     Valiant
## Duster 360               Duster 360
## Merc 240D                 Merc 240D
```

```
weight <- filter(mtcars, wt > 3.0 & cyl == 4) ##conditional returns of column data, using filter, can b
head(weight, n=10)
```

```
##            mpg cyl  disp hp drat   wt qsec vs am gear carb   carname
## Merc 240D 24.4   4 146.7 62 3.69 3.19 20.0  1  0    4    2 Merc 240D
## Merc 230  22.8   4 140.8 95 3.92 3.15 22.9  1  0    4    2  Merc 230
```

```
##reorders rows based on the values of the column- ARRANGE
mtcars <- arrange(mtcars, mpg) ##ARRANGE here the data.frame based on ascending order by miles per gall
head(mtcars, n=15)
```

```
##     mpg cyl  disp  hp drat    wt  qsec vs am gear carb             carname
## 1  10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4  Cadillac Fleetwood
## 2  10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4 Lincoln Continental
## 3  13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4          Camaro Z28
## 4  14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4          Duster 360
## 5  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4   Chrysler Imperial
## 6  15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8       Maserati Bora
## 7  15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3         Merc 450SLC
## 8  15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2         AMC Javelin
## 9  15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2    Dodge Challenger
## 10 15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4      Ford Pantera L
## 11 16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3          Merc 450SE
## 12 17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3          Merc 450SL
## 13 17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4           Merc 280C
## 14 18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1             Valiant
## 15 18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2   Hornet Sportabout
```

```
mtcars <- arrange(mtcars, desc(mpg))  ##the same function, but in descending order.

library(dplyr)
mtcars <- dplyr::rename(mtcars, horse = hp, weight = wt)
 ##RENAME function in dplyr, where the new column name is first, followed by "= existing column name"
head(mtcars)
```

```
##    mpg cyl  disp horse drat weight  qsec vs am gear carb        carname
## 1 33.9   4  71.1    65 4.22  1.835 19.90  1  1    4    1 Toyota Corolla
## 2 32.4   4  78.7    66 4.08  2.200 19.47  1  1    4    1       Fiat 128
## 3 30.4   4  75.7    52 4.93  1.615 18.52  1  1    4    2    Honda Civic
## 4 30.4   4  95.1   113 3.77  1.513 16.90  1  1    5    2   Lotus Europa
## 5 27.3   4  79.0    66 4.08  1.935 18.90  1  1    4    1      Fiat X1-9
## 6 26.0   4 120.3    91 4.43  2.140 16.70  0  1    5    2  Porsche 914-2
```

```
mtcars <- mutate(mtcars, mpgDev = mpg-mean(mpg, na.rm = TRUE))  ##this inserts a new column in your dat
head(select(mtcars, carname, mpg, mpgDev))
```

```
##          carname  mpg    mpgDev
## 1 Toyota Corolla 33.9 13.809375
## 2       Fiat 128 32.4 12.309375
## 3    Honda Civic 30.4 10.309375
## 4   Lotus Europa 30.4 10.309375
## 5      Fiat X1-9 27.3  7.209375
## 6  Porsche 914-2 26.0  5.909375
```

###Merging Data

```r
if(!file.exists("./data")) {dir.create("./data")}
fileURL1 = "https://d396qusza40orc.cloudfront.net/getdata%2Fdata%2FGDP.csv"
fileURL2 = "https://d396qusza40orc.cloudfront.net/getdata%2Fdata%2FEDSTATS_Country.csv"
download.file(fileURL1, destfile ="./data/gdp190.csv", method = "curl")
download.file(fileURL2, destfile ="./data/education.csv", method = "curl")
gdp <- read.csv("./data/gdp190.csv"); education <- read.csv("./data/education.csv")
head(gdp, n= 20)
```

```
##      X Gross.domestic.product.2012 X.1                X.2          X.3 X.4 X.5
## 1                                   NA                                      NA
## 2                                   NA                    (millions of      NA
## 3                          Ranking  NA            Economy  US dollars)      NA
## 4                                   NA                                      NA
## 5  USA                           1  NA      United States  16,244,600       NA
## 6  CHN                           2  NA              China   8,227,103       NA
## 7  JPN                           3  NA              Japan   5,959,718       NA
## 8  DEU                           4  NA            Germany   3,428,131       NA
## 9  FRA                           5  NA             France   2,612,878       NA
## 10 GBR                           6  NA     United Kingdom   2,471,784       NA
## 11 BRA                           7  NA             Brazil   2,252,664       NA
## 12 RUS                           8  NA Russian Federation   2,014,775       NA
## 13 ITA                           9  NA              Italy   2,014,670       NA
## 14 IND                          10  NA              India   1,841,710       NA
## 15 CAN                          11  NA             Canada   1,821,424       NA
## 16 AUS                          12  NA          Australia   1,532,408       NA
## 17 ESP                          13  NA              Spain   1,322,965       NA
## 18 MEX                          14  NA             Mexico   1,178,126       NA
## 19 KOR                          15  NA        Korea, Rep.   1,129,598       NA
## 20 IDN                          16  NA          Indonesia     878,043       NA
##     X.6 X.7 X.8
## 1    NA  NA  NA
## 2    NA  NA  NA
## 3    NA  NA  NA
## 4    NA  NA  NA
## 5    NA  NA  NA
## 6    NA  NA  NA
## 7    NA  NA  NA
## 8    NA  NA  NA
## 9    NA  NA  NA
## 10   NA  NA  NA
## 11   NA  NA  NA
## 12   NA  NA  NA
## 13   NA  NA  NA
## 14   NA  NA  NA
## 15   NA  NA  NA
## 16   NA  NA  NA
## 17   NA  NA  NA
## 18   NA  NA  NA
## 19   NA  NA  NA
## 20   NA  NA  NA
```

```r
head(education, n = 20)
```

```
##    CountryCode                       Long.Name         Income.Group
## 1          ABW                           Aruba High income: nonOECD
## 2          ADO         Principality of Andorra High income: nonOECD
## 3          AFG    Islamic State of Afghanistan           Low income
## 4          AGO     People’s Republic of Angola  Lower middle income
## 5          ALB             Republic of Albania  Upper middle income
## 6          ARE            United Arab Emirates High income: nonOECD
## 7          ARG              Argentine Republic  Upper middle income
## 8          ARM             Republic of Armenia  Lower middle income
## 9          ASM                  American Samoa  Upper middle income
## 10         ATG             Antigua and Barbuda  Upper middle income
## 11         AUS       Commonwealth of Australia    High income: OECD
## 12         AUT             Republic of Austria    High income: OECD
## 13         AZE          Republic of Azerbaijan  Upper middle income
## 14         BDI             Republic of Burundi           Low income
## 15         BEL              Kingdom of Belgium    High income: OECD
## 16         BEN               Republic of Benin           Low income
## 17         BFA                    Burkina Faso           Low income
## 18         BGD People’s Republic of Bangladesh           Low income
## 19         BGR            Republic of Bulgaria  Upper middle income
## 20         BHR              Kingdom of Bahrain High income: nonOECD
##                        Region Lending.category Other.groups
## 1   Latin America & Caribbean
## 2       Europe & Central Asia
## 3                  South Asia              IDA         HIPC
## 4          Sub-Saharan Africa              IDA
## 5       Europe & Central Asia             IBRD
## 6  Middle East & North Africa
## 7   Latin America & Caribbean             IBRD
## 8       Europe & Central Asia            Blend
## 9         East Asia & Pacific
## 10  Latin America & Caribbean             IBRD
## 11        East Asia & Pacific
## 12      Europe & Central Asia                     Euro area
## 13      Europe & Central Asia            Blend
## 14         Sub-Saharan Africa              IDA         HIPC
## 15      Europe & Central Asia                     Euro area
## 16         Sub-Saharan Africa              IDA         HIPC
## 17         Sub-Saharan Africa              IDA         HIPC
## 18                 South Asia              IDA
## 19      Europe & Central Asia             IBRD
## 20 Middle East & North Africa
##            Currency.Unit Latest.population.census  Latest.household.survey
## 1          Aruban florin                     2000
## 2                   Euro           Register based
## 3         Afghan afghani                     1979               MICS, 2003
## 4         Angolan kwanza                     1970 MICS, 2001, MIS, 2006/07
## 5           Albanian lek                     2001               MICS, 2005
## 6          U.A.E. dirham                     2005
## 7         Argentine peso                     2001
## 8          Armenian dram                     2001                DHS, 2005
## 9            U.S. dollar                     2000
## 10 East Caribbean dollar                     2001
## 11     Australian dollar                     2006
## 12                  Euro                     2001
## 13       New Azeri manat                     2009                DHS, 2006
## 14         Burundi franc                     1990               MICS, 2005
## 15                  Euro                     2001
## 16             CFA franc                     2002                DHS, 2006
## 17             CFA franc                     2006               MICS, 2006
## 18      Bangladeshi taka                     2001                DHS, 2007
## 19         Bulgarian lev                     2001
## 20        Bahraini dinar                     2001
##
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11
## 12 A simple multiplier is used to convert the national currencies of EMU members to euros. The follow
## 13
## 14
## 15      A simple multiplier is used to convert the national currencies of EMU members to euros. The f
## 16
## 17
## 18
## 19
## 20
##    National.accounts.base.year National.accounts.reference.year
## 1                         1995                               NA
## 2                                                            NA
## 3                    2002/2003                               NA
## 4                         1997                               NA
## 5                                                          1996
## 6                         1995                               NA
## 7                         1993                               NA
## 8                                                          1996
## 9                                                            NA
## 10                        1990                               NA
## 11                                                         2007
## 12                        2000                               NA
## 13                                                         2003
## 14                        1980                               NA
## 15                        2000                               NA
## 16                        1985                               NA
## 17                        1999                               NA
## 18                   1995/1996                               NA
## 19                                                         2002
## 20                        1985                               NA
##    System.of.National.Accounts SNA.price.valuation
## 1                           NA
## 2                           NA
## 3                           NA                 VAB
## 4                           NA                 VAP
## 5                         1993                 VAB
## 6                           NA                 VAB
## 7                         1993                 VAB
## 8                         1993                 VAB
## 9                           NA
## 10                          NA                 VAB
## 11                        1993                 VAB
## 12                        1993                 VAB
## 13                        1993                 VAB
## 14                          NA                 VAB
## 15                        1993                 VAB
## 16                          NA                 VAP
## 17                          NA                 VAB
## 18                        1993                 VAB
## 19                        1993                 VAB
## 20                          NA                 VAP
##    Alternative.conversion.factor PPP.survey.year
## 1                                             NA
## 2                                             NA
## 3                                             NA
## 4                        1991-96            2005
## 5                                           2005
## 6                                             NA
## 7                        1971-84            2005
## 8                        1990-95            2005
## 9                                             NA
## 10                                            NA
## 11                                          2005
## 12                                          2005
## 13                       1992-95            2005
## 14                                          2005
## 15                                          2005
## 16                          1992            2005
## 17                       1992-93            2005
## 18                                          2005
## 19              1978-89, 1991-92            2005
## 20                                          2005
##    Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1
## 2
## 3                                                              Actual
## 4                               BPM5                           Actual
## 5                               BPM5                           Actual
## 6                               BPM4
## 7                               BPM5                           Actual
## 8                               BPM5                           Actual
## 9
## 10                              BPM5
## 11                              BPM5
## 12                              BPM5
## 13                              BPM5                         Actual
## 14                              BPM5                         Actual
## 15                              BPM5
## 16                              BPM5                    Preliminary
## 17                              BPM4                         Actual
## 18                              BPM5                    Preliminary
## 19                              BPM5                         Actual
## 20                              BPM5
##    System.of.trade Government.Accounting.concept
## 1          Special
## 2          General
## 3          General                  Consolidated
## 4          Special
## 5          General                  Consolidated
## 6          General                  Consolidated
## 7          Special                  Consolidated
## 8          Special                  Consolidated
## 9
## 10         General
## 11         General                  Consolidated
## 12         Special                  Consolidated
## 13         General                  Consolidated
## 14         Special                  Consolidated
## 15         Special                  Consolidated
## 16         Special                     Budgetary
## 17         General                     Budgetary
## 18         General                  Consolidated
## 19         General                  Consolidated
## 20         General                  Consolidated
##    IMF.data.dissemination.standard
## 1
## 2
## 3                             GDDS
## 4                             GDDS
## 5                             GDDS
## 6                             GDDS
## 7                             SDDS
## 8                             SDDS
## 9
## 10                            GDDS
## 11                            SDDS
## 12                            SDDS
## 13                            GDDS
## 14
## 15                            SDDS
## 16                            GDDS
## 17                            GDDS
## 18                            GDDS
## 19                            SDDS
## 20                            GDDS
##    Source.of.most.recent.Income.and.expenditure.data
## 1
## 2
## 3
## 4                                          IHS, 2000
## 5                                         LSMS, 2005
## 6
## 7                                          IHS, 2006
## 8                                          IHS, 2007
## 9
## 10
## 11                                       ES/BS, 1994
## 12                                           IS 2000
## 13                                       ES/BS, 2005
## 14                                        CWIQ, 2006
## 15                                         IHS, 2000
## 16                                        CWIQ, 2003
## 17                                        CWIQ, 2003
## 18                                         IHS, 2005
## 19                                       ES/BS, 2003
## 20
##    Vital.registration.complete     Latest.agricultural.census
## 1
## 2                          Yes
## 3
## 4                                                     1964-65
## 5                          Yes                           1998
## 6                                                        1998
## 7                          Yes                           2002
## 8                          Yes
## 9                          Yes
## 10                         Yes
## 11                         Yes                           2001
## 12                         Yes                      1999-2000
## 13                         Yes
## 14
## 15                         Yes 1999-2000 (conducted annually)
## 16                                                       1992
## 17                                                       1993
## 18                                                       2005
## 19                         Yes
## 20                         Yes
##    Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                      NA              2008                           NA
## 2                      NA              2006                           NA
## 3                      NA              2008                         2000
## 4                      NA              1991                         2000
## 5                    2005              2008                         2000
## 6                      NA              2008                         2005
## 7                    2001              2008                         2000
## 8                      NA              2008                         2000
## 9                      NA                NA                           NA
## 10                     NA              2007                         1990
## 11                   2004              2008                         2000
## 12                   2004              2008                         2000
## 13                   2005              2008                         2005
## 14                     NA              2008                         2000
## 15                   2004              2008                           NA
## 16                     NA              2005                         2001
## 17                     NA              2005                         2000
## 18                   1997              2007                         2000
## 19                   2005              2008                         2000
## 20                     NA              2007                         2003
##    X2.alpha.code WB.2.code           Table.Name           Short.Name
## 1             AW        AW                Aruba                Aruba
## 2             AD        AD              Andorra              Andorra
## 3             AF        AF          Afghanistan          Afghanistan
## 4             AO        AO               Angola               Angola
## 5             AL        AL              Albania              Albania
## 6             AE        AE United Arab Emirates United Arab Emirates
## 7             AR        AR            Argentina            Argentina
## 8             AM        AM              Armenia              Armenia
## 9             AS        AS       American Samoa       American Samoa
## 10            AG        AG  Antigua and Barbuda  Antigua and Barbuda
## 11            AU        AU            Australia            Australia
## 12            AT        AT              Austria              Austria
## 13            AZ        AZ           Azerbaijan           Azerbaijan
## 14            BI        BI              Burundi              Burundi
## 15            BE        BE              Belgium              Belgium
## 16            BJ        BJ                Benin                Benin
## 17            BF        BF         Burkina Faso         Burkina Faso
## 18            BD        BD           Bangladesh           Bangladesh
## 19            BG        BG             Bulgaria             Bulgaria
## 20            BH        BH              Bahrain              Bahrain
```

```
names(gdp)
```

```
##  [1] "X"                           "Gross.domestic.product.2012"
##  [3] "X.1"                         "X.2"
##  [5] "X.3"                         "X.4"
##  [7] "X.5"                         "X.6"
##  [9] "X.7"                         "X.8"
```

```
gdp2 <- dplyr::rename(gdp, Countrycode = X, country = X.2, milDollars = X.3, rank = Gross.domesti
names(education)
```

```
##  [1] "CountryCode"
##  [2] "Long.Name"
##  [3] "Income.Group"
##  [4] "Region"
##  [5] "Lending.category"
##  [6] "Other.groups"
##  [7] "Currency.Unit"
##  [8] "Latest.population.census"
##  [9] "Latest.household.survey"
## [10] "Special.Notes"
## [11] "National.accounts.base.year"
## [12] "National.accounts.reference.year"
## [13] "System.of.National.Accounts"
## [14] "SNA.price.valuation"
## [15] "Alternative.conversion.factor"
## [16] "PPP.survey.year"
## [17] "Balance.of.Payments.Manual.in.use"
## [18] "External.debt.Reporting.status"
## [19] "System.of.trade"
## [20] "Government.Accounting.concept"
## [21] "IMF.data.dissemination.standard"
## [22] "Source.of.most.recent.Income.and.expenditure.data"
## [23] "Vital.registration.complete"
## [24] "Latest.agricultural.census"
## [25] "Latest.industrial.data"
## [26] "Latest.trade.data"
## [27] "Latest.water.withdrawal.data"
## [28] "X2.alpha.code"
## [29] "WB.2.code"
## [30] "Table.Name"
## [31] "Short.Name"
```

```
            gdp2 <- as.data.frame(gdp2)
            mergeData <- merge(gdp2, education, by.x="Countrycode", by.y="CountryCode") ##merges the tw
            head(mergeData, n=20)
```

```
##    Countrycode rank X.1              country  milDollars X.4 X.5 X.6 X.7 X.8
## 1          ABW  161  NA                Aruba      2,584       NA  NA  NA  NA
## 2          ADO       NA              Andorra          ..      NA  NA  NA  NA
## 3          AFG  105  NA          Afghanistan     20,497       NA  NA  NA  NA
## 4          AGO   60  NA               Angola    114,147       NA  NA  NA  NA
## 5          ALB  125  NA              Albania     12,648       NA  NA  NA  NA
## 6          ARE   32  NA United Arab Emirates    348,595       NA  NA  NA  NA
## 7          ARG   26  NA            Argentina    475,502       NA  NA  NA  NA
## 8          ARM  133  NA              Armenia      9,951       NA  NA  NA  NA
## 9          ASM       NA       American Samoa          ..      NA  NA  NA  NA
## 10         ATG  172  NA  Antigua and Barbuda      1,134       NA  NA  NA  NA
## 11         AUS   12  NA            Australia  1,532,408       NA  NA  NA  NA
## 12         AUT   27  NA              Austria    394,708       NA  NA  NA  NA
## 13         AZE   68  NA           Azerbaijan     66,605       NA  NA  NA  NA
## 14         BDI  162  NA              Burundi      2,472       NA  NA  NA  NA
## 15         BEL   25  NA              Belgium    483,262       NA  NA  NA  NA
## 16         BEN  140  NA                Benin      7,557       NA  NA  NA  NA
## 17         BFA  128  NA         Burkina Faso     10,441       NA  NA  NA  NA
## 18         BGD   59  NA           Bangladesh    116,355       NA  NA  NA  NA
## 19         BGR   76  NA             Bulgaria     50,972       NA  NA  NA  NA
## 20         BHR   93  NA              Bahrain     29,044       NA  NA  NA  NA
##                           Long.Name         Income.Group
## 1                             Aruba High income: nonOECD
## 2           Principality of Andorra High income: nonOECD
## 3      Islamic State of Afghanistan           Low income
## 4       People’s Republic of Angola  Lower middle income
## 5               Republic of Albania  Upper middle income
## 6              United Arab Emirates High income: nonOECD
## 7                Argentine Republic  Upper middle income
## 8               Republic of Armenia  Lower middle income
## 9                    American Samoa  Upper middle income
## 10              Antigua and Barbuda  Upper middle income
## 11       Commonwealth of Australia    High income: OECD
## 12             Republic of Austria    High income: OECD
## 13          Republic of Azerbaijan  Upper middle income
## 14             Republic of Burundi           Low income
## 15              Kingdom of Belgium    High income: OECD
## 16               Republic of Benin           Low income
## 17                    Burkina Faso           Low income
## 18 People’s Republic of Bangladesh           Low income
## 19            Republic of Bulgaria  Upper middle income
## 20              Kingdom of Bahrain High income: nonOECD
##                        Region Lending.category Other.groups
## 1   Latin America & Caribbean
## 2       Europe & Central Asia
## 3                  South Asia              IDA         HIPC
## 4          Sub-Saharan Africa              IDA
## 5       Europe & Central Asia             IBRD
## 6  Middle East & North Africa
## 7   Latin America & Caribbean             IBRD
## 8       Europe & Central Asia            Blend
## 9         East Asia & Pacific
## 10  Latin America & Caribbean             IBRD
## 11        East Asia & Pacific
## 12      Europe & Central Asia                     Euro area
## 13      Europe & Central Asia            Blend
## 14         Sub-Saharan Africa              IDA         HIPC
## 15      Europe & Central Asia                     Euro area
## 16         Sub-Saharan Africa              IDA         HIPC
## 17         Sub-Saharan Africa              IDA         HIPC
## 18                 South Asia              IDA
## 19      Europe & Central Asia             IBRD
## 20 Middle East & North Africa
##            Currency.Unit Latest.population.census  Latest.household.survey
## 1          Aruban florin                     2000
## 2                   Euro           Register based
## 3         Afghan afghani                     1979               MICS, 2003
## 4         Angolan kwanza                     1970 MICS, 2001, MIS, 2006/07
## 5           Albanian lek                     2001               MICS, 2005
## 6          U.A.E. dirham                     2005
## 7         Argentine peso                     2001
## 8          Armenian dram                     2001                DHS, 2005
## 9            U.S. dollar                     2000
## 10 East Caribbean dollar                     2001
## 11     Australian dollar                     2006
## 12                  Euro                     2001
## 13       New Azeri manat                     2009                DHS, 2006
## 14         Burundi franc                     1990               MICS, 2005
## 15                  Euro                     2001
## 16             CFA franc                     2002                DHS, 2006
## 17             CFA franc                     2006               MICS, 2006
## 18      Bangladeshi taka                     2001                DHS, 2007
## 19         Bulgarian lev                     2001
## 20        Bahraini dinar                     2001
##
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11
## 12 A simple multiplier is used to convert the national currencies of EMU members to euros. The follo
## 13
## 14
## 15      A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 16
## 17
## 18
## 19
## 20
##    National.accounts.base.year National.accounts.reference.year
## 1                         1995                               NA
## 2                                                            NA
## 3                    2002/2003                               NA
## 4                         1997                               NA
## 5                                                          1996
## 6                         1995                               NA
## 7                         1993                               NA
## 8                                                          1996
## 9                                                            NA
## 10                        1990                               NA
## 11                                                         2007
## 12                        2000                               NA
## 13                                                         2003
## 14                        1980                               NA
## 15                        2000                               NA
## 16                        1985                               NA
## 17                        1999                               NA
## 18                   1995/1996                               NA
## 19                                                         2002
## 20                        1985                               NA
##    System.of.National.Accounts SNA.price.valuation
## 1                           NA
## 2                           NA
## 3                           NA                 VAB
## 4                           NA                 VAP
## 5                         1993                 VAB
## 6                           NA                 VAB
## 7                         1993                 VAB
## 8                         1993                 VAB
## 9                           NA
## 10                          NA                 VAB
## 11                        1993                 VAB
## 12                        1993                 VAB
## 13                        1993                 VAB
## 14                          NA                 VAB
## 15                        1993                 VAB
## 16                          NA                 VAP
## 17                          NA                 VAB
## 18                        1993                 VAB
## 19                        1993                 VAB
## 20                          NA                 VAP
##    Alternative.conversion.factor PPP.survey.year
## 1                                             NA
## 2                                             NA
## 3                                             NA
## 4                        1991-96            2005
## 5                                           2005
## 6                                             NA
## 7                        1971-84            2005
## 8                        1990-95            2005
## 9                                             NA
## 10                                            NA
## 11                                          2005
## 12                                          2005
## 13                       1992-95            2005
## 14                                          2005
## 15                                          2005
## 16                          1992            2005
## 17                       1992-93            2005
## 18                                          2005
## 19              1978-89, 1991-92            2005
## 20                                          2005
##    Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1
## 2
## 3                                                              Actual
## 4                                 BPM5                         Actual
## 5                                 BPM5                         Actual
## 6                                 BPM4
## 7                                 BPM5                         Actual
## 8                                 BPM5                         Actual
## 9
## 10                                BPM5
## 11                                BPM5
## 12                                BPM5
## 13                                BPM5                         Actual
## 14                                BPM5                         Actual
## 15                                BPM5
## 16                                BPM5                    Preliminary
## 17                                BPM4                         Actual
## 18                                BPM5                    Preliminary
## 19                                BPM5                         Actual
## 20                                BPM5
##    System.of.trade Government.Accounting.concept
## 1          Special
## 2          General
## 3          General                  Consolidated
## 4          Special
## 5          General                  Consolidated
## 6          General                  Consolidated
## 7          Special                  Consolidated
## 8          Special                  Consolidated
## 9
## 10         General
## 11         General                  Consolidated
## 12         Special                  Consolidated
## 13         General                  Consolidated
## 14         Special                  Consolidated
## 15         Special                  Consolidated
## 16         Special                     Budgetary
## 17         General                     Budgetary
## 18         General                  Consolidated
## 19         General                  Consolidated
## 20         General                  Consolidated
##    IMF.data.dissemination.standard
## 1
## 2
## 3                             GDDS
## 4                             GDDS
## 5                             GDDS
## 6                             GDDS
## 7                             SDDS
## 8                             SDDS
## 9
## 10                            GDDS
## 11                            SDDS
## 12                            SDDS
## 13                            GDDS
## 14
## 15                            SDDS
## 16                            GDDS
## 17                            GDDS
## 18                            GDDS
## 19                            SDDS
## 20                            GDDS
##    Source.of.most.recent.Income.and.expenditure.data
## 1
## 2
## 3
## 4                                          IHS, 2000
## 5                                         LSMS, 2005
## 6
## 7                                          IHS, 2006
## 8                                          IHS, 2007
## 9
## 10
## 11                                       ES/BS, 1994
## 12                                           IS 2000
## 13                                       ES/BS, 2005
## 14                                        CWIQ, 2006
## 15                                         IHS, 2000
## 16                                        CWIQ, 2003
## 17                                        CWIQ, 2003
## 18                                         IHS, 2005
## 19                                       ES/BS, 2003
## 20
##    Vital.registration.complete     Latest.agricultural.census
## 1
## 2                           Yes
## 3
## 4                                                     1964-65
## 5                           Yes                           1998
## 6                                                         1998
## 7                           Yes                           2002
## 8                           Yes
## 9                           Yes
## 10                          Yes
## 11                          Yes                           2001
## 12                          Yes                      1999-2000
## 13                          Yes
## 14
## 15                          Yes 1999-2000 (conducted annually)
## 16                                                        1992
## 17                                                        1993
## 18                                                        2005
## 19                          Yes
## 20                          Yes
##    Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                      NA              2008                           NA
## 2                      NA              2006                           NA
## 3                      NA              2008                         2000
## 4                      NA              1991                         2000
## 5                    2005              2008                         2000
## 6                      NA              2008                         2005
## 7                    2001              2008                         2000
## 8                      NA              2008                         2000
## 9                      NA                NA                           NA
## 10                     NA              2007                         1990
## 11                   2004              2008                         2000
## 12                   2004              2008                         2000
## 13                   2005              2008                         2005
## 14                     NA              2008                         2000
## 15                   2004              2008                           NA
## 16                     NA              2005                         2001
## 17                     NA              2005                         2000
## 18                   1997              2007                         2000
## 19                   2005              2008                         2000
## 20                     NA              2007                         2003
##    X2.alpha.code WB.2.code           Table.Name           Short.Name
## 1             AW        AW                Aruba                Aruba
## 2             AD        AD              Andorra              Andorra
## 3             AF        AF          Afghanistan          Afghanistan
## 4             AO        AO               Angola               Angola
## 5             AL        AL              Albania              Albania
## 6             AE        AE United Arab Emirates United Arab Emirates
## 7             AR        AR            Argentina            Argentina
## 8             AM        AM              Armenia              Armenia
## 9             AS        AS       American Samoa       American Samoa
## 10            AG        AG  Antigua and Barbuda  Antigua and Barbuda
## 11            AU        AU            Australia            Australia
## 12            AT        AT              Austria              Austria
## 13            AZ        AZ           Azerbaijan           Azerbaijan
## 14            BI        BI              Burundi              Burundi
## 15            BE        BE              Belgium              Belgium
## 16            BJ        BJ                Benin                Benin
## 17            BF        BF         Burkina Faso         Burkina Faso
## 18            BD        BD           Bangladesh           Bangladesh
## 19            BG        BG             Bulgaria             Bulgaria
## 20            BH        BH              Bahrain              Bahrain
```

```
mergeData$rank <- as.integer(mergeData$rank)  ##turns the ranking from character into
arrange(mergeData, desc(rank)) ##descending order of ranks
```

```
##     Countrycode rank X.1                        country   milDollars X.4 X.5
## 1           TUV  190  NA                         Tuvalu          40        NA
## 2           KIR  189  NA                       Kiribati         175        NA
## 3           MHL  188  NA               Marshall Islands         182        NA
## 4           PLW  187  NA                          Palau         228        NA
## 5           STP  186  NA    S\xe3o Tom\xe9 and Principe         263        NA
## 6           FSM  185  NA          Micronesia, Fed. Sts.         326        NA
## 7           TON  184  NA                          Tonga         472        NA
## 8           DMA  183  NA                       Dominica         480        NA
## 9           COM  182  NA                        Comoros         596        NA
## 10          WSM  181  NA                          Samoa         684        NA
## 11          VCT  180  NA St. Vincent and the Grenadines         713        NA
## 12          GRD  178  NA                        Grenada         767        NA
## 13          KNA  178  NA             St. Kitts and Nevis         767        NA
## 14          VUT  177  NA                        Vanuatu         787        NA
## 15          GNB  176  NA                  Guinea-Bissau         822        NA
## 16          GMB  175  NA                    Gambia, The         917        NA
## 17          SLB  174  NA                Solomon Islands       1,008        NA
## 18          SYC  173  NA                     Seychelles       1,129        NA
## 19          ATG  172  NA            Antigua and Barbuda       1,134        NA
## 20          LCA  171  NA                      St. Lucia       1,239        NA
## 21          TMP  170  NA                    Timor-Leste       1,293        NA
## 22          BLZ  169  NA                         Belize       1,493        NA
## 23          LBR  168  NA                        Liberia       1,734        NA
## 24          BTN  167  NA                         Bhutan       1,780        NA
## 25          CPV  166  NA                     Cape Verde       1,827        NA
## 26          CAF  165  NA       Central African Republic       2,184        NA
## 27          MDV  164  NA                       Maldives       2,222        NA
## 28          LSO  163  NA                        Lesotho       2,448        NA
## 29          BDI  162  NA                        Burundi       2,472        NA
## 30          ABW  161  NA                          Aruba       2,584        NA
## 31          GUY  160  NA                         Guyana       2,851        NA
## 32          ERI  159  NA                        Eritrea       3,092        NA
## 33          SWZ  158  NA                      Swaziland       3,744        NA
## 34          SLE  157  NA                   Sierra Leone       3,796        NA
## 35          TGO  156  NA                           Togo       3,814        NA
## 36          FJI  155  NA                           Fiji       3,908        NA
## 37          MRT  154  NA                 Mauritania       4,199       NA
## 38          BRB  153  NA                   Barbados       4,225       NA
## 39          MWI  152  NA                     Malawi       4,264       NA
## 40          MNE  151  NA                 Montenegro       4,373       NA
## 41          SUR  150  NA                   Suriname       5,012       NA
## 42          BMU  149  NA                    Bermuda       5,474       NA
## 43          GIN  148  NA                     Guinea       5,632       NA
## 44          MCO  147  NA                     Monaco       6,075       NA
## 45          KSV  146  NA                     Kosovo       6,445       NA
## 46          KGZ  145  NA            Kyrgyz Republic       6,475       NA
## 47          NER  144  NA                      Niger       6,773       NA
## 48          TJK  143  NA                 Tajikistan       6,972       NA
## 49          RWA  142  NA                     Rwanda       7,103       NA
## 50          MDA  141  NA                    Moldova       7,253   f   NA
## 51          BEN  140  NA                      Benin       7,557       NA
## 52          HTI  139  NA                      Haiti       7,843       NA
## 53          BHS  138  NA               Bahamas, The       8,149       NA
## 54          MLT  137  NA                      Malta       8,722       NA
## 55          LAO  136  NA                    Lao PDR       9,418       NA
## 56          MKD  135  NA             Macedonia, FYR       9,613       NA
## 57          ZWE  134  NA                   Zimbabwe       9,802       NA
## 58          ARM  133  NA                    Armenia       9,951       NA
## 59          MDG  132  NA                 Madagascar       9,975       NA
## 60          MNG  130  NA                   Mongolia      10,271       NA
## 61          MLI  129  NA                       Mali      10,308       NA
## 62          BFA  128  NA               Burkina Faso      10,441       NA
## 63          MUS  127  NA                  Mauritius      10,486       NA
## 64          NIC  126  NA                  Nicaragua      10,507       NA
## 65          ALB  125  NA                    Albania      12,648       NA
## 66          TCD  124  NA                       Chad      12,887       NA
## 67          NAM  123  NA                    Namibia      13,072       NA
## 68          ISL  122  NA                    Iceland      13,579       NA
## 69          COG  121  NA                Congo, Rep.      13,678       NA
## 70          KHM  120  NA                   Cambodia      14,038       NA
## 71          SEN  119  NA                    Senegal      14,046       NA
## 72          MOZ  118  NA                 Mozambique      14,244       NA
## 73          BWA  117  NA                   Botswana      14,504       NA
## 74          JAM  116  NA                    Jamaica      14,755       NA
## 75          PNG  115  NA           Papua New Guinea      15,654       NA
## 76          GEO  114  NA                    Georgia      15,747   e   NA
## 77          BRN  113  NA          Brunei Darussalam      16,954       NA
## 78          ZAR  112  NA           Congo, Dem. Rep.      17,204       NA
## 79          BIH  111  NA     Bosnia and Herzegovina      17,466       NA
## 80          GNQ  110  NA          Equatorial Guinea      17,697       NA
## 81          GAB  109  NA                      Gabon      18,377       NA
## 82          HND  108  NA                   Honduras      18,434       NA
## 83          NPL  107  NA                      Nepal      18,963       NA
## 84          UGA  106  NA                     Uganda      19,881       NA
## 85          AFG  105  NA                Afghanistan      20,497       NA
## 86          ZMB  104  NA                     Zambia      20,678       NA
## 87          EST  103  NA                    Estonia      22,390       NA
## 88          CYP  102  NA                     Cyprus      22,767   d   NA
## 89          TTO  101  NA        Trinidad and Tobago      23,320       NA
## 90          SLV  100  NA                El Salvador      23,864       NA
## 91          CIV   99  NA                C\xf4te d'Ivoire      24,680       NA
## 92          CMR   98  NA                        Cameroon      25,322       NA
## 93          PRY   97  NA                        Paraguay      25,502       NA
## 94          BOL   96  NA                         Bolivia      27,035       NA
## 95          TZA   95  NA                        Tanzania      28,242    c  NA
## 96          LVA   94  NA                          Latvia      28,373       NA
## 97          BHR   93  NA                         Bahrain      29,044       NA
## 98          JOR   92  NA                          Jordan      31,015       NA
## 99          TKM   91  NA                    Turkmenistan      35,164       NA
## 100         YEM   90  NA                     Yemen, Rep.      35,646       NA
## 101         PAN   89  NA                          Panama      36,253       NA
## 102         SRB   88  NA                          Serbia      37,489       NA
## 103         KEN   87  NA                           Kenya      40,697       NA
## 104         GHA   86  NA                           Ghana      40,711       NA
## 105         ETH   85  NA                        Ethiopia      41,605       NA
## 106         LTU   84  NA                       Lithuania      42,344       NA
## 107         LBN   83  NA                         Lebanon      42,945       NA
## 108         MAC   82  NA                Macao SAR, China      43,582       NA
## 109         CRI   81  NA                      Costa Rica      45,104       NA
## 110         SVN   80  NA                        Slovenia      45,279       NA
## 111         TUN   79  NA                         Tunisia      45,662       NA
## 112         URY   78  NA                         Uruguay      49,920       NA
## 113         GTM   77  NA                       Guatemala      50,234       NA
## 114         BGR   76  NA                        Bulgaria      50,972       NA
## 115         UZB   75  NA                      Uzbekistan      51,113       NA
## 116         LUX   74  NA                      Luxembourg      55,178       NA
## 117         SDN   73  NA                           Sudan      58,769    b  NA
## 118         DOM   72  NA              Dominican Republic      59,047       NA
## 119         HRV   71  NA                         Croatia      59,228       NA
## 120         LKA   70  NA                       Sri Lanka      59,423       NA
## 121         BLR   69  NA                         Belarus      63,267       NA
## 122         AZE   68  NA                      Azerbaijan      66,605       NA
## 123         CUB   67  NA                            Cuba      68,234       NA
## 124         OMN   66  NA                            Oman      69,972       NA
## 125         SYR   65  NA            Syrian Arab Republic      73,672       NA
## 126         ECU   64  NA                         Ecuador      84,040       NA
## 127         SVK   63  NA                 Slovak Republic      91,149       NA
## 128         MAR   62  NA                         Morocco      95,982    a  NA
## 129         PRI   61  NA                     Puerto Rico     101,496       NA
## 130         AGO   60  NA                          Angola     114,147       NA
## 131         BGD   59  NA                      Bangladesh     116,355       NA
## 132         HUN   58  NA                         Hungary     124,600       NA
## 133         VNM   57  NA                         Vietnam     155,820       NA
## 134         KWT   56  NA                          Kuwait     160,913       NA
## 135         NZL   55  NA                     New Zealand     167,347       NA
## 136         QAT   54  NA                           Qatar     171,476       NA
## 137         UKR   53  NA                         Ukraine     176,309       NA
## 138         ROM   52  NA                         Romania     192,711       NA
## 139         CZE   51  NA                  Czech Republic     196,446       NA
## 140         KAZ   50  NA                      Kazakhstan     203,521       NA
## 141         PER   49  NA                            Peru     203,790       NA
## 142         DZA   48  NA                         Algeria     205,789       NA
## 143         IRQ   47  NA                            Iraq     210,280       NA
## 144         IRL   46  NA                         Ireland     210,771       NA
## 145         PRT   45  NA                       Portugal     212,274       NA
## 146         PAK   44  NA                       Pakistan     225,143       NA
## 147         FIN   43  NA                        Finland     247,546       NA
## 148         GRC   42  NA                         Greece     249,099       NA
## 149         PHL   41  NA                    Philippines     250,182       NA
## 150         ISR   40  NA                         Israel     258,217       NA
## 151         NGA   39  NA                        Nigeria     262,597       NA
## 152         EGY   38  NA               Egypt, Arab Rep.     262,832       NA
## 153         HKG   37  NA           Hong Kong SAR, China     263,259       NA
## 154         CHL   36  NA                          Chile     269,869       NA
## 155         SGP   35  NA                      Singapore     274,701       NA
## 156         MYS   34  NA                       Malaysia     305,033       NA
## 157         DNK   33  NA                        Denmark     314,887       NA
## 158         ARE   32  NA           United Arab Emirates     348,595       NA
## 159         THA   31  NA                       Thailand     365,966       NA
## 160         COL   30  NA                       Colombia     369,606       NA
## 161         VEN   29  NA                  Venezuela, RB     381,286       NA
## 162         ZAF   28  NA                   South Africa     384,313       NA
## 163         AUT   27  NA                        Austria     394,708       NA
## 164         ARG   26  NA                      Argentina     475,502       NA
## 165         BEL   25  NA                        Belgium     483,262       NA
## 166         POL   24  NA                         Poland     489,795       NA
## 167         NOR   23  NA                         Norway     499,667       NA
## 168         IRN   22  NA             Iran, Islamic Rep.     514,060       NA
## 169         SWE   21  NA                         Sweden     523,806       NA
## 170         CHE   20  NA                    Switzerland     631,173       NA
## 171         SAU   19  NA                   Saudi Arabia     711,050       NA
## 172         NLD   18  NA                    Netherlands     770,555       NA
## 173         TUR   17  NA                         Turkey     789,257       NA
## 174         IDN   16  NA                      Indonesia     878,043       NA
## 175         KOR   15  NA                    Korea, Rep.   1,129,598       NA
## 176         MEX   14  NA                         Mexico   1,178,126       NA
## 177         ESP   13  NA                          Spain   1,322,965       NA
## 178         AUS   12  NA                      Australia   1,532,408       NA
## 179         CAN   11  NA                         Canada   1,821,424       NA
## 180         IND   10  NA                          India   1,841,710       NA
## 181         ITA    9  NA                          Italy   2,014,670       NA
## 182         RUS    8  NA             Russian Federation   2,014,775       NA
## 183         BRA    7  NA                         Brazil   2,252,664       NA
## 184         GBR    6  NA                 United Kingdom   2,471,784       NA
## 185         FRA    5  NA                         France   2,612,878       NA
## 186         DEU    4  NA                        Germany   3,428,131       NA
## 187         JPN    3  NA                          Japan   5,959,718       NA
## 188         CHN    2  NA                          China   8,227,103       NA
## 189         USA    1  NA                  United States  16,244,600       NA
## 190         ADO   NA  NA                        Andorra           ..      NA
## 191         ASM   NA  NA                 American Samoa           ..      NA
## 192         CHI   NA  NA                Channel Islands           ..      NA
## 193         CYM   NA  NA                 Cayman Islands           ..      NA
## 194         DJI   NA  NA                       Djibouti                   NA
## 195         EAP   NA  NA            East Asia & Pacific   10,329,684      NA
## 196         ECA   NA  NA          Europe & Central Asia    1,887,950      NA
## 197         EMU   NA  NA                      Euro area   12,192,344      NA
## 198         FRO   NA  NA                 Faeroe Islands           ..      NA
## 199         GRL   NA  NA                      Greenland           ..      NA
## 200         GUM   NA  NA                           Guam           ..      NA
## 201         HIC   NA  NA                    High income   49,717,634      NA
## 202         IMY   NA  NA                    Isle of Man           ..      NA
## 203         LAC   NA  NA      Latin America & Caribbean    5,344,028      NA
## 204         LBY   NA  NA                          Libya           ..      NA
## 205         LIC   NA  NA                     Low income      504,431      NA
## 206         LIE   NA  NA                  Liechtenstein           ..      NA
## 207         LMC   NA  NA            Lower middle income    4,823,811      NA
## 208         LMY   NA  NA            Low & middle income   22,769,282      NA
## 209         MIC   NA  NA                  Middle income   22,249,909      NA
## 210         MMR   NA  NA                        Myanmar           ..      NA
## 211         MNA   NA  NA     Middle East & North Africa    1,540,807      NA
## 212         MNP   NA  NA       Northern Mariana Islands           ..      NA
## 213         NCL   NA  NA                  New Caledonia           ..      NA
## 214         PRK   NA  NA               Korea, Dem. Rep.           ..      NA
## 215         PYF   NA  NA               French Polynesia           ..      NA
## 216         SAS   NA  NA                     South Asia    2,286,093      NA
## 217         SMR   NA  NA                     San Marino           ..      NA
## 218         SOM   NA  NA                        Somalia           ..      NA
## 219         SSA   NA  NA             Sub-Saharan Africa    1,289,813      NA
## 220         TCA   NA  NA       Turks and Caicos Islands           ..      NA
## 221         UMC   NA  NA            Upper middle income   17,426,690      NA
## 222         VIR   NA  NA          Virgin Islands (U.S.)           ..      NA
## 223         WBG   NA  NA             West Bank and Gaza           ..      NA
## 224         WLD   NA  NA                          World   72,440,449      NA
##     X.6 X.7 X.8
## 1    NA  NA  NA
## 2    NA  NA  NA
## 3    NA  NA  NA
## 4    NA  NA  NA
## 5    NA  NA  NA
## 6    NA  NA  NA
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## 223  NA  NA  NA
## 224  NA  NA  NA
##                                                                       Long.Name
## 1                                                                        Tuvalu
## 2                                                          Republic of Kiribati
## 3                                              Republic of the Marshall Islands
## 4                                                             Republic of Palau
## 5                           Democratic Republic of S\xe3o Tom\xe9 and Principe
## 6                                                Federated States of Micronesia
## 7                                                              Kingdom of Tonga
## 8                                                      Commonwealth of Dominica
## 9                                                          Union of the Comoros
## 10                                                                        Samoa
## 11                                              St. Vincent and the Grenadines
## 12                                                                      Grenada
## 13                                                          St. Kitts and Nevis
## 14                                                          Republic of Vanuatu
## 15                                                    Republic of Guinea-Bissau
## 16                                                       Republic of The Gambia
## 17                                                              Solomon Islands
## 18                                                       Republic of Seychelles
## 19                                                        Antigua and Barbuda
## 20                                                                  St. Lucia
## 21                                         Democratic Republic of Timor-Leste
## 22                                                                     Belize
## 23                                                        Republic of Liberia
## 24                                                          Kingdom of Bhutan
## 25                                                     Republic of Cape Verde
## 26                                                   Central African Republic
## 27                                                       Republic of Maldives
## 28                                                         Kingdom of Lesotho
## 29                                                        Republic of Burundi
## 30                                                                      Aruba
## 31                                                         Republic of Guyana
## 32                                                           State of Eritrea
## 33                                                       Kingdom of Swaziland
## 34                                                   Republic of Sierra Leone
## 35                                                           Republic of Togo
## 36                                                           Republic of Fiji
## 37                                             Islamic Republic of Mauritania
## 38                                                                   Barbados
## 39                                                         Republic of Malawi
## 40                                                                 Montenegro
## 41                                                       Republic of Suriname
## 42                                                               The Bermudas
## 43                                                         Republic of Guinea
## 44                                                     Principality of Monaco
## 45                                                         Republic of Kosovo
## 46                                                            Kyrgyz Republic
## 47                                                          Republic of Niger
## 48                                                     Republic of Tajikistan
## 49                                                         Republic of Rwanda
## 50                                                        Republic of Moldova
## 51                                                          Republic of Benin
## 52                                                          Republic of Haiti
## 53                                                Commonwealth of The Bahamas
## 54                                                          Republic of Malta
## 55                                           Lao People's Democratic Republic
## 56                                      Former Yugoslav Republic of Macedonia
## 57                                                       Republic of Zimbabwe
## 58                                                        Republic of Armenia
## 59                                                     Republic of Madagascar
## 60                                                                   Mongolia
## 61                                                           Republic of Mali
## 62                                                               Burkina Faso
## 63                                                      Republic of Mauritius
## 64                                                      Republic of Nicaragua
## 65                                                        Republic of Albania
## 66                                                           Republic of Chad
## 67                                                        Republic of Namibia
## 68                                                        Republic of Iceland
## 69                                                          Republic of Congo
## 70                                                        Kingdom of Cambodia
## 71                                                        Republic of Senegal
## 72                                                     Republic of Mozambique
## 73                                                        Republic of Botswana
## 74                                                                     Jamaica
## 75                                   The Independent State of Papua New Guinea
## 76                                                                     Georgia
## 77                                                           Brunei Darussalam
## 78                                            Democratic Republic of the Congo
## 79                                                      Bosnia and Herzegovina
## 80                                               Republic of Equatorial Guinea
## 81                                                           Gabonese Republic
## 82                                                        Republic of Honduras
## 83                                                                       Nepal
## 84                                                          Republic of Uganda
## 85                                                Islamic State of Afghanistan
## 86                                                          Republic of Zambia
## 87                                                         Republic of Estonia
## 88                                                          Republic of Cyprus
## 89                                             Republic of Trinidad and Tobago
## 90                                                     Republic of El Salvador
## 91                                               Republic of C\xf4te d’Ivoire
## 92                                                        Republic of Cameroon
## 93                                                        Republic of Paraguay
## 94                                              Plurinational State of Bolivia
## 95                                                 United Republic of Tanzania
## 96                                                          Republic of Latvia
## 97                                                          Kingdom of Bahrain
## 98                                                 Hashemite Kingdom of Jordan
## 99                                                                Turkmenistan
## 100                                                          Republic of Yemen
## 101                                                         Republic of Panama
## 102                                                         Republic of Serbia
## 103                                                          Republic of Kenya
## 104                                                          Republic of Ghana
## 105                                    Federal Democratic Republic of Ethiopia
## 106                                                      Republic of Lithuania
## 107                                                          Lebanese Republic
## 108     Macao Special Administrative Region of the People’s Republic of China
## 109                                                     Republic of Costa Rica
## 110                                                       Republic of Slovenia
## 111                                                        Republic of Tunisia
## 112                                               Oriental Republic of Uruguay
## 113                                                      Republic of Guatemala
## 114                                                       Republic of Bulgaria
## 115                                                     Republic of Uzbekistan
## 116                                                  Grand Duchy of Luxembourg
## 117                                                      Republic of the Sudan
## 118                                                         Dominican Republic
## 119                                                        Republic of Croatia
## 120                                 Democratic Socialist Republic of Sri Lanka
## 121                                                        Republic of Belarus
## 122                                                     Republic of Azerbaijan
## 123                                                           Republic of Cuba
## 124                                                          Sultanate of Oman
## 125                                                       Syrian Arab Republic
## 126                                                        Republic of Ecuador
## 127                                                           Slovak Republic
## 128                                                        Kingdom of Morocco
## 129                                                               Puerto Rico
## 130                                               People’s Republic of Angola
## 131                                           People’s Republic of Bangladesh
## 132                                                       Republic of Hungary
## 133                                             Socialist Republic of Vietnam
## 134                                                           State of Kuwait
## 135                                                               New Zealand
## 136                                                            State of Qatar
## 137                                                                   Ukraine
## 138                                                                   Romania
## 139                                                            Czech Republic
## 140                                                    Republic of Kazakhstan
## 141                                                          Republic of Peru
## 142                                   People’s Democratic Republic of Algeria
## 143                                                          Republic of Iraq
## 144                                                                   Ireland
## 145                                                       Portuguese Republic
## 146                                              Islamic Republic of Pakistan
## 147                                                       Republic of Finland
## 148                                                         Hellenic Republic
## 149                                               Republic of the Philippines
## 150                                                           State of Israel
## 151                                               Federal Republic of Nigeria
## 152                                                    Arab Republic of Egypt
## 153 Hong Kong Special Administrative Region of the People’s Republic of China
## 154                                                         Republic of Chile
## 155                                                     Republic of Singapore
## 156                                                                  Malaysia
## 157                                                        Kingdom of Denmark
## 158                                                      United Arab Emirates
## 159                                                       Kingdom of Thailand
## 160                                                      Republic of Colombia
## 161                                     Rep\xfablica Bolivariana de Venezuela
## 162                                                  Republic of South Africa
## 163                                                       Republic of Austria
## 164                                                        Argentine Republic
## 165                                                        Kingdom of Belgium
## 166                                                        Republic of Poland
## 167                                                         Kingdom of Norway
## 168                                                  Islamic Republic of Iran
## 169                                                         Kingdom of Sweden
## 170                                                               Switzerland
## 171                                                   Kingdom of Saudi Arabia
## 172                                                Kingdom of the Netherlands
## 173                                                        Republic of Turkey
## 174                                                     Republic of Indonesia
## 175                                                         Republic of Korea
## 176                                                     United Mexican States
## 177                                                          Kingdom of Spain
## 178                                                 Commonwealth of Australia
## 179                                                                    Canada
## 180                                                         Republic of India
## 181                                                          Italian Republic
## 182                                                        Russian Federation
## 183                                             Federative Republic of Brazil
## 184                      United Kingdom of Great Britain and Northern Ireland
## 185                                                           French Republic
## 186                                               Federal Republic of Germany
## 187                                                                     Japan
## 188                                                People’s Republic of China
## 189                                                  United States of America
## 190                                                   Principality of Andorra
## 191                                                            American Samoa
## 192                                                           Channel Islands
## 193                                                            Cayman Islands
## 194                                                      Republic of Djibouti
## 195                                     East Asia & Pacific (developing only)
## 196                                   Europe & Central Asia (developing only)
## 197                                                                 Euro area
## 198                                                            Faeroe Islands
## 199                                                                 Greenland
## 200                                                                      Guam
## 201                                                               High income
## 202                                                               Isle of Man
## 203                               Latin America & Caribbean (developing only)
## 204                                 Socialist People’s Libyan Arab Jamahiriya
## 205                                                                Low income
## 206                                             Principality of Liechtenstein
## 207                                                       Lower middle income
## 208                                                       Low & middle income
## 209                                                             Middle income
## 210                                                          Union of Myanmar
## 211                              Middle East & North Africa (developing only)
## 212                              Commonwealth of the Northern Mariana Islands
## 213                                                             New Caledonia
## 214                                     Democratic People’s Republic of Korea
## 215                                                          French Polynesia
## 216                                                                South Asia
## 217                                                    Republic of San Marino
## 218                                                Somali Democratic Republic
## 219                                      Sub-Saharan Africa (developing only)
## 220                                                  Turks and Caicos Islands
## 221                                                       Upper middle income
## 222                                       Virgin Islands of the United States
## 223                                                        West Bank and Gaza
## 224                                                                     World
##             Income.Group                     Region Lending.category
## 1    Lower middle income        East Asia & Pacific
## 2    Lower middle income        East Asia & Pacific              IDA
## 3    Lower middle income        East Asia & Pacific             IBRD
## 4    Upper middle income        East Asia & Pacific             IBRD
## 5    Lower middle income         Sub-Saharan Africa              IDA
## 6    Lower middle income        East Asia & Pacific             IBRD
## 7    Lower middle income        East Asia & Pacific              IDA
## 8    Upper middle income  Latin America & Caribbean            Blend
## 9             Low income         Sub-Saharan Africa              IDA
## 10   Lower middle income        East Asia & Pacific              IDA
## 11   Upper middle income  Latin America & Caribbean            Blend
## 12   Upper middle income  Latin America & Caribbean            Blend
## 13   Upper middle income  Latin America & Caribbean             IBRD
## 14   Lower middle income        East Asia & Pacific              IDA
## 15            Low income         Sub-Saharan Africa              IDA
## 16            Low income         Sub-Saharan Africa              IDA
## 17            Low income        East Asia & Pacific              IDA
## 18   Upper middle income         Sub-Saharan Africa             IBRD
## 19   Upper middle income  Latin America & Caribbean             IBRD
## 20   Upper middle income  Latin America & Caribbean            Blend
## 21   Lower middle income        East Asia & Pacific              IDA
## 22   Lower middle income  Latin America & Caribbean             IBRD
## 23            Low income         Sub-Saharan Africa              IDA
## 24   Lower middle income                 South Asia              IDA
## 25   Lower middle income         Sub-Saharan Africa            Blend
## 26            Low income         Sub-Saharan Africa              IDA
## 27   Lower middle income                 South Asia              IDA
## 28   Lower middle income         Sub-Saharan Africa              IDA
## 29            Low income         Sub-Saharan Africa              IDA
## 30  High income: nonOECD  Latin America & Caribbean
## 31   Lower middle income  Latin America & Caribbean              IDA
## 32            Low income         Sub-Saharan Africa              IDA
## 33   Lower middle income         Sub-Saharan Africa             IBRD
## 34            Low income         Sub-Saharan Africa              IDA
## 35            Low income         Sub-Saharan Africa              IDA
## 36   Upper middle income        East Asia & Pacific             IBRD
## 37            Low income         Sub-Saharan Africa              IDA
## 38  High income: nonOECD  Latin America & Caribbean
## 39            Low income         Sub-Saharan Africa              IDA
## 40   Upper middle income      Europe & Central Asia             IBRD
## 41   Upper middle income  Latin America & Caribbean             IBRD
## 42  High income: nonOECD              North America
## 43            Low income         Sub-Saharan Africa              IDA
## 44  High income: nonOECD      Europe & Central Asia
## 45   Lower middle income      Europe & Central Asia              IDA
## 46            Low income      Europe & Central Asia              IDA
## 47            Low income         Sub-Saharan Africa              IDA
## 48            Low income      Europe & Central Asia              IDA
## 49            Low income         Sub-Saharan Africa              IDA
## 50   Lower middle income      Europe & Central Asia              IDA
## 51            Low income         Sub-Saharan Africa              IDA
## 52            Low income  Latin America & Caribbean              IDA
## 53  High income: nonOECD  Latin America & Caribbean
## 54  High income: nonOECD Middle East & North Africa
## 55            Low income        East Asia & Pacific              IDA
## 56   Upper middle income      Europe & Central Asia             IBRD
## 57            Low income         Sub-Saharan Africa            Blend
## 58   Lower middle income      Europe & Central Asia            Blend
## 59            Low income         Sub-Saharan Africa              IDA
## 60   Lower middle income        East Asia & Pacific              IDA
## 61            Low income         Sub-Saharan Africa              IDA
## 62            Low income         Sub-Saharan Africa              IDA
## 63   Upper middle income         Sub-Saharan Africa             IBRD
## 64   Lower middle income  Latin America & Caribbean              IDA
## 65   Upper middle income      Europe & Central Asia             IBRD
## 66            Low income         Sub-Saharan Africa              IDA
## 67   Upper middle income         Sub-Saharan Africa             IBRD
## 68     High income: OECD      Europe & Central Asia
## 69   Lower middle income         Sub-Saharan Africa              IDA
## 70            Low income        East Asia & Pacific              IDA
## 71   Lower middle income         Sub-Saharan Africa              IDA
## 72            Low income         Sub-Saharan Africa              IDA
## 73   Upper middle income         Sub-Saharan Africa             IBRD
## 74   Upper middle income  Latin America & Caribbean             IBRD
## 75   Lower middle income        East Asia & Pacific            Blend
## 76   Lower middle income      Europe & Central Asia            Blend
## 77  High income: nonOECD        East Asia & Pacific
## 78            Low income         Sub-Saharan Africa              IDA
## 79   Upper middle income      Europe & Central Asia            Blend
## 80  High income: nonOECD         Sub-Saharan Africa             IBRD
## 81   Upper middle income         Sub-Saharan Africa             IBRD
## 82   Lower middle income  Latin America & Caribbean              IDA
## 83            Low income                 South Asia              IDA
## 84            Low income         Sub-Saharan Africa              IDA
## 85            Low income                 South Asia              IDA
## 86            Low income         Sub-Saharan Africa              IDA
## 87  High income: nonOECD      Europe & Central Asia
## 88  High income: nonOECD      Europe & Central Asia
## 89  High income: nonOECD  Latin America & Caribbean             IBRD
## 90   Lower middle income  Latin America & Caribbean             IBRD
## 91   Lower middle income         Sub-Saharan Africa              IDA
## 92   Lower middle income         Sub-Saharan Africa              IDA
## 93   Lower middle income  Latin America & Caribbean             IBRD
## 94   Lower middle income  Latin America & Caribbean            Blend
## 95            Low income         Sub-Saharan Africa              IDA
## 96  High income: nonOECD      Europe & Central Asia
## 97  High income: nonOECD Middle East & North Africa
## 98   Lower middle income Middle East & North Africa             IBRD
## 99   Lower middle income      Europe & Central Asia             IBRD
## 100  Lower middle income Middle East & North Africa              IDA
## 101  Upper middle income  Latin America & Caribbean             IBRD
## 102  Upper middle income      Europe & Central Asia             IBRD
## 103           Low income         Sub-Saharan Africa              IDA
## 104           Low income         Sub-Saharan Africa              IDA
## 105           Low income         Sub-Saharan Africa              IDA
## 106  Upper middle income      Europe & Central Asia
## 107  Upper middle income Middle East & North Africa             IBRD
## 108 High income: nonOECD        East Asia & Pacific
## 109  Upper middle income  Latin America & Caribbean             IBRD
## 110    High income: OECD      Europe & Central Asia
## 111  Lower middle income Middle East & North Africa             IBRD
## 112  Upper middle income  Latin America & Caribbean             IBRD
## 113  Lower middle income  Latin America & Caribbean             IBRD
## 114  Upper middle income      Europe & Central Asia             IBRD
## 115  Lower middle income      Europe & Central Asia            Blend
## 116    High income: OECD      Europe & Central Asia
## 117  Lower middle income         Sub-Saharan Africa              IDA
## 118  Upper middle income  Latin America & Caribbean             IBRD
## 119 High income: nonOECD      Europe & Central Asia             IBRD
## 120  Lower middle income                 South Asia              IDA
## 121  Upper middle income      Europe & Central Asia             IBRD
## 122  Upper middle income      Europe & Central Asia            Blend
## 123  Upper middle income  Latin America & Caribbean
## 124 High income: nonOECD Middle East & North Africa
## 125  Lower middle income Middle East & North Africa             IBRD
## 126  Lower middle income  Latin America & Caribbean             IBRD
## 127    High income: OECD      Europe & Central Asia
## 128  Lower middle income Middle East & North Africa             IBRD
## 129 High income: nonOECD  Latin America & Caribbean
## 130  Lower middle income         Sub-Saharan Africa              IDA
## 131           Low income                 South Asia              IDA
## 132    High income: OECD      Europe & Central Asia
## 133  Lower middle income        East Asia & Pacific            Blend
## 134 High income: nonOECD Middle East & North Africa
## 135    High income: OECD        East Asia & Pacific
## 136 High income: nonOECD Middle East & North Africa
## 137  Lower middle income      Europe & Central Asia             IBRD
## 138  Upper middle income      Europe & Central Asia             IBRD
## 139    High income: OECD      Europe & Central Asia
## 140  Upper middle income      Europe & Central Asia             IBRD
## 141  Upper middle income  Latin America & Caribbean             IBRD
## 142  Upper middle income Middle East & North Africa             IBRD
## 143  Lower middle income Middle East & North Africa             IBRD
## 144    High income: OECD      Europe & Central Asia
## 145    High income: OECD      Europe & Central Asia
## 146  Lower middle income                 South Asia            Blend
## 147    High income: OECD      Europe & Central Asia
## 148    High income: OECD      Europe & Central Asia
## 149  Lower middle income        East Asia & Pacific             IBRD
## 150    High income: OECD Middle East & North Africa
## 151  Lower middle income         Sub-Saharan Africa              IDA
## 152  Lower middle income Middle East & North Africa             IBRD
## 153 High income: nonOECD        East Asia & Pacific
## 154  Upper middle income  Latin America & Caribbean             IBRD
## 155 High income: nonOECD        East Asia & Pacific
## 156  Upper middle income        East Asia & Pacific             IBRD
## 157    High income: OECD      Europe & Central Asia
## 158 High income: nonOECD Middle East & North Africa
## 159  Lower middle income        East Asia & Pacific             IBRD
## 160  Upper middle income  Latin America & Caribbean             IBRD
## 161  Upper middle income  Latin America & Caribbean             IBRD
## 162  Upper middle income         Sub-Saharan Africa             IBRD
## 163    High income: OECD      Europe & Central Asia
## 164  Upper middle income  Latin America & Caribbean             IBRD
## 165    High income: OECD      Europe & Central Asia
## 166    High income: OECD      Europe & Central Asia             IBRD
## 167    High income: OECD      Europe & Central Asia
## 168  Upper middle income Middle East & North Africa             IBRD
## 169    High income: OECD      Europe & Central Asia
## 170    High income: OECD      Europe & Central Asia
## 171 High income: nonOECD Middle East & North Africa
## 172    High income: OECD      Europe & Central Asia
## 173  Upper middle income      Europe & Central Asia             IBRD
## 174  Lower middle income        East Asia & Pacific             IBRD
## 175    High income: OECD        East Asia & Pacific             IBRD
## 176  Upper middle income  Latin America & Caribbean             IBRD
## 177    High income: OECD      Europe & Central Asia
## 178    High income: OECD        East Asia & Pacific
## 179    High income: OECD              North America
## 180  Lower middle income                 South Asia            Blend
## 181    High income: OECD      Europe & Central Asia
## 182  Upper middle income      Europe & Central Asia             IBRD
## 183  Upper middle income  Latin America & Caribbean             IBRD
## 184    High income: OECD      Europe & Central Asia
## 185    High income: OECD      Europe & Central Asia
## 186    High income: OECD      Europe & Central Asia
## 187    High income: OECD        East Asia & Pacific
## 188  Lower middle income        East Asia & Pacific             IBRD
## 189    High income: OECD              North America
## 190 High income: nonOECD      Europe & Central Asia
## 191  Upper middle income        East Asia & Pacific
## 192 High income: nonOECD      Europe & Central Asia
## 193 High income: nonOECD  Latin America & Caribbean
## 194  Lower middle income Middle East & North Africa              IDA
## 195
## 196
## 197
## 198 High income: nonOECD      Europe & Central Asia
## 199 High income: nonOECD      Europe & Central Asia
## 200 High income: nonOECD        East Asia & Pacific
## 201
## 202 High income: nonOECD      Europe & Central Asia
## 203
## 204  Upper middle income Middle East & North Africa             IBRD
## 205
## 206 High income: nonOECD      Europe & Central Asia
## 207
## 208
## 209
## 210           Low income        East Asia & Pacific              IDA
## 211
## 212 High income: nonOECD        East Asia & Pacific
## 213 High income: nonOECD        East Asia & Pacific
## 214           Low income        East Asia & Pacific
## 215 High income: nonOECD        East Asia & Pacific
## 216
## 217 High income: nonOECD      Europe & Central Asia
## 218           Low income         Sub-Saharan Africa              IDA
## 219
## 220 High income: nonOECD  Latin America & Caribbean
## 221
## 222 High income: nonOECD  Latin America & Caribbean
## 223  Lower middle income Middle East & North Africa
## 224
##     Other.groups                              Currency.Unit
## 1                                         Australian dollar
## 2                                         Australian dollar
## 3                                               U.S. dollar
## 4                                               U.S. dollar
## 5           HIPC          S\xe3o Tom\xe9 and Principe dobra
## 6                                               U.S. dollar
## 7                                            Tongan pa’anga
## 8                                     East Caribbean dollar
## 9           HIPC                             Comorian franc
## 10                                              Samoan tala
## 11                                    East Caribbean dollar
## 12                                    East Caribbean dollar
## 13                                    East Caribbean dollar
## 14                                             Vanuatu vatu
## 15          HIPC                                  CFA franc
## 16          HIPC                             Gambian dalasi
## 17                                   Solomon Islands dollar
## 18                                         Seychelles rupee
## 19                                    East Caribbean dollar
## 20                                    East Caribbean dollar
## 21                                              U.S. dollar
## 22                                            Belize dollar
## 23          HIPC                            Liberian dollar
## 24                                       Bhutanese ngultrum
## 25                                        Cape Verde escudo
## 26          HIPC                                  CFA franc
## 27                                        Maldivian rufiyaa
## 28                                             Lesotho loti
## 29          HIPC                              Burundi franc
## 30                                            Aruban florin
## 31          HIPC                              Guyana dollar
## 32          HIPC                             Eritrean nakfa
## 33                                      Swaziland lilangeni
## 34          HIPC                       Sierra Leonean leone
## 35          HIPC                                  CFA franc
## 36                                            Fijian dollar
## 37          HIPC                        Mauritanian ouguiya
## 38                                          Barbados dollar
## 39          HIPC                              Malawi kwacha
## 40                                                     Euro
## 41                                          Suriname dollar
## 42                                           Bermuda dollar
## 43          HIPC                              Guinean franc
## 44                                                     Euro
## 45                                                     Euro
## 46          HIPC                                 Kyrgyz som
## 47          HIPC                                  CFA franc
## 48                                             Tajik somoni
## 49          HIPC                              Rwandan franc
## 50                                             Moldovan leu
## 51          HIPC                                  CFA franc
## 52          HIPC                             Haitian gourde
## 53                                          Bahamian dollar
## 54     Euro area       Euro (data reported in Maltese liri)
## 55                                                   Lao kip
## 56                                          Macedonian denar
## 57                                           Zimbabwe dollar
## 58                                             Armenian dram
## 59          HIPC                             Malagasy ariary
## 60                                          Mongolian tugrik
## 61          HIPC                                   CFA franc
## 62          HIPC                                   CFA franc
## 63                                           Mauritian rupee
## 64          HIPC                    Nicaraguan gold cordoba
## 65                                              Albanian lek
## 66          HIPC                                   CFA franc
## 67                                           Namibian dollar
## 68                                             Iceland krona
## 69          HIPC                                   CFA franc
## 70                                            Cambodian riel
## 71          HIPC                                   CFA franc
## 72          HIPC                     New Mozambican metical
## 73                                            Botswana pula
## 74                                           Jamaican dollar
## 75                                      Papua New Guinea kina
## 76                                             Georgian lari
## 77                                             Brunei dollar
## 78          HIPC                             Congolese franc
## 79                   Bosnia and Herzegovina convertible mark
## 80                                                 CFA franc
## 81                                                 CFA franc
## 82          HIPC                             Honduran lempira
## 83                                            Nepalese rupee
## 84          HIPC                             Ugandan shilling
## 85          HIPC                              Afghan afghani
## 86          HIPC                              Zambian kwacha
## 87                                            Estonian kroon
## 88     Euro area                                        Euro
## 89                                 Trinidad and Tobago dollar
## 90                                                U.S. dollar
## 91          HIPC                                   CFA franc
## 92          HIPC                                   CFA franc
## 93                                         Paraguayan guarani
## 94          HIPC                           Bolivian Boliviano
## 95          HIPC                           Tanzanian shilling
## 96                                              Latvian lats
## 97                                            Bahraini dinar
## 98                                           Jordanian dinar
## 99                                          New Turkmen manat
## 100                                              Yemeni rial
## 101                                         Panamanian balboa
## 102                                             Serbian dinar
## 103                                          Kenyan shilling
## 104         HIPC                            New Ghanaian cedi
## 105         HIPC                               Ethiopian birr
## 106                                         Lithuanian litas
## 107                                           Lebanese pound
## 108                                             Macao pataca
## 109                                       Costa Rican colon
## 110    Euro area                                       Euro
## 111                                          Tunisian dinar
## 112                                          Uruguayan peso
## 113                                      Guatemalan quetzal
## 114                                           Bulgarian lev
## 115                                               Uzbek sum
## 116    Euro area                                       Euro
## 117         HIPC                             Sudanese pound
## 118                                          Dominican peso
## 119                                           Croatian kuna
## 120                                        Sri Lankan rupee
## 121                                        Belarusian rubel
## 122                                         New Azeri manat
## 123                                              Cuban peso
## 124                                              Rial Omani
## 125                                            Syrian pound
## 126                                             U.S. dollar
## 127    Euro area                                       Euro
## 128                                         Moroccan dirham
## 129                                             U.S. dollar
## 130                                          Angolan kwanza
## 131                                        Bangladeshi taka
## 132                                        Hungarian forint
## 133                                         Vietnamese dong
## 134                                           Kuwaiti dinar
## 135                                      New Zealand dollar
## 136                                            Qatari riyal
## 137                                       Ukrainian hryvnia
## 138                                        New Romanian leu
## 139                                            Czech koruna
## 140                                            Kazakh tenge
## 141                                        Peruvian new sol
## 142                                          Algerian dinar
## 143                                             Iraqi dinar
## 144    Euro area                                       Euro
## 145    Euro area                                       Euro
## 146                                         Pakistani rupee
## 147    Euro area                                       Euro
## 148    Euro area                                       Euro
## 149                                         Philippine peso
## 150                                      Israeli new shekel
## 151                                          Nigerian naira
## 152                                          Egyptian pound
## 153                                        Hong Kong dollar
## 154                                            Chilean peso
## 155                                        Singapore dollar
## 156                                       Malaysian ringgit
## 157                                            Danish krone
## 158                                            U.A.E. dirham
## 159                                               Thai baht
## 160                                          Colombian peso
## 161                               Venezuelan bolivar fuerte
## 162                                      South African rand
## 163    Euro area                                       Euro
## 164                                          Argentine peso
## 165    Euro area                                       Euro
## 166                                            Polish zloty
## 167                                         Norwegian krone
## 168                                            Iranian rial
## 169                                           Swedish krona
## 170                                             Swiss franc
## 171                                     Saudi Arabian riyal
## 172    Euro area                                       Euro
## 173                                        New Turkish lira
## 174                                       Indonesian rupiah
## 175                                              Korean won
## 176                                            Mexican peso
## 177    Euro area                                       Euro
## 178                                       Australian dollar
## 179                                         Canadian dollar
## 180                                            Indian rupee
## 181    Euro area                                       Euro
## 182                                           Russian ruble
## 183                                          Brazilian real
## 184                                          Pound sterling
## 185    Euro area                                       Euro
## 186    Euro area                                       Euro
## 187                                            Japanese yen
## 188                                            Chinese yuan
## 189                                             U.S. dollar
## 190                                                    Euro
## 191                                             U.S. dollar
## 192                        Jersey pound and Guernsey pound 
## 193                                   Cayman Islands dollar
## 194                                          Djibouti franc
## 195
## 196
## 197
## 198                                            Danish krone
## 199                                            Danish krone
## 200                                             U.S. dollar
## 201
## 202                                              Manx pound
## 203
## 204                                            Libyan dinar
## 205
## 206                                             Swiss franc
## 207
## 208
## 209
## 210                                            Myanmar kyat
## 211
## 212                                             U.S. dollar
## 213                                               CFP franc
## 214              Democratic People’s Republic of Korean won
## 215                                               CFP franc
## 216
## 217                                                    Euro
## 218         HIPC                            Somali shilling
## 219
## 220                                             U.S. dollar
## 221
## 222                                             U.S. dollar
## 223                                      Israeli new shekel
## 224
##     Latest.population.census    Latest.household.survey
## 1
## 2                       2005
## 3                       1999
## 4                       2005
## 5                       2001
## 6                       2000
## 7                       2006
## 8                       2001
## 9                       2003                 MICS, 2000
## 10                      2006
## 11                      2001
## 12                      2001
## 13                      2001
## 14                      2009
## 15                      2009                 MICS, 2006
## 16                      2003              MICS, 2005/06
## 17                      1999
## 18                      2002
## 19                      2001
## 20                      2001
## 21                      2004                 DGHS, 2003
## 22                      2000                 MICS, 2006
## 23                      2008    DHS, 2007, MIS, 2008/09
## 24                      2005
## 25                      2000
## 26                      2003                 MICS, 2006
## 27                      2006                 MICS, 2001
## 28                      2006                  DHS, 2004
## 29                      1990                 MICS, 2005
## 30                      2000
## 31                      2002                 MICS, 2006
## 32                      1984                  DHS, 2002
## 33                      2007               DHS, 2006/07
## 34                      2004                   DHS 2008
## 35                      1981                 MICS, 2006
## 36                      2007
## 37                      2000                 MICS, 2007
## 38                      2000
## 39                      2008                  MICS 2006
## 40                      2003              MICS, 2005/06
## 41                      2004                 MICS, 2000
## 42                      2000
## 43                      1996                  DHS, 2005
## 44                      2008
## 45                      1981
## 46                      2009               MICS 2005/06
## 47                      2001             DHS/MICS, 2006
## 48                      2000                 MICS, 2005
## 49                      2002               DHS, 2007/08
## 50                      2004                  DHS, 2005
## 51                      2002                  DHS, 2006
## 52                      2003               DHS, 2005/06
## 53                      2000
## 54                      2005
## 55                      2005                 MICS, 2006
## 56                      2002                 MICS, 2005
## 57                      2002               DHS, 2005/06
## 58                      2001                  DHS, 2005
## 59                      1993               DHS, 2003/04
## 60                      2000                 MICS, 2005
## 61                      1998                  DHS, 2006
## 62                      2006                 MICS, 2006
## 63                      2000
## 64                      2005               RHS, 2006/07
## 65                      2001                 MICS, 2005
## 66                      1993                  DHS, 2004
## 67                      2001               DHS, 2006/07
## 68            Register based
## 69                      1996                  DHS, 2005
## 70                      2008                  DHS, 2005
## 71                      2002    DHS, 2005, MIS, 2008-09
## 72                      2007                  DHS, 2003
## 73                      2001                 MICS, 2000
## 74                      2001                  MICS 2005
## 75                      2000                  DHS, 1996
## 76                      2002      MICS, 2005, RHS, 2005
## 77                      2001
## 78                      1984                   DHS 2007
## 79                      1991                 MICS, 2006
## 80                      2002
## 81                      2003                  DHS, 2000
## 82                      2001               DHS, 2005/06
## 83                      2001                  DHS, 2006
## 84                      2002       DHS, 2006, SPA, 2007
## 85                      1979                 MICS, 2003
## 86                      2000                  DHS, 2007
## 87                      2000
## 88                      2001
## 89                      2000                 MICS, 2006
## 90                      2007                  RHS, 2008
## 91                      1998                 MICS, 2006
## 92                      1987                 MICS, 2006
## 93                      2002                  RHS, 2004
## 94                      2001                  DHS, 2008
## 95                      2002 DHS, 2004/05, AIS, 2007/08
## 96                      2000
## 97                      2001
## 98                      2004                  DHS, 2007
## 99                      1995                  MICS,2006
## 100                     2004                 MICS, 2006
## 101                     2000                 LSMS, 2003
## 102                     2002              MICS, 2005-06
## 103                     1999       DHS, 2003, SPA, 2004
## 104                     2000                  DHS, 2008
## 105                     2007                  DHS, 2005
## 106                     2001
## 107                     1970                 MICS, 2000
## 108                     2006
## 109                     2000                  RHS, 1993
## 110                     2002
## 111                     2004                 MICS, 2006
## 112                     2004
## 113                     2002                  RHS, 2002
## 114                     2001
## 115                     1989                 MICS, 2006
## 116                     2001
## 117                     2008           MICS-PAPFAM 2006
## 118                     2002                  DHS, 2007
## 119                     2001
## 120                     2001                  DHS, 1987
## 121                     1999                 MICS, 2005
## 122                     2009                  DHS, 2006
## 123                     2002                 MICS, 2006
## 124                     2003                  FHS, 1995
## 125                     2004                 MICS, 2006
## 126                     2001                  RHS, 2004
## 127                     2001
## 128                     2004                 MICS, 2006
## 129                     2000               RHS, 1995/96
## 130                     1970   MICS, 2001, MIS, 2006/07
## 131                     2001                  DHS, 2007
## 132                     2001
## 133                     2009                 MICS, 2006
## 134                     2005                  FHS, 1996
## 135                     2006
## 136                     2004
## 137                     2001                  DHS, 2007
## 138                     2002                  RHS, 1999
## 139                     2001                  RHS, 1993
## 140                     1999                 MICS, 2006
## 141                     2007               DHS, 2007/08
## 142                     2008                 MICS, 2006
## 143                     1997                 MICS, 2006
## 144                     2006
## 145                     2001
## 146                     1998               DHS, 2006/07
## 147                     2000
## 148                     2001
## 149                     2007                  DHS, 2008
## 150                     2008
## 151                     2006                  DHS, 2008
## 152                     2006                  DHS, 2008
## 153                     2006
## 154                     2002
## 155                     2000   General  household, 2005
## 156                     2000
## 157                     2001
## 158                     2005
## 159                     2000               MICS 2005/06
## 160                     2005                  DHS, 2005
## 161                     2001                 MICS, 2000
## 162                     2001                  DHS, 2003
## 163                     2001
## 164                     2001
## 165                     2001
## 166                     2002
## 167                     2001
## 168                     2006                  DHS, 2000
## 169           Register based
## 170                     2000
## 171                     2004   Demographic survey, 2007
## 172                     2001
## 173                     2000                  DHS, 2003
## 174                     2000                  DHS, 2007
## 175                     2005
## 176                     2005                 ENPF, 1995
## 177                     2001
## 178                     2006
## 179                     2006
## 180                     2001               DHS, 2005/06
## 181                     2001
## 182                     2002                  RHS, 1996
## 183                     2000                  DHS, 1996
## 184                     2001
## 185           2006 (rolling)
## 186                     2001
## 187                     2005
## 188                     2000                  NSS, 2007
## 189                     2000              CPS (monthly)
## 190           Register based
## 191                     2000
## 192                     2001
## 193                     1999
## 194                     2009                 MICS, 2006
## 195
## 196
## 197
## 198           Register based
## 199           Register based
## 200                     2000
## 201
## 202                     2006
## 203
## 204                     1995                 MICS, 2000
## 205
## 206                     2000
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## 209
## 210                    1983                   MICS, 2000
## 211
## 212                    2000
## 213                    2009
## 214                    2008                   MICS, 2000
## 215                    2007
## 216
## 217          Register based
## 218                    1987                   MICS, 2006
## 219
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## 221
## 222                    2000
## 223                    2007                 PAPFAM, 2006
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## 101
## 102 Montenegro declared independence from Serbia and Montenegro on June 3, 2006. Where available, da
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## 117 1981/82 (Reporting period switch from fiscal year to calendar year from 1996. Pre-1996 data conve
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##     National.accounts.reference.year System.of.National.Accounts
## 1                                 NA                          NA
## 2                                 NA                          NA
## 3                                 NA                          NA
## 4                                 NA                          NA
## 5                                 NA                          NA
## 6                                 NA                          NA
## 7                                 NA                          NA
## 8                                 NA                        1993
## 9                                 NA                          NA
## 10                                NA                          NA
## 11                                NA                          NA
## 12                                NA                          NA
## 13                                NA                        1993
## 14                                NA                          NA
## 15                                NA                          NA
## 16                                NA                          NA
## 17                                NA                          NA
## 18                                NA                          NA
## 19                                NA                           NA
## 20                                NA                           NA
## 21                                NA                           NA
## 22                                NA                         1993
## 23                                NA                           NA
## 24                                NA                         1993
## 25                                NA                           NA
## 26                                NA                           NA
## 27                                NA                           NA
## 28                                NA                         1993
## 29                                NA                           NA
## 30                                NA                           NA
## 31                                NA                           NA
## 32                                NA                           NA
## 33                                NA                           NA
## 34                                NA                         1993
## 35                                NA                           NA
## 36                                NA                           NA
## 37                                NA                           NA
## 38                                NA                           NA
## 39                                NA                           NA
## 40                                NA                         1993
## 41                                NA                         1993
## 42                                NA                           NA
## 43                                NA                           NA
## 44                                NA                           NA
## 45                                NA                           NA
## 46                              1995                         1993
## 47                                NA                           NA
## 48                              2000                         1993
## 49                                NA                           NA
## 50                              1996                         1993
## 51                                NA                           NA
## 52                                NA                           NA
## 53                                NA                         1993
## 54                                NA                           NA
## 55                                NA                           NA
## 56                              1995                         1993
## 57                                NA                           NA
## 58                              1996                         1993
## 59                                NA                           NA
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## 64                                NA                         1993
## 65                              1996                         1993
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## 67                                NA                         1993
## 68                                NA                           NA
## 69                                NA                           NA
## 70                                NA                           NA
## 71                              1987                         1993
## 72                                NA                           NA
## 73                                NA                        1993
## 74                                NA                          NA
## 75                                NA                          NA
## 76                              1996                        1993
## 77                                NA                          NA
## 78                                NA                        1993
## 79                              1996                        1993
## 80                                NA                          NA
## 81                                NA                          NA
## 82                                NA                        1993
## 83                                NA                          NA
## 84                                NA                          NA
## 85                                NA                          NA
## 86                                NA                          NA
## 87                                NA                        1993
## 88                              2000                          NA
## 89                                NA                        1993
## 90                                NA                          NA
## 91                                NA                          NA
## 92                                NA                        1993
## 93                                NA                          NA
## 94                                NA                        1993
## 95                                NA                          NA
## 96                                NA                        1993
## 97                                NA                          NA
## 98                                NA                          NA
## 99                              2007                        1993
## 100                               NA                          NA
## 101                               NA                        1993
## 102                             2002                        1993
## 103                               NA                        1993
## 104                               NA                          NA
## 105                               NA                        1993
## 106                               NA                        1993
## 107                               NA                          NA
## 108                               NA                          NA
## 109                               NA                        1993
## 110                             2000                        1993
## 111                               NA                          NA
## 112                               NA                          NA
## 113                               NA                        1993
## 114                             2002                        1993
## 115                             1997                        1993
## 116                             2000                          NA
## 117                             1996                          NA
## 118                               NA                          NA
## 119                             1997                        1993
## 120                               NA                          NA
## 121                             2000                        1993
## 122                             2003                        1993
## 123                               NA                          NA
## 124                               NA                          NA
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## 126                               NA                        1993
## 127                              1995                         1993
## 128                                NA                           NA
## 129                                NA                           NA
## 130                                NA                           NA
## 131                                NA                         1993
## 132                              2000                         1993
## 133                                NA                         1993
## 134                                NA                           NA
## 135                                NA                           NA
## 136                                NA                           NA
## 137                              2003                         1993
## 138                              2005                         1993
## 139                              1995                         1993
## 140                              1995                         1993
## 141                                NA                           NA
## 142                                NA                           NA
## 143                                NA                           NA
## 144                                NA                         1993
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## 146                                NA                         1993
## 147                                NA                         1993
## 148                              2000                           NA
## 149                                NA                           NA
## 150                                NA                         1993
## 151                                NA                           NA
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## 157                                NA                         1993
## 158                                NA                           NA
## 159                                NA                           NA
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## 164                                NA                         1993
## 165                                NA                         1993
## 166                              2002                         1993
## 167                              2000                         1993
## 168                                NA                           NA
## 169                              2000                           NA
## 170                                NA                           NA
## 171                                NA                           NA
## 172                              2000                         1993
## 173                                NA                           NA
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## 177                                NA                         1993
## 178                              2007                         1993
## 179                                NA                         1993
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## 181                               NA                         1993
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## 185                             2000                         1993
## 186                               NA                         1993
## 187                               NA                           NA
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## 189                             2000                           NA
## 190                               NA                           NA
## 191                               NA                           NA
## 192                             2007                         1993
## 193                               NA                           NA
## 194                               NA                           NA
## 195                               NA                           NA
## 196                               NA                           NA
## 197                               NA                           NA
## 198                               NA                           NA
## 199                               NA                           NA
## 200                               NA                           NA
## 201                               NA                           NA
## 202                             2003                           NA
## 203                               NA                           NA
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## 211                               NA                           NA
## 212                               NA                           NA
## 213                               NA                           NA
## 214                               NA                           NA
## 215                               NA                           NA
## 216                               NA                           NA
## 217                             2000                         1993
## 218                               NA                           NA
## 219                               NA                           NA
## 220                               NA                           NA
## 221                               NA                           NA
## 222                               NA                           NA
## 223                               NA                           NA
## 224                               NA                           NA
##     SNA.price.valuation Alternative.conversion.factor PPP.survey.year
## 1                                                                  NA
## 2                   VAB                                            NA
## 3                   VAB                                            NA
## 4                   VAB                                            NA
## 5                   VAP                                          2005
## 6                   VAB                                            NA
## 7                   VAB                                            NA
## 8                   VAB                                            NA
## 9                   VAP                                          2005
## 10                  VAB                                            NA
## 11                  VAB                                            NA
## 12                  VAB                                            NA
## 13                  VAB                                            NA
## 14                  VAP                                            NA
## 15                  VAB                                          2005
## 16                  VAB                                          2005
## 17                  VAB                                            NA
## 18                  VAP                                            NA
## 19                  VAB                                            NA
## 20                  VAB                                            NA
## 21                  VAP                                            NA
## 22                  VAB                                            NA
## 23                  VAP                                          2005
## 24                  VAB                                          2005
## 25                  VAP                                          2005
## 26                  VAB                                          2005
## 27                  VAB                                          2005
## 28                  VAB                                          2005
## 29                  VAB                                          2005
## 30                                                                 NA
## 31                  VAB                                            NA
## 32                  VAB                                            NA
## 33                  VAB                                          2005
## 34                  VAB                                          2005
## 35                  VAP                                          2005
## 36                  VAB                                          2005
## 37                  VAB                                          2005
## 38                  VAB                                            NA
## 39                  VAB                                          2005
## 40                  VAB                                          2005
## 41                  VAB                                            NA
## 42                  VAB                                            NA
## 43                  VAB                                          2005
## 44                                                                 NA
## 45                                                                 NA
## 46                  VAB                       1990-95            2005
## 47                  VAP                          1993            2005
## 48                  VAB                       1990-95            2005
## 49                  VAP                          1994            2005
## 50                  VAB                       1990-95            2005
## 51                  VAP                          1992            2005
## 52                  VAB                          1991              NA
## 53                  VAB                                            NA
## 54                  VAB                                          2005
## 55                  VAB                                          2005
## 56                  VAB                                          2005
## 57                  VAB                    1991, 1998            2005
## 58                  VAB                       1990-95            2005
## 59                  VAB                                          2005
## 60                  VAB                                          2005
## 61                  VAB                                          2005
## 62                  VAB                       1992-93            2005
## 63                  VAB                                          2005
## 64                  VAB                       1965-95              NA
## 65                  VAB                                          2005
## 66                  VAB                                          2005
## 67                  VAB                                          2005
## 68                  VAB                                          2005
## 69                  VAP                          1993            2005
## 70                  VAB                                          2005
## 71                  VAB                                          2005
## 72                  VAB                       1992-95            2005
## 73                  VAB                                          2005
## 74                  VAB                                            NA
## 75                  VAB                          1989              NA
## 76                  VAB                       1990-95            2005
## 77                  VAP                                          2005
## 78                  VAB                       1999-01            2005
## 79                  VAB                                          2005
## 80                  VAB                       1965-84            2005
## 81                  VAP                          1993            2005
## 82                  VAB                       1988-89              NA
## 83                  VAB                                          2005
## 84                  VAB                                          2005
## 85                  VAB                                            NA
## 86                  VAB                       1990-92            2005
## 87                  VAB                       1987-95            2005
## 88                  VAB                                          2005
## 89                  VAB                                            NA
## 90                  VAB                                            NA
## 91                  VAP                                          2005
## 92                  VAB                                          2005
## 93                  VAP                                          2005
## 94                  VAB                       1960-85            2005
## 95                  VAB                                          2005
## 96                  VAB                       1987-95            2005
## 97                  VAP                                          2005
## 98                  VAB                                          2005
## 99                  VAB              1987-95, 1997-07              NA
## 100                 VAP                       1990-96            2005
## 101                 VAB                                            NA
## 102                 VAB                                          2005
## 103                 VAB                                          2005
## 104                 VAP                       1973-87            2005
## 105                 VAB                                          2005
## 106                 VAB                       1990-95            2005
## 107                 VAB                                          2005
## 108                 VAB                                          2005
## 109                 VAB                                            NA
## 110                 VAB                                          2005
## 111                 VAP                                          2005
## 112                 VAB                                          2005
## 113                 VAB                                            NA
## 114                 VAB              1978-89, 1991-92            2005
## 115                 VAB                       1990-95              NA
## 116                 VAB                                          2005
## 117                 VAB                                          2005
## 118                 VAB                                            NA
## 119                 VAB                                          2005
## 120                 VAP                                          2005
## 121                 VAB                       1990-95            2005
## 122                 VAB                       1992-95            2005
## 123                 VAP                                            NA
## 124                 VAP                                          2005
## 125                 VAB                       1970-08            2005
## 126                 VAB                                          2005
## 127                 VAB                                          2005
## 128                 VAB                                          2005
## 129                 VAP                                            NA
## 130                 VAP                       1991-96            2005
## 131                 VAB                                          2005
## 132                 VAB                                          2005
## 133                 VAP                          1991            2005
## 134                 VAP                                          2005
## 135                 VAB                                          2005
## 136                 VAP                                          2005
## 137                 VAB                       1987-95            2005
## 138                 VAB                 1987-89, 1992            2005
## 139                 VAB                                          2005
## 140                 VAB                       1987-95            2005
## 141                 VAB                       1985-90            2005
## 142                 VAB                                            NA
## 143                 VAB                    1997, 2004            2005
## 144                 VAB                                          2005
## 145                 VAB                                          2005
## 146                 VAB                                          2005
## 147                 VAB                                          2005
## 148                 VAB                                          2005
## 149                 VAP                                          2005
## 150                 VAP                                          2005
## 151                 VAB                       1971-98            2005
## 152                 VAB                                          2005
## 153                 VAB                                          2005
## 154                 VAB                                          2005
## 155                 VAB                                          2005
## 156                 VAP                                          2005
## 157                 VAB                                          2005
## 158                 VAB                                            NA
## 159                 VAP                                          2005
## 160                 VAB                       1992-94            2005
## 161                 VAB                                          2005
## 162                 VAB                                          2005
## 163                 VAB                                          2005
## 164                 VAB                       1971-84            2005
## 165                 VAB                                          2005
## 166                 VAB                                          2005
## 167                 VAB                                          2005
## 168                 VAB                       1980-02            2005
## 169                 VAB                                          2005
## 170                 VAB                                          2005
## 171                 VAP                                          2005
## 172                 VAB                                          2005
## 173                 VAB                                          2005
## 174                 VAP                                          2005
## 175                 VAB                                          2005
## 176                 VAB                                          2005
## 177                 VAB                                          2005
## 178                 VAB                                          2005
## 179                 VAB                                          2005
## 180                 VAB                                          2005
## 181                 VAB                                          2005
## 182                 VAB                       1987-95            2005
## 183                 VAB                                          2005
## 184                 VAB                                          2005
## 185                 VAB                                          2005
## 186                 VAB                                          2005
## 187                 VAB                                          2005
## 188                 VAP                       1978-93            2005
## 189                 VAB                                          2005
## 190                                                                NA
## 191                                                                NA
## 192                 VAB                                            NA
## 193                                                                NA
## 194                 VAB                                          2005
## 195                                                                NA
## 196                                                                NA
## 197                                                                NA
## 198                 VAB                                            NA
## 199                                                                NA
## 200                                                                NA
## 201                                                                NA
## 202                                                                NA
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## 208                                                                NA
## 209                                                                NA
## 210                 VAP                                            NA
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## 213                                                                NA
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## 216                                                                NA
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## 218                 VAB                       1977-90              NA
## 219                                                                NA
## 220                                                                NA
## 221                                                                NA
## 222                                                                NA
## 223                 VAB                                            NA
## 224                                                                NA
##     Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1
## 2
## 3
## 4
## 5                                                        Preliminary
## 6
## 7                                 BPM5                         Actual
## 8                                 BPM5                         Actual
## 9                                                        Preliminary
## 10                               BPM5                    Preliminary
## 11                               BPM5                    Preliminary
## 12                               BPM5                         Actual
## 13                               BPM5                    Preliminary
## 14                               BPM5                       Estimate
## 15                               BPM5                         Actual
## 16                               BPM5                       Estimate
## 17                               BPM5                         Actual
## 18                               BPM5                         Actual
## 19                               BPM5
## 20                               BPM5                         Actual
## 21
## 22                               BPM5                         Actual
## 23                               BPM5                       Estimate
## 24                                                            Actual
## 25                               BPM5                         Actual
## 26                               BPM4                    Preliminary
## 27                               BPM5                         Actual
## 28                               BPM5                         Actual
## 29                               BPM5                         Actual
## 30
## 31                               BPM5                         Actual
## 32                               BPM4                         Actual
## 33                                                       Preliminary
## 34                               BPM5                    Preliminary
## 35                               BPM5                         Actual
## 36                               BPM4                         Actual
## 37                               BPM4                         Actual
## 38                               BPM5
## 39                               BPM5                         Actual
## 40                                                            Actual
## 41                               BPM5
## 42
## 43                               BPM5                       Estimate
## 44
## 45
## 46                               BPM5                         Actual
## 47                               BPM5                    Preliminary
## 48                               BPM5                    Preliminary
## 49                               BPM5                       Estimate
## 50                               BPM5                         Actual
## 51                               BPM5                    Preliminary
## 52                               BPM5                    Preliminary
## 53                               BPM5
## 54                               BPM5
## 55                               BPM5                    Preliminary
## 56                               BPM5                         Actual
## 57                               BPM5                         Actual
## 58                               BPM5                         Actual
## 59                               BPM5                         Actual
## 60                               BPM5                       Estimate
## 61                               BPM4                         Actual
## 62                               BPM4                         Actual
## 63                               BPM5                         Actual
## 64                               BPM5                         Actual
## 65                               BPM5                         Actual
## 66                               BPM5                         Actual
## 67                               BPM5
## 68                               BPM5
## 69                               BPM5                    Preliminary
## 70                               BPM5                         Actual
## 71                               BPM5                         Actual
## 72                               BPM5                         Actual
## 73                               BPM5                    Preliminary
## 74                               BPM5                         Actual
## 75                               BPM5                         Actual
## 76                               BPM5                         Actual
## 77
## 78                               BPM5                       Estimate
## 79                               BPM5                         Actual
## 80
## 81                               BPM5                    Preliminary
## 82                               BPM5                         Actual
## 83                               BPM5                         Actual
## 84                               BPM5                         Actual
## 85                                                            Actual
## 86                               BPM5                    Preliminary
## 87                               BPM5
## 88                               BPM5
## 89                               BPM5
## 90                               BPM5                         Actual
## 91                               BPM5                         Actual
## 92                               BPM5                         Actual
## 93                               BPM5                         Actual
## 94                               BPM5                         Actual
## 95                               BPM5                         Actual
## 96                               BPM5                         Actual
## 97                               BPM5
## 98                               BPM5                         Actual
## 99                               BPM5                       Estimate
## 100                              BPM5                         Actual
## 101                              BPM5                         Actual
## 102                                                           Actual
## 103                              BPM5                         Actual
## 104                              BPM5                         Actual
## 105                              BPM5                         Actual
## 106                              BPM5                         Actual
## 107                              BPM5                         Actual
## 108                              BPM5
## 109                              BPM5                          Actual
## 110                              BPM5
## 111                              BPM5                          Actual
## 112                              BPM5                          Actual
## 113                              BPM5                          Actual
## 114                              BPM5                          Actual
## 115                              BPM5                          Actual
## 116                              BPM5
## 117                              BPM5                          Actual
## 118                              BPM5                          Actual
## 119                              BPM5
## 120                              BPM5                          Actual
## 121                              BPM5                          Actual
## 122                              BPM5                          Actual
## 123
## 124                              BPM5
## 125                              BPM5
## 126                              BPM5                          Actual
## 127                              BPM5
## 128                              BPM5                          Actual
## 129
## 130                              BPM5                          Actual
## 131                              BPM5                     Preliminary
## 132                              BPM5
## 133                              BPM4                        Estimate
## 134                              BPM5
## 135                              BPM5
## 136
## 137                              BPM5                          Actual
## 138                              BPM5                          Actual
## 139                              BPM5
## 140                              BPM5                          Actual
## 141                              BPM5                          Actual
## 142                              BPM5                          Actual
## 143                              BPM5
## 144                              BPM5
## 145                              BPM5
## 146                              BPM5                          Actual
## 147                              BPM5
## 148                              BPM5
## 149                              BPM5                          Actual
## 150                              BPM5
## 151                              BPM5                     Preliminary
## 152                              BPM5                          Actual
## 153                              BPM5
## 154                              BPM5                          Actual
## 155                              BPM5
## 156                              BPM5                        Estimate
## 157                              BPM5
## 158                              BPM4
## 159                              BPM5                        Estimate
## 160                              BPM5                          Actual
## 161                              BPM5                          Actual
## 162                              BPM5                     Preliminary
## 163                              BPM5
## 164                              BPM5                         Actual
## 165                              BPM5
## 166                              BPM5                         Actual
## 167                              BPM5
## 168                              BPM5                         Actual
## 169                              BPM5
## 170                              BPM5
## 171                              BPM4
## 172                              BPM5
## 173                              BPM5                         Actual
## 174                              BPM5                         Actual
## 175                              BPM5
## 176                              BPM5                         Actual
## 177                              BPM5
## 178                              BPM5
## 179                              BPM5
## 180                              BPM5                         Actual
## 181                              BPM5
## 182                              BPM5                    Preliminary
## 183                              BPM5                         Actual
## 184                              BPM5
## 185                              BPM5
## 186                              BPM5
## 187                              BPM5
## 188                              BPM5                    Preliminary
## 189                              BPM5
## 190
## 191
## 192
## 193
## 194                                                           Actual
## 195
## 196
## 197
## 198                              BPM5
## 199
## 200
## 201
## 202
## 203
## 204                              BPM5
## 205
## 206
## 207
## 208
## 209
## 210                              BPM5                       Estimate
## 211
## 212
## 213
## 214                              BPM5
## 215
## 216
## 217
## 218                                                         Estimate
## 219
## 220
## 221
## 222
## 223
## 224
##     System.of.trade Government.Accounting.concept
## 1
## 2           General
## 3
## 4
## 5           Special
## 6
## 7
## 8           General
## 9
## 10          General
## 11          General                  Consolidated
## 12          General                     Budgetary
## 13          General                  Consolidated
## 14                                   Consolidated
## 15          General
## 16          General                  Consolidated
## 17
## 18          General                  Consolidated
## 19          General
## 20          General
## 21
## 22          General                     Budgetary
## 23
## 24                                   Consolidated
## 25          Special
## 26          Special                     Budgetary
## 27          General                  Consolidated
## 28          General                  Consolidated
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## 30          Special
## 31          Special
## 32          General
## 33          General                  Consolidated
## 34          Special                     Budgetary
## 35          Special                     Budgetary
## 36          General                     Budgetary
## 37          General
## 38          General                  Consolidated
## 39          General
## 40
## 41          General
## 42
## 43          Special                  Consolidated
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## 45
## 46          General                  Consolidated
## 47          Special
## 48          General                  Consolidated
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## 50          General                  Consolidated
## 51          Special                     Budgetary
## 52          General
## 53          General                     Budgetary
## 54          General                  Consolidated
## 55          General
## 56          General
## 57          General                  Consolidated
## 58          Special                  Consolidated
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## 60          Special                  Consolidated
## 61          General                     Budgetary
## 62          General                     Budgetary
## 63          General                  Consolidated
## 64          Special                     Budgetary
## 65          General                  Consolidated
## 66          Special
## 67          General                     Budgetary
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## 69          Special                  Consolidated
## 70          General                  Consolidated
## 71          Special                     Budgetary
## 72          Special
## 73          General                     Budgetary
## 74          General                  Consolidated
## 75          General                     Budgetary
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## 77          General
## 78          Special                  Consolidated
## 79          General                  Consolidated
## 80
## 81          Special
## 82          Special                     Budgetary
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## 84          General                     Budgetary
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## 86          General                     Budgetary
## 87          General                  Consolidated
## 88          General                  Consolidated
## 89          Special                  Consolidated
## 90          Special                  Consolidated
## 91          Special                  Consolidated
## 92          Special                  Consolidated
## 93          Special                  Consolidated
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## 95          Special
## 96          Special                  Consolidated
## 97          General                  Consolidated
## 98          General                     Budgetary
## 99          General
## 100         General                     Budgetary
## 101         Special                  Consolidated
## 102         Special                  Consolidated
## 103         General                     Budgetary
## 104         General                     Budgetary
## 105         General                  Consolidated
## 106         General                  Consolidated
## 107         General                     Budgetary
## 108         General                  Consolidated
## 109         Special                  Consolidated
## 110         Special                  Consolidated
## 111         General                  Consolidated
## 112         Special                  Consolidated
## 113         Special                     Budgetary
## 114         General                  Consolidated
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## 116         Special                  Consolidated
## 117         General                     Budgetary
## 118         General                  Consolidated
## 119         General                  Consolidated
## 120         General                     Budgetary
## 121         General                  Consolidated
## 122         General                  Consolidated
## 123         General
## 124         General                     Budgetary
## 125         Special                  Consolidated
## 126         Special                     Budgetary
## 127         General                  Consolidated
## 128         Special                  Consolidated
## 129         General
## 130         Special
## 131         General                  Consolidated
## 132         Special                  Consolidated
## 133         General                  Consolidated
## 134         Special                  Consolidated
## 135         General                  Consolidated
## 136         General                     Budgetary
## 137         General                  Consolidated
## 138         Special                  Consolidated
## 139         General                  Consolidated
## 140         General                  Consolidated
## 141         Special                  Consolidated
## 142         Special                     Budgetary
## 143         Special
## 144         General                  Consolidated
## 145         Special                  Consolidated
## 146         General                  Consolidated
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## 148         Special                  Consolidated
## 149         General                     Budgetary
## 150         Special                  Consolidated
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## 152         Special                     Budgetary
## 153         General                  Consolidated
## 154         Special                  Consolidated
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## 157         General                  Consolidated
## 158         General                  Consolidated
## 159         General                  Consolidated
## 160         Special                     Budgetary
## 161         General                  Consolidated
## 162         General                  Consolidated
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## 164         Special                  Consolidated
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## 170         Special                  Consolidated
## 171         General
## 172         Special                  Consolidated
## 173         Special                     Budgetary
## 174         Special                  Consolidated
## 175         Special                  Consolidated
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## 181         Special                  Consolidated
## 182         General                  Consolidated
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## 184         General                  Consolidated
## 185         Special                  Consolidated
## 186         Special                  Consolidated
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## 188         Special                     Budgetary
## 189         General                  Consolidated
## 190         General
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## 197
## 198         General
## 199         General
## 200
## 201
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## 203
## 204         General
## 205
## 206         Special
## 207
## 208
## 209
## 210         General                  Consolidated
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## 212
## 213         Special
## 214
## 215         General
## 216
## 217         Special                  Consolidated
## 218
## 219
## 220
## 221
## 222         General
## 223                                     Budgetary
## 224
##     IMF.data.dissemination.standard
## 1
## 2                               GDDS
## 3
## 4
## 5                               GDDS
## 6
## 7                               GDDS
## 8                               GDDS
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## 10
## 11                              GDDS
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## 14                              GDDS
## 15                              GDDS
## 16                              GDDS
## 17
## 18                              SDDS
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## 20                              GDDS
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## 22                              GDDS
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## 25                              GDDS
## 26                              GDDS
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## 28                              GDDS
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## 33                              GDDS
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## 41                              GDDS
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## 43                              GDDS
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## 46                              SDDS
## 47                              GDDS
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## 81                              GDDS
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## 103                             GDDS
## 104                             GDDS
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## 116                             SDDS
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## 158                             GDDS
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## 161                             GDDS
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## 169                             SDDS
## 170                             SDDS
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## 202
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## 204                            GDDS
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## 215
## 216
## 217                            GDDS
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## 219
## 220
## 221
## 222
## 223                            GDDS
## 224
##     Source.of.most.recent.Income.and.expenditure.data
## 1
## 2
## 3
## 4
## 5                                           PS 2000-01
## 6
## 7
## 8
## 9                                            IHS, 2004
## 10
## 11
## 12
## 13
## 14
## 15                                          CWIQ, 2002
## 16                                           IHS, 2003
## 17
## 18
## 19
## 20                                           IHS, 1995
## 21                                          LSMS, 2007
## 22                                          ES/BS 1995
## 23                                           CWIQ 2007
## 24                                           IHS, 2003
## 25                                         ES/BS, 2001
## 26                                            PS, 2003
## 27
## 28                                     ES/BS, 2002-03
## 29                                         CWIQ, 2006
## 30
## 31                                          IHS, 1998
## 32
## 33                                     ES/BS, 2000/01
## 34                                          IHS, 2003
## 35                                         CWIQ, 2006
## 36
## 37                                          IHS, 2000
## 38
## 39                                      LSMS, 2004-05
## 40                                         ES/BS 2007
## 41                                        ES/BS, 1999
## 42
## 43                                        CWIQ/, 2003
## 44
## 45
## 46                                        ES/BS, 2007
## 47                                       QWIC/PS 2005
## 48                                         LSMS, 2004
## 49                                          IHS, 2000
## 50                                        ES/BS, 2007
## 51                                         CWIQ, 2003
## 52                                          IHS, 2001
## 53
## 54
## 55                                     ES/BS, 2002-03
## 56                                        ES/BS, 2006
## 57
## 58                                          IHS, 2007
## 59                                            PS 2005
## 60                                      LSMS, 2006-08
## 61                                          IHS, 2006
## 62                                         CWIQ, 2003
## 63
## 64                                         LSMS, 2005
## 65                                         LSMS, 2005
## 66                                        PS, 2002-03
## 67                                     ES/BS, 1993/94
## 68
## 69                                     CWIQ/ PS, 2005
## 70                                          IHS, 2007
## 71                                            PS 2005
## 72                                     ES/BS, 2002/03
## 73                                     ES/BS, 1993/94
## 74                                         LSMS, 2004
## 75                                          IHS, 1996
## 76                                          IHS, 2007
## 77
## 78                                     1-2-3, 2005-06
## 79                                         LSMS, 2007
## 80
## 81                                    CWIQ/ IHS, 2005
## 82                                          IHS, 2006
## 83                                      LSMS, 2003/04
## 84                                           PS, 2005
## 85
## 86                                       IHS, 2004-05
## 87                                        ES/BS, 2004
## 88
## 89                                          IHS, 1992
## 90                                          IHS, 2007
## 91                                          IHS, 2002
## 92                                           PS, 2001
## 93                                          IHS, 2007
## 94                                          IHS, 2007
## 95                                     ES/BS, 2000/01
## 96                                          IHS, 2007
## 97
## 98                                        ES/BS, 2006
## 99                                         LSMS, 1998
## 100                                       ES/BS, 2005
## 101                                         LFS, 2006
## 102
## 103                                      IHS, 2005-06
## 104                                        LSMS, 2006
## 105                                       ES/BS, 2005
## 106                                       ES/BS, 2004
## 107
## 108
## 109                                         LFS, 2007
## 110                                       ES/BS, 2004
## 111                                         IHS, 2000
## 112                                         IHS, 2007
## 113                                        LSMS, 2006
## 114                                       ES/BS, 2003
## 115                                       ES/BS, 2003
## 116
## 117
## 118                                         IHS, 2005
## 119                                       ES/BS, 2005
## 120                                       ES/BS, 2002
## 121                                        ES/BS 2007
## 122                                       ES/BS, 2005
## 123
## 124
## 125
## 126                                         LFS, 2005
## 127                                          IS, 1996
## 128                                       ES/BS, 2007
## 129
## 130                                         IHS, 2000
## 131                                         IHS, 2005
## 132                                       ES/BS, 2004
## 133                                         IHS, 2006
## 134
## 135                                          IS, 1997
## 136
## 137                                        ES/BS, 2008
## 138                                          LFS, 2007
## 139                                            IS 1996
## 140                                        ES/BS, 2007
## 141                                         LSMS, 2007
## 142                                          IHS, 1995
## 143
## 144                                          IHS, 2000
## 145                                           IS, 1997
## 146                                      LSMS, 2004/05
## 147                                           IS, 2000
## 148                                          IHS, 2000
## 149                                        ES/BS, 2006
## 150                                        ES/BS, 2001
## 151                                       IHS, 2003-04
## 152                                     ES/BS, 2004-05
## 153
## 154                                          IHS, 2006
## 155
## 156                                        ES/BS, 2004
## 157                                           ITR 1997
## 158
## 159                                          IHS, 2004
## 160                                          IHS, 2006
## 161                                          IHS, 2003
## 162                                        ES/BS, 2000
## 163                                            IS 2000
## 164                                          IHS, 2006
## 165                                          IHS, 2000
## 166                                        ES/BS, 2005
## 167                                           IS, 2000
## 168                                        ES/BS, 2005
## 169                                           IS, 2000
## 170                                        ES/BS, 2000
## 171
## 172                                          IHS, 1999
## 173                                          LFS, 2006
## 174                                          IHS, 2007
## 175                                        ES/BS, 1998
## 176                                          LFS, 2008
## 177                                          IHS, 2000
## 178                                        ES/BS, 1994
## 179                                          LFS, 2000
## 180                                       IHS, 2004/05
## 181                                        ES/BS, 2000
## 182                                          IHS, 2007
## 183                                          LFS, 2007
## 184                                           IS, 1999
## 185                                     ES/BS, 1994/95
## 186                                          IHS, 2000
## 187                                           IS, 1993
## 188                                          IHS, 2005
## 189                                           LFS 2000
## 190
## 191
## 192
## 193
## 194                                          PS, 2002
## 195
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## 223
## 224
##     Vital.registration.complete     Latest.agricultural.census
## 1
## 2
## 3
## 4                            Yes
## 5
## 6
## 7                            Yes                           2001
## 8                            Yes
## 9
## 10                                                         1999
## 11                           Yes
## 12
## 13
## 14
## 15                                                         1988
## 16                                                    2001-2002
## 17
## 18                           Yes                           1998
## 19                          Yes
## 20                          Yes
## 21
## 22
## 23
## 24                                                        2000
## 25                          Yes                           2004
## 26                                                        1985
## 27                          Yes
## 28                                                   1999-2000
## 29
## 30
## 31
## 32
## 33                                                        2003
## 34                                                   1984-1985
## 35                                                        1996
## 36                          Yes
## 37                                                   1984-1985
## 38                          Yes
## 39                                                        1993
## 40                          Yes
## 41                          Yes
## 42                          Yes
## 43                                                   2000-2001
## 44
## 45
## 46                          Yes                           2002
## 47                                                        1980
## 48                                                        1994
## 49                                                        1984
## 50                          Yes
## 51                                                        1992
## 52                                                        1971
## 53
## 54                          Yes                           2001
## 55                                                   1998-1999
## 56                          Yes                           1994
## 57                                                        1960
## 58                          Yes
## 59                                                        2004
## 60                          Yes
## 61                                                        1984
## 62                                                        1993
## 63                          Yes
## 64                                                        2001
## 65                          Yes                           1998
## 66
## 67                                                   1996-1997
## 68                          Yes
## 69                                                   1985-1986
## 70
## 71                                                   1998-1999
## 72                                                   1999-2000
## 73                                                        1993
## 74                                                        1996
## 75
## 76                          Yes                           2004
## 77                          Yes
## 78                                                        1990
## 79                          Yes
## 80
## 81                                                     1974-75
## 82                                                        1993
## 83                                                        2002
## 84                                                        1991
## 85
## 86                                                        1990
## 87                          Yes                           2001
## 88                          Yes
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## 90                          Yes                        1970-71
## 91                                                        2001
## 92                                                        1984
## 93                                                        1991
## 94                                                   1984-1988
## 95                                                   2002-2003
## 96                          Yes                           2001
## 97                          Yes
## 98                                                        1997
## 99                          Yes
## 100                                                       2002
## 101                                                       2001
## 102                         Yes
## 103                                                  1977-1979
## 104                                                       1984
## 105                                                  2001-2002
## 106                         Yes                           2003
## 107                                                  1998-1999
## 108                         Yes
## 109                         Yes                           1973
## 110                         Yes                           2000
## 111                                                       2004
## 112                         Yes                           2000
## 113                         Yes                           2003
## 114                         Yes
## 115                         Yes
## 116                         Yes 1999-2000 (conducted annually)
## 117
## 118                                                       1971
## 119                         Yes                           2003
## 120                         Yes                           2002
## 121                         Yes                           1994
## 122                         Yes
## 123                         Yes
## 124                                                  1978-1979
## 125                                                       1981
## 126                                                  1999-2000
## 127                         Yes                           2001
## 128                                                       1996
## 129                         Yes                      1997/2002
## 130                                                    1964-65
## 131                                                       2005
## 132                         Yes                           2000
## 133                                                       2001
## 134                         Yes                           1970
## 135                         Yes                           2002
## 136                         Yes                      2000-2001
## 137                         Yes
## 138                         Yes                           2002
## 139                         Yes                           2000
## 140                         Yes
## 141                                                       1994
## 142                                                       2001
## 143                                                       1981
## 144                         Yes                           2000
## 145                         Yes                           1999
## 146                                                       2000
## 147                         Yes                      1999-2000
## 148                         Yes                      1999-2000
## 149                         Yes                           2002
## 150                         Yes                           1981
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## 152                         Yes                      1999-2000
## 153                         Yes
## 154                         Yes                           1997
## 155                         Yes
## 156                         Yes
## 157                         Yes                      1999-2000
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## 159                                                       2003
## 160                                                       2001
## 161                         Yes                           1997
## 162                                                       2000
## 163                         Yes                      1999-2000
## 164                         Yes                           2002
## 165                         Yes 1999-2000 (conducted annually)
## 166                         Yes                      1996/2002
## 167                         Yes                           1999
## 168                         Yes                           2003
## 169                         Yes                      1999-2000
## 170                         Yes                           2000
## 171                                                       1999
## 172                         Yes 1999-2000 (conducted annually)
## 173                                                       2001
## 174                                                       2003
## 175                         Yes                           2000
## 176                                                       1991
## 177                         Yes                           1999
## 178                         Yes                           2001
## 179                         Yes                      1996/2001
## 180                                        1995-1996/2000-2001
## 181                         Yes                           2000
## 182                         Yes                        1994-95
## 183                                                       1996
## 184                         Yes 1999-2000 (conducted annually)
## 185                         Yes                      1999-2000
## 186                         Yes                      1999-2000
## 187                         Yes                           2000
## 188                                                       1997
## 189                         Yes                      1997/2002
## 190                         Yes
## 191                         Yes
## 192                         Yes
## 193                         Yes
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## 199                         Yes
## 200                         Yes
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## 204                                                       2001
## 205
## 206                         Yes
## 207
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## 209
## 210                                                       2003
## 211
## 212
## 213                         Yes
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## 215                         Yes
## 216
## 217                         Yes
## 218
## 219
## 220
## 221
## 222                         Yes
## 223                                                       1971
## 224
##     Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                       NA                NA                           NA
## 2                       NA              2005                           NA
## 3                       NA                NA                           NA
## 4                       NA                NA                           NA
## 5                       NA              2008                           NA
## 6                       NA                NA                           NA
## 7                       NA              2007                           NA
## 8                       NA              2008                           NA
## 9                       NA              2007                           NA
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## 12                      NA              2008                           NA
## 13                      NA              2007                           NA
## 14                      NA              2007                           NA
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## 16                      NA              2008                         2000
## 17                      NA              2007                           NA
## 18                      NA              2008                         2003
## 19                      NA              2007                         1990
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## 23                      NA              1985                         2000
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## 26                      NA              2005                         2000
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## 28                      NA              2004                         2000
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## 31                      NA              2008                         2000
## 32                    2005              2003                         2004
## 33                      NA              2007                         2000
## 34                      NA              2002                         2000
## 35                      NA              2007                         2002
## 36                    2003              2007                         2000
## 37                      NA              2008                         2000
## 38                      NA              2008                         2000
## 39                    2000              2008                         2000
## 40                      NA                NA                           NA
## 41                      NA              2008                         2000
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## 43                      NA              2008                         2000
## 44                      NA                NA                           NA
## 45                      NA                NA                           NA
## 46                    2004              2007                         2000
## 47                      NA              2008                         2000
## 48                      NA              2000                         2000
## 49                    1998              2008                         2000
## 50                    2004              2008                         2000
## 51                      NA              2005                         2001
## 52                      NA              1997                         2000
## 53                    1997              2008                           NA
## 54                    2004              2008                         2000
## 55                    1998              1975                         2000
## 56                    2000              2008                           NA
## 57                    1995              2008                         2002
## 58                      NA              2008                         2000
## 59                    2005              2008                         2000
## 60                    1999              2007                         2000
## 61                      NA              2008                         2000
## 62                      NA              2005                         2000
## 63                    2003              2008                         2003
## 64                     NA              2007                         2000
## 65                   2005              2008                         2000
## 66                     NA              1996                         2000
## 67                     NA              2008                         2000
## 68                   2004              2008                         2000
## 69                     NA              1995                         2002
## 70                   1999              2004                         2000
## 71                   2001              2008                         2002
## 72                     NA              2008                         2000
## 73                   2005              2008                         2000
## 74                     NA              2008                         2000
## 75                     NA              2004                         2000
## 76                   2005              2008                         2005
## 77                     NA              2006                           NA
## 78                     NA              1986                         2000
## 79                     NA              2008                           NA
## 80                     NA                NA                         2000
## 81                     NA              2006                         2000
## 82                     NA              2007                         2000
## 83                   2001              2002                         2000
## 84                   2001              2008                           NA
## 85                     NA              2008                         2000
## 86                     NA              2008                         2000
## 87                   2005              2008                         2000
## 88                   2005              2008                         2000
## 89                   2005              2008                         2000
## 90                     NA              2008                         2000
## 91                     NA              2008                           NA
## 92                     NA              2006                         2000
## 93                     NA              2008                         2000
## 94                   2000              2008                         2000
## 95                     NA              2007                         2002
## 96                   2005              2008                         2000
## 97                     NA              2007                         2003
## 98                   2005              2008                         2005
## 99                     NA              2000                         2000
## 100                  2005              2008                         2000
## 101                  2000              2008                         2000
## 102                    NA              2008                           NA
## 103                  2005              2008                         2003
## 104                  2002              2008                         2000
## 105                  2005              2008                         2002
## 106                  2005              2008                         2000
## 107                  1997              2008                         2005
## 108                    NA              2008                           NA
## 109                    NA              2008                         2000
## 110                  2005              2008                           NA
## 111                    NA              2008                         2000
## 112                  2004              2008                         2000
## 113                    NA              2008                         2000
## 114                  2005              2008                         2000
## 115                    NA                NA                         2000
## 116                  2004              2008                           NA
## 117                  2000              2008                         2000
## 118                      NA              2008                          2000
## 119                      NA              2008                            NA
## 120                    2005              2008                          2000
## 121                      NA              2008                          2000
## 122                    2005              2008                          2005
## 123                      NA              2006                          2000
## 124                    2005              2008                          2003
## 125                      NA              2007                          2003
## 126                    2004              2008                          2000
## 127                    2004              2008                            NA
## 128                    2005              2008                          2000
## 129                      NA                NA                            NA
## 130                      NA              1991                          2000
## 131                    1997              2007                          2000
## 132                    2004              2008                          2000
## 133                    1999              2008                          2000
## 134                      NA              2007                          2002
## 135                    2003              2008                          2000
## 136                    2005              2008                          2005
## 137                      NA              2008                          2000
## 138                    2005              2008                          2000
## 139                    2005              2008                          2000
## 140                      NA              2008                          2000
## 141                    2006              2008                          2000
## 142                      NA              2007                          2000
## 143                    1996              2008                          2000
## 144                    2004              2008                          2000
## 145                    2004              2008                          2000
## 146                      NA              2008                          2000
## 147                    2004              2008                          2000
## 148                    2003              2008                          2000
## 149                    2004              2008                          2000
## 150                    2004              2008                          2004
## 151                      NA              2008                          2000
## 152                    2001              2008                          2000
## 153                      NA              2008                            NA
## 154                    2005              2008                          2000
## 155                    2005              2008                            NA
## 156                    2004              2008                          2000
## 157                    2004              2008                          2000
## 158                      NA              2008                          2005
## 159                    1999              2008                          2000
## 160                    2004              2008                          2000
## 161                      NA              2008                            NA
## 162                    2005              2008                          2000
## 163                    2004              2008                          2000
## 164                    2001              2008                          2000
## 165                    2004              2008                            NA
## 166                    2004              2008                          2000
## 167                    2003              2008                          2000
## 168                    2004              2006                          2004
## 169                    2004              2008                          2000
## 170                      NA              2008                          2000
## 171                    2005              2007                          2006
## 172                   2004              2008                            NA
## 173                   2000              2008                          2003
## 174                   2004              2008                          2000
## 175                   2005              2008                          2000
## 176                   1999              2008                          2000
## 177                   2004              2008                          2000
## 178                   2004              2008                          2000
## 179                   2001              2008                          2000
## 180                   2003              2008                          2000
## 181                   2004              2008                          2000
## 182                   2005              2008                          2000
## 183                   2004              2008                          2000
## 184                   2004              2008                          2000
## 185                   2004              2008                          2000
## 186                   2004              2008                          2000
## 187                   2004              2008                          2000
## 188                   2005              2008                          2000
## 189                   2004              2008                          2000
## 190                     NA              2006                            NA
## 191                     NA                NA                            NA
## 192                     NA                NA                            NA
## 193                     NA                NA                            NA
## 194                     NA              1998                          2000
## 195                     NA                NA                            NA
## 196                     NA                NA                            NA
## 197                     NA                NA                            NA
## 198                     NA              2005                            NA
## 199                     NA              2007                            NA
## 200                     NA                NA                            NA
## 201                     NA                NA                            NA
## 202                     NA                NA                            NA
## 203                     NA                NA                            NA
## 204                     NA              2004                          2000
## 205                     NA                NA                            NA
## 206                     NA                NA                            NA
## 207                     NA                NA                            NA
## 208                     NA                NA                            NA
## 209                     NA                NA                            NA
## 210                     NA              2001                          2000
## 211                     NA                NA                            NA
## 212                     NA                NA                            NA
## 213                     NA              2008                            NA
## 214                     NA                NA                          2000
## 215                     NA              2008                            NA
## 216                     NA                NA                            NA
## 217                     NA                NA                            NA
## 218                     NA              1982                          2003
## 219                     NA                NA                            NA
## 220                     NA                NA                            NA
## 221                     NA                NA                            NA
## 222                     NA                NA                            NA
## 223                     NA                NA                            NA
## 224                     NA                NA                            NA
##     X2.alpha.code WB.2.code                     Table.Name
## 1              TV        TV                         Tuvalu
## 2              KI        KI                       Kiribati
## 3              MH        MH               Marshall Islands
## 4              PW        PW                          Palau
## 5              ST        ST    S\xe3o Tom\xe9 and Principe
## 6              FM        FM          Micronesia, Fed. Sts.
## 7              TO        TO                          Tonga
## 8              DM        DM                       Dominica
## 9              KM        KM                        Comoros
## 10             WS        WS                          Samoa
## 11             VC        VC St. Vincent and the Grenadines
## 12             GD        GD                        Grenada
## 13             KN        KN            St. Kitts and Nevis
## 14             VU        VU                        Vanuatu
## 15             GW        GW                  Guinea-Bissau
## 16             GM        GM                    Gambia, The
## 17             SB        SB                Solomon Islands
## 18             SC        SC                     Seychelles
## 19             AG        AG            Antigua and Barbuda
## 20             LC        LC                      St. Lucia
## 21             TL        TP                    Timor-Leste
## 22             BZ        BZ                         Belize
## 23             LR        LR                        Liberia
## 24             BT        BT                         Bhutan
## 25             CV        CV                     Cape Verde
## 26             CF        CF       Central African Republic
## 27             MV        MV                       Maldives
## 28             LS        LS                        Lesotho
## 29             BI        BI                        Burundi
## 30             AW        AW                          Aruba
## 31             GY        GY                         Guyana
## 32             ER        ER                        Eritrea
## 33             SZ        SZ                      Swaziland
## 34             SL        SL                   Sierra Leone
## 35             TG        TG                           Togo
## 36             FJ        FJ                           Fiji
## 37             MR        MR                     Mauritania
## 38             BB        BB                       Barbados
## 39             MW        MW                         Malawi
## 40             ME        ME                     Montenegro
## 41             SR        SR                       Suriname
## 42             BM        BM                        Bermuda
## 43             GN        GN                         Guinea
## 44             MC        MC                         Monaco
## 45                       KV                         Kosovo
## 46             KG        KG                Kyrgyz Republic
## 47             NE        NE                          Niger
## 48             TJ        TJ                     Tajikistan
## 49             RW        RW                         Rwanda
## 50             MD        MD                        Moldova
## 51             BJ        BJ                          Benin
## 52             HT        HT                          Haiti
## 53             BS        BS                   Bahamas, The
## 54             MT        MT                          Malta
## 55             LA        LA                        Lao PDR
## 56             MK        MK                 Macedonia, FYR
## 57             ZW        ZW                       Zimbabwe
## 58             AM        AM                        Armenia
## 59             MG        MG                     Madagascar
## 60             MN        MN                       Mongolia
## 61             ML        ML                           Mali
## 62             BF        BF                   Burkina Faso
## 63             MU        MU                      Mauritius
## 64             NI        NI                      Nicaragua
## 65             AL        AL                        Albania
## 66             TD        TD                           Chad
## 67           <NA>      <NA>                        Namibia
## 68             IS        IS                        Iceland
## 69             CG        CG                    Congo, Rep.
## 70             KH        KH                       Cambodia
## 71             SN        SN                        Senegal
## 72             MZ        MZ                     Mozambique
## 73             BW        BW                       Botswana
## 74             JM        JM                        Jamaica
## 75             PG        PG               Papua New Guinea
## 76             GE        GE                        Georgia
## 77             BN        BN              Brunei Darussalam
## 78             CD        ZR               Congo, Dem. Rep.
## 79             BA        BA         Bosnia and Herzegovina
## 80             GQ        GQ              Equatorial Guinea
## 81             GA        GA                          Gabon
## 82             HN        HN                       Honduras
## 83             NP        NP                          Nepal
## 84             UG        UG                         Uganda
## 85             AF        AF                    Afghanistan
## 86             ZM        ZM                         Zambia
## 87             EE        EE                        Estonia
## 88             CY        CY                         Cyprus
## 89             TT        TT            Trinidad and Tobago
## 90             SV        SV                    El Salvador
## 91             CI        CI               C\xf4te d'Ivoire
## 92             CM        CM                       Cameroon
## 93             PY        PY                       Paraguay
## 94             BO        BO                        Bolivia
## 95             TZ        TZ                       Tanzania
## 96             LV        LV                         Latvia
## 97             BH        BH                        Bahrain
## 98             JO        JO                         Jordan
## 99             TM        TM                   Turkmenistan
## 100            YE        RY                    Yemen, Rep.
## 101            PA        PA                         Panama
## 102            RS        YF                         Serbia
## 103            KE        KE                          Kenya
## 104            GH        GH                          Ghana
## 105            ET        ET                       Ethiopia
## 106            LT        LT                      Lithuania
## 107            LB        LB                        Lebanon
## 108            MO        MO               Macao SAR, China
## 109            CR        CR                     Costa Rica
## 110            SI        SI                       Slovenia
## 111            TN        TN                        Tunisia
## 112            UY        UY                        Uruguay
## 113            GT        GT                      Guatemala
## 114            BG        BG                       Bulgaria
## 115            UZ        UZ                     Uzbekistan
## 116            LU        LU                     Luxembourg
## 117            SD        SD                          Sudan
## 118            DO        DO             Dominican Republic
## 119            HR        HR                        Croatia
## 120            LK        LK                      Sri Lanka
## 121            BY        BY                        Belarus
## 122            AZ        AZ                     Azerbaijan
## 123            CU        CU                           Cuba
## 124            OM        OM                           Oman
## 125            SY        SY           Syrian Arab Republic
## 126            EC        EC                        Ecuador
## 127            SK        SK                Slovak Republic
## 128            MA        MA                        Morocco
## 129            PR        PR                    Puerto Rico
## 130            AO        AO                         Angola
## 131            BD        BD                     Bangladesh
## 132            HU        HU                        Hungary
## 133            VN        VN                        Vietnam
## 134            KW        KW                         Kuwait
## 135            NZ        NZ                    New Zealand
## 136            QA        QA                          Qatar
## 137            UA        UA                        Ukraine
## 138            RO        RO                        Romania
## 139            CZ        CZ                 Czech Republic
## 140            KZ        KZ                     Kazakhstan
## 141            PE        PE                           Peru
## 142            DZ        DZ                        Algeria
## 143            IQ        IQ                           Iraq
## 144            IE        IE                        Ireland
## 145            PT        PT                       Portugal
## 146            PK        PK                       Pakistan
## 147            FI        FI                        Finland
## 148            GR        GR                         Greece
## 149            PH        PH                    Philippines
## 150            IL        IL                         Israel
## 151            NG        NG                        Nigeria
## 152            EG        EG               Egypt, Arab Rep.
## 153            HK        HK           Hong Kong SAR, China
## 154            CL        CL                          Chile
## 155            SG        SG                      Singapore
## 156            MY        MY                       Malaysia
## 157            DK        DK                        Denmark
## 158            AE        AE           United Arab Emirates
## 159            TH        TH                       Thailand
## 160            CO        CO                       Colombia
## 161            VE        VE                  Venezuela, RB
## 162            ZA        ZA                   South Africa
## 163            AT        AT                        Austria
## 164            AR        AR                      Argentina
## 165            BE        BE                        Belgium
## 166            PL        PL                         Poland
## 167            NO        NO                         Norway
## 168            IR        IR             Iran, Islamic Rep.
## 169            SE        SE                         Sweden
## 170            CH        CH                    Switzerland
## 171            SA        SA                   Saudi Arabia
## 172            NL        NL                    Netherlands
## 173            TR        TR                         Turkey
## 174            ID        ID                      Indonesia
## 175            KR        KR                    Korea, Rep.
## 176            MX        MX                         Mexico
## 177            ES        ES                          Spain
## 178            AU        AU                      Australia
## 179            CA        CA                         Canada
## 180            IN        IN                          India
## 181            IT        IT                          Italy
## 182            RU        RU             Russian Federation
## 183            BR        BR                         Brazil
## 184            GB        GB                 United Kingdom
## 185            FR        FR                         France
## 186            DE        DE                        Germany
## 187            JP        JP                          Japan
## 188            CN        CN                          China
## 189            US        US                  United States
## 190            AD        AD                        Andorra
## 191            AS        AS                 American Samoa
## 192                                         Channel Islands
## 193            KY        KY                 Cayman Islands
## 194            DJ        DJ                       Djibouti
## 195                                     East Asia & Pacific
## 196                                   Europe & Central Asia
## 197                                               Euro area
## 198            FO        FO                 Faeroe Islands
## 199            GL        GL                      Greenland
## 200            GU        GU                           Guam
## 201                                             High income
## 202            IM        IM                    Isle of Man
## 203                               Latin America & Caribbean
## 204            LY        LY                          Libya
## 205                                              Low income
## 206            LI        LI                  Liechtenstein
## 207                                     Lower middle income
## 208                                     Low & middle income
## 209                                           Middle income
## 210            MM        MM                        Myanmar
## 211                              Middle East & North Africa
## 212            MP        MP       Northern Mariana Islands
## 213            NC        NC                  New Caledonia
## 214            KP        KP               Korea, Dem. Rep.
## 215            PF        PF               French Polynesia
## 216                                              South Asia
## 217            SM        SM                     San Marino
## 218            SO        SO                        Somalia
## 219                                     Sub-Saharan Africa
## 220            TC        TC       Turks and Caicos Islands
## 221                                    Upper middle income
## 222            VI        VI          Virgin Islands (U.S.)
## 223            PS        GZ             West Bank and Gaza
## 224                                                   World
##                                       Short.Name
## 1                                         Tuvalu
## 2                                       Kiribati
## 3                               Marshall Islands
## 4                                          Palau
## 5                    S\xe3o Tom\xe9 and Principe
## 6                                     Micronesia
## 7                                          Tonga
## 8                                       Dominica
## 9                                        Comoros
## 10                                         Samoa
## 11                St. Vincent and the Grenadines
## 12                                       Grenada
## 13                            St. Kitts and Nevis
## 14                                       Vanuatu
## 15                                 Guinea-Bissau
## 16                                    The Gambia
## 17                               Solomon Islands
## 18                                    Seychelles
## 19                           Antigua and Barbuda
## 20                                     St. Lucia
## 21                                   Timor-Leste
## 22                                        Belize
## 23                                       Liberia
## 24                                        Bhutan
## 25                                    Cape Verde
## 26                      Central African Republic
## 27                                      Maldives
## 28                                       Lesotho
## 29                                       Burundi
## 30                                         Aruba
## 31                                        Guyana
## 32                                       Eritrea
## 33                                     Swaziland
## 34                                  Sierra Leone
## 35                                          Togo
## 36                                          Fiji
## 37                                    Mauritania
## 38                                      Barbados
## 39                                        Malawi
## 40                                    Montenegro
## 41                                      Suriname
## 42                                       Bermuda
## 43                                        Guinea
## 44                                        Monaco
## 45                                        Kosovo
## 46                               Kyrgyz Republic
## 47                                         Niger
## 48                                    Tajikistan
## 49                                        Rwanda
## 50                                       Moldova
## 51                                         Benin
## 52                                         Haiti
## 53                                   The Bahamas
## 54                                         Malta
## 55                                       Lao PDR
## 56                                     Macedonia
## 57                                      Zimbabwe
## 58                                       Armenia
## 59                                    Madagascar
## 60                                      Mongolia
## 61                                          Mali
## 62                                  Burkina Faso
## 63                                     Mauritius
## 64                                     Nicaragua
## 65                                       Albania
## 66                                          Chad
## 67                                       Namibia
## 68                                       Iceland
## 69                                         Congo
## 70                                      Cambodia
## 71                                       Senegal
## 72                                    Mozambique
## 73                                      Botswana
## 74                                       Jamaica
## 75                              Papua New Guinea
## 76                                       Georgia
## 77                                        Brunei
## 78                               Dem. Rep. Congo
## 79                        Bosnia and Herzegovina
## 80                             Equatorial Guinea
## 81                                         Gabon
## 82                                      Honduras
## 83                                         Nepal
## 84                                        Uganda
## 85                                   Afghanistan
## 86                                        Zambia
## 87                                       Estonia
## 88                                        Cyprus
## 89                           Trinidad and Tobago
## 90                                   El Salvador
## 91                              C\xf4te d'Ivoire
## 92                                      Cameroon
## 93                                      Paraguay
## 94                                       Bolivia
## 95                                      Tanzania
## 96                                        Latvia
## 97                                       Bahrain
## 98                                        Jordan
## 99                                  Turkmenistan
## 100                                        Yemen
## 101                                       Panama
## 102                                       Serbia
## 103                                        Kenya
## 104                                        Ghana
## 105                                     Ethiopia
## 106                                    Lithuania
## 107                                      Lebanon
## 108                             Macao SAR, China
## 109                                   Costa Rica
## 110                                     Slovenia
## 111                                      Tunisia
## 112                                      Uruguay
## 113                                    Guatemala
## 114                                     Bulgaria
## 115                                   Uzbekistan
## 116                                   Luxembourg
## 117                                        Sudan
## 118                           Dominican Republic
## 119                                      Croatia
## 120                                    Sri Lanka
## 121                                      Belarus
## 122                                   Azerbaijan
## 123                                         Cuba
## 124                                         Oman
## 125                         Syrian Arab Republic
## 126                                      Ecuador
## 127                              Slovak Republic
## 128                                      Morocco
## 129                                  Puerto Rico
## 130                                       Angola
## 131                                   Bangladesh
## 132                                      Hungary
## 133                                      Vietnam
## 134                                       Kuwait
## 135                                  New Zealand
## 136                                        Qatar
## 137                                      Ukraine
## 138                                      Romania
## 139                               Czech Republic
## 140                                   Kazakhstan
## 141                                         Peru
## 142                                      Algeria
## 143                                         Iraq
## 144                                      Ireland
## 145                                     Portugal
## 146                                     Pakistan
## 147                                      Finland
## 148                                       Greece
## 149                                  Philippines
## 150                                       Israel
## 151                                      Nigeria
## 152                                        Egypt
## 153                         Hong Kong SAR, China
## 154                                        Chile
## 155                                    Singapore
## 156                                     Malaysia
## 157                                      Denmark
## 158                         United Arab Emirates
## 159                                     Thailand
## 160                                     Colombia
## 161                                    Venezuela
## 162                                 South Africa
## 163                                      Austria
## 164                                    Argentina
## 165                                      Belgium
## 166                                       Poland
## 167                                       Norway
## 168                                         Iran
## 169                                       Sweden
## 170                                  Switzerland
## 171                                 Saudi Arabia
## 172                                  Netherlands
## 173                                       Turkey
## 174                                    Indonesia
## 175                                        Korea
## 176                                       Mexico
## 177                                        Spain
## 178                                    Australia
## 179                                       Canada
## 180                                        India
## 181                                        Italy
## 182                                       Russia
## 183                                       Brazil
## 184                               United Kingdom
## 185                                       France
## 186                                      Germany
## 187                                        Japan
## 188                                        China
## 189                                United States
## 190                                      Andorra
## 191                               American Samoa
## 192                              Channel Islands
## 193                               Cayman Islands
## 194                                     Djibouti
## 195        East Asia & Pacific (developing only)
## 196      Europe & Central Asia (developing only)
## 197                                    Euro area
## 198                               Faeroe Islands
## 199                                    Greenland
## 200                                         Guam
## 201                                  High income
## 202                                  Isle of Man
## 203  Latin America & Caribbean (developing only)
## 204                                        Libya
## 205                                   Low income
## 206                                Liechtenstein
## 207                          Lower middle income
## 208                          Low & middle income
## 209                                Middle income
## 210                                      Myanmar
## 211 Middle East & North Africa (developing only)
## 212                     Northern Mariana Islands
## 213                                New Caledonia
## 214                              Dem. Rep. Korea
## 215                             French Polynesia
## 216                                   South Asia
## 217                                   San Marino
## 218                                      Somalia
## 219         Sub-Saharan Africa (developing only)
## 220                     Turks and Caicos Islands
## 221                          Upper middle income
## 222                               Virgin Islands
## 223                           West Bank and Gaza
## 224                                        World
```

```
                  head(mergeData, n=20)
```

```
##    Countrycode rank X.1              country  milDollars X.4 X.5 X.6 X.7 X.8
## 1          ABW  161  NA                Aruba      2,584        NA  NA  NA  NA
## 2          ADO   NA  NA              Andorra          ..       NA  NA  NA  NA
## 3          AFG  105  NA          Afghanistan     20,497        NA  NA  NA  NA
## 4          AGO   60  NA               Angola    114,147        NA  NA  NA  NA
## 5          ALB  125  NA              Albania     12,648        NA  NA  NA  NA
## 6          ARE   32  NA United Arab Emirates    348,595        NA  NA  NA  NA
## 7          ARG   26  NA            Argentina    475,502        NA  NA  NA  NA
## 8          ARM  133  NA              Armenia      9,951        NA  NA  NA  NA
## 9          ASM   NA  NA       American Samoa          ..       NA  NA  NA  NA
## 10         ATG  172  NA  Antigua and Barbuda      1,134        NA  NA  NA  NA
## 11         AUS   12  NA            Australia  1,532,408        NA  NA  NA  NA
## 12         AUT   27  NA              Austria    394,708        NA  NA  NA  NA
## 13         AZE   68  NA           Azerbaijan     66,605        NA  NA  NA  NA
## 14         BDI  162  NA              Burundi      2,472        NA  NA  NA  NA
## 15         BEL   25  NA              Belgium    483,262        NA  NA  NA  NA
## 16         BEN  140  NA                Benin      7,557        NA  NA  NA  NA
## 17         BFA  128  NA         Burkina Faso     10,441        NA  NA  NA  NA
## 18         BGD   59  NA           Bangladesh    116,355        NA  NA  NA  NA
## 19         BGR   76  NA             Bulgaria     50,972        NA  NA  NA  NA
## 20         BHR   93  NA              Bahrain     29,044        NA  NA  NA  NA
##                           Long.Name         Income.Group
## 1                             Aruba High income: nonOECD
## 2           Principality of Andorra High income: nonOECD
## 3      Islamic State of Afghanistan           Low income
## 4       People’s Republic of Angola  Lower middle income
## 5               Republic of Albania  Upper middle income
## 6              United Arab Emirates High income: nonOECD
## 7                Argentine Republic  Upper middle income
## 8               Republic of Armenia  Lower middle income
## 9                    American Samoa  Upper middle income
## 10              Antigua and Barbuda  Upper middle income
## 11        Commonwealth of Australia    High income: OECD
## 12              Republic of Austria    High income: OECD
## 13          Republic of Azerbaijan  Upper middle income
## 14             Republic of Burundi           Low income
## 15              Kingdom of Belgium    High income: OECD
## 16               Republic of Benin           Low income
## 17                    Burkina Faso           Low income
## 18 People’s Republic of Bangladesh           Low income
## 19            Republic of Bulgaria  Upper middle income
## 20              Kingdom of Bahrain High income: nonOECD
##                        Region Lending.category Other.groups
## 1   Latin America & Caribbean
## 2       Europe & Central Asia
## 3                  South Asia              IDA         HIPC
## 4          Sub-Saharan Africa              IDA
## 5       Europe & Central Asia             IBRD
## 6  Middle East & North Africa
## 7   Latin America & Caribbean             IBRD
## 8       Europe & Central Asia            Blend
## 9         East Asia & Pacific
## 10  Latin America & Caribbean             IBRD
## 11        East Asia & Pacific
## 12      Europe & Central Asia                     Euro area
## 13      Europe & Central Asia            Blend
## 14         Sub-Saharan Africa              IDA         HIPC
## 15      Europe & Central Asia                     Euro area
## 16         Sub-Saharan Africa              IDA         HIPC
## 17         Sub-Saharan Africa              IDA         HIPC
## 18                 South Asia              IDA
## 19      Europe & Central Asia             IBRD
## 20 Middle East & North Africa
##            Currency.Unit Latest.population.census  Latest.household.survey
## 1          Aruban florin                     2000
## 2                   Euro           Register based
## 3         Afghan afghani                     1979               MICS, 2003
## 4         Angolan kwanza                     1970 MICS, 2001, MIS, 2006/07
## 5           Albanian lek                     2001               MICS, 2005
## 6          U.A.E. dirham                     2005
## 7         Argentine peso                     2001
## 8          Armenian dram                     2001                DHS, 2005
## 9            U.S. dollar                     2000
## 10 East Caribbean dollar                     2001
## 11     Australian dollar                     2006
## 12                  Euro                     2001
## 13       New Azeri manat                     2009                DHS, 2006
## 14         Burundi franc                     1990               MICS, 2005
## 15                  Euro                     2001
## 16             CFA franc                     2002                DHS, 2006
## 17             CFA franc                     2006               MICS, 2006
## 18      Bangladeshi taka                     2001                DHS, 2007
## 19         Bulgarian lev                     2001
## 20        Bahraini dinar                     2001
##
## 1
## 2
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## 11
## 12 A simple multiplier is used to convert the national currencies of EMU members to euros. The follow
## 13
## 14
## 15      A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 16
## 17
## 18
## 19
## 20
##    National.accounts.base.year National.accounts.reference.year
## 1                         1995                               NA
## 2                                                            NA
## 3                    2002/2003                               NA
## 4                         1997                               NA
## 5                                                          1996
## 6                         1995                               NA
## 7                         1993                               NA
## 8                                                          1996
## 9                                                            NA
## 10                        1990                               NA
## 11                                                         2007
## 12                        2000                               NA
## 13                                                         2003
## 14                        1980                               NA
## 15                        2000                               NA
## 16                        1985                               NA
## 17                        1999                               NA
## 18                   1995/1996                               NA
## 19                                                         2002
## 20                        1985                               NA
##    System.of.National.Accounts SNA.price.valuation
## 1                           NA
## 2                           NA
## 3                           NA                 VAB
## 4                           NA                 VAP
## 5                         1993                 VAB
## 6                           NA                 VAB
## 7                         1993                 VAB
## 8                         1993                 VAB
## 9                           NA
## 10                          NA                 VAB
## 11                        1993                 VAB
## 12                        1993                 VAB
## 13                        1993                 VAB
## 14                          NA                 VAB
## 15                        1993                 VAB
## 16                          NA                 VAP
## 17                          NA                 VAB
## 18                        1993                 VAB
## 19                        1993                 VAB
## 20                          NA                 VAP
##    Alternative.conversion.factor PPP.survey.year
## 1                                             NA
## 2                                             NA
## 3                                             NA
## 4                        1991-96            2005
## 5                                           2005
## 6                                             NA
## 7                        1971-84            2005
## 8                        1990-95            2005
## 9                                             NA
## 10                                            NA
## 11                                          2005
## 12                                          2005
## 13                       1992-95            2005
## 14                                          2005
## 15                                          2005
## 16                          1992            2005
## 17                       1992-93            2005
## 18                                          2005
## 19              1978-89, 1991-92            2005
## 20                                          2005
##    Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1
## 2
## 3                                                              Actual
## 4                                BPM5                          Actual
## 5                                BPM5                          Actual
## 6                                BPM4
## 7                                BPM5                          Actual
## 8                                BPM5                          Actual
## 9
## 10                               BPM5
## 11                               BPM5
## 12                               BPM5
## 13                               BPM5                          Actual
## 14                               BPM5                          Actual
## 15                               BPM5
## 16                               BPM5                     Preliminary
## 17                               BPM4                          Actual
## 18                               BPM5                     Preliminary
## 19                               BPM5                          Actual
## 20                               BPM5
##    System.of.trade Government.Accounting.concept
## 1          Special
## 2          General
## 3          General                  Consolidated
## 4          Special
## 5          General                  Consolidated
## 6          General                  Consolidated
## 7          Special                  Consolidated
## 8          Special                  Consolidated
## 9
## 10         General
## 11         General                  Consolidated
## 12         Special                  Consolidated
## 13         General                  Consolidated
## 14         Special                  Consolidated
## 15         Special                  Consolidated
## 16         Special                     Budgetary
## 17         General                     Budgetary
## 18         General                  Consolidated
## 19         General                  Consolidated
## 20         General                  Consolidated
##    IMF.data.dissemination.standard
## 1
## 2
## 3                             GDDS
## 4                             GDDS
## 5                             GDDS
## 6                             GDDS
## 7                             SDDS
## 8                             SDDS
## 9
## 10                            GDDS
## 11                            SDDS
## 12                            SDDS
## 13                            GDDS
## 14
## 15                            SDDS
## 16                            GDDS
## 17                            GDDS
## 18                            GDDS
## 19                            SDDS
## 20                            GDDS
##    Source.of.most.recent.Income.and.expenditure.data
## 1
## 2
## 3
## 4                                           IHS, 2000
## 5                                          LSMS, 2005
## 6
## 7                                           IHS, 2006
## 8                                           IHS, 2007
## 9
## 10
## 11                                        ES/BS, 1994
## 12                                            IS 2000
## 13                                        ES/BS, 2005
## 14                                         CWIQ, 2006
## 15                                          IHS, 2000
## 16                                         CWIQ, 2003
## 17                                         CWIQ, 2003
## 18                                          IHS, 2005
## 19                                       ES/BS, 2003
## 20
##    Vital.registration.complete     Latest.agricultural.census
## 1
## 2                          Yes
## 3
## 4                                                     1964-65
## 5                          Yes                           1998
## 6                                                        1998
## 7                          Yes                           2002
## 8                          Yes
## 9                          Yes
## 10                         Yes
## 11                         Yes                           2001
## 12                         Yes                      1999-2000
## 13                         Yes
## 14
## 15                         Yes 1999-2000 (conducted annually)
## 16                                                       1992
## 17                                                       1993
## 18                                                       2005
## 19                         Yes
## 20                         Yes
##    Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                      NA              2008                           NA
## 2                      NA              2006                           NA
## 3                      NA              2008                         2000
## 4                      NA              1991                         2000
## 5                    2005              2008                         2000
## 6                      NA              2008                         2005
## 7                    2001              2008                         2000
## 8                      NA              2008                         2000
## 9                      NA                NA                           NA
## 10                     NA              2007                         1990
## 11                   2004              2008                         2000
## 12                   2004              2008                         2000
## 13                   2005              2008                         2005
## 14                     NA              2008                         2000
## 15                   2004              2008                           NA
## 16                     NA              2005                         2001
## 17                     NA              2005                         2000
## 18                   1997              2007                         2000
## 19                   2005              2008                         2000
## 20                     NA              2007                         2003
##    X2.alpha.code WB.2.code           Table.Name           Short.Name
## 1             AW        AW                Aruba                Aruba
## 2             AD        AD              Andorra              Andorra
## 3             AF        AF          Afghanistan          Afghanistan
## 4             AO        AO               Angola               Angola
## 5             AL        AL              Albania              Albania
## 6             AE        AE United Arab Emirates United Arab Emirates
## 7             AR        AR            Argentina            Argentina
## 8             AM        AM              Armenia              Armenia
## 9             AS        AS       American Samoa       American Samoa
## 10            AG        AG  Antigua and Barbuda  Antigua and Barbuda
## 11            AU        AU            Australia            Australia
## 12            AT        AT              Austria              Austria
## 13            AZ        AZ           Azerbaijan           Azerbaijan
## 14            BI        BI              Burundi              Burundi
## 15            BE        BE              Belgium              Belgium
## 16            BJ        BJ                Benin                Benin
## 17            BF        BF         Burkina Faso         Burkina Faso
## 18            BD        BD           Bangladesh           Bangladesh
## 19            BG        BG             Bulgaria             Bulgaria
## 20            BH        BH              Bahrain              Bahrain
```

```
                       merge2<- filter(mergeData, Income.Group == "High income: OECD") ##Filters data i
                       summary(merge2)
```

```
##  Countrycode             rank          X.1            country
##  Length:30          Min.   :  1.00   Mode:logical   Length:30
##  Class :character   1st Qu.: 12.25   NA's:30        Class :character
##  Mode  :character   Median : 24.50                  Mode  :character
##                     Mean   : 32.97
##                     3rd Qu.: 45.75
##                     Max.   :122.00
##
##   milDollars            X.4              X.5            X.6
##  Length:30          Length:30          Mode:logical   Mode:logical
##  Class :character   Class :character   NA's:30        NA's:30
##  Mode  :character   Mode  :character
##
##
##
##
##    X.7            X.8           Long.Name         Income.Group
##  Mode:logical   Mode:logical   Length:30          Length:30
##  NA's:30        NA's:30        Class :character   Class :character
##                                Mode  :character   Mode  :character
##
##
##
##
##     Region          Lending.category   Other.groups       Currency.Unit
##  Length:30          Length:30          Length:30          Length:30
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##  Latest.population.census Latest.household.survey Special.Notes
##  Length:30                Length:30               Length:30
##  Class :character         Class :character        Class :character
##  Mode  :character         Mode  :character        Mode  :character
##
##
##
```

```
##
##  National.accounts.base.year National.accounts.reference.year
##  Length:30                   Min.   :1995
##  Class :character            1st Qu.:2000
##  Mode  :character            Median :2000
##                              Mean   :2000
##                              3rd Qu.:2000
##                              Max.   :2007
##                              NA’s   :17
##  System.of.National.Accounts SNA.price.valuation Alternative.conversion.factor
##  Min.   :1993                Length:30           Length:30
##  1st Qu.:1993                Class :character    Class :character
##  Median :1993                Mode  :character    Mode  :character
##  Mean   :1993
##  3rd Qu.:1993
##  Max.   :1993
##  NA’s   :8
##  PPP.survey.year Balance.of.Payments.Manual.in.use
##  Min.   :2005    Length:30
##  1st Qu.:2005    Class :character
##  Median :2005    Mode  :character
##  Mean   :2005
##  3rd Qu.:2005
##  Max.   :2005
##
##  External.debt.Reporting.status System.of.trade
##  Length:30                      Length:30
##  Class :character               Class :character
##  Mode  :character               Mode  :character
##
##
##
##
##  Government.Accounting.concept IMF.data.dissemination.standard
##  Length:30                     Length:30
##  Class :character              Class :character
##  Mode  :character              Mode  :character
##
##
##
##
##  Source.of.most.recent.Income.and.expenditure.data Vital.registration.complete
##  Length:30                                         Length:30
##  Class :character                                  Class :character
##  Mode  :character                                  Mode  :character
##
##
##
##
##  Latest.agricultural.census Latest.industrial.data Latest.trade.data
##  Length:30                  Min.   :2001           Min.   :2008
##  Class :character           1st Qu.:2004           1st Qu.:2008
##  Mode  :character           Median :2004           Median :2008
##                             Mean   :2004           Mean   :2008
##                              3rd Qu.:2004           3rd Qu.:2008
##                              Max.   :2005           Max.   :2008
##                              NA's   :1
## Latest.water.withdrawal.data X2.alpha.code       WB.2.code
## Min.   :2000                 Length:30          Length:30
## 1st Qu.:2000                 Class :character   Class :character
## Median :2000                 Mode  :character   Mode  :character
## Mean   :2000
## 3rd Qu.:2000
## Max.   :2004
## NA's   :5
##  Table.Name         Short.Name
## Length:30          Length:30
## Class :character   Class :character
## Mode  :character   Mode  :character
##
##
##
##
```

```
                       head(merge2, n=20)
```

```
##    Countrycode rank X.1        country  milDollars X.4 X.5 X.6 X.7 X.8
## 1          AUS   12  NA      Australia  1,532,408       NA  NA  NA  NA
## 2          AUT   27  NA        Austria    394,708       NA  NA  NA  NA
## 3          BEL   25  NA        Belgium    483,262       NA  NA  NA  NA
## 4          CAN   11  NA         Canada  1,821,424       NA  NA  NA  NA
## 5          CHE   20  NA    Switzerland    631,173       NA  NA  NA  NA
## 6          CZE   51  NA Czech Republic    196,446       NA  NA  NA  NA
## 7          DEU    4  NA        Germany  3,428,131       NA  NA  NA  NA
## 8          DNK   33  NA        Denmark    314,887       NA  NA  NA  NA
## 9          ESP   13  NA          Spain  1,322,965       NA  NA  NA  NA
## 10         FIN   43  NA        Finland    247,546       NA  NA  NA  NA
## 11         FRA    5  NA         France  2,612,878       NA  NA  NA  NA
## 12         GBR    6  NA United Kingdom  2,471,784       NA  NA  NA  NA
## 13         GRC   42  NA         Greece    249,099       NA  NA  NA  NA
## 14         HUN   58  NA        Hungary    124,600       NA  NA  NA  NA
## 15         IRL   46  NA        Ireland    210,771       NA  NA  NA  NA
## 16         ISL  122  NA        Iceland     13,579       NA  NA  NA  NA
## 17         ISR   40  NA         Israel    258,217       NA  NA  NA  NA
## 18         ITA    9  NA          Italy  2,014,670       NA  NA  NA  NA
## 19         JPN    3  NA          Japan  5,959,718       NA  NA  NA  NA
## 20         KOR   15  NA    Korea, Rep.  1,129,598       NA  NA  NA  NA
##                                               Long.Name      Income.Group
## 1                             Commonwealth of Australia High income: OECD
## 2                                   Republic of Austria High income: OECD
## 3                                    Kingdom of Belgium High income: OECD
## 4                                                Canada High income: OECD
## 5                                           Switzerland High income: OECD
## 6                                        Czech Republic High income: OECD
## 7                           Federal Republic of Germany High income: OECD
## 8                                    Kingdom of Denmark High income: OECD
## 9                                      Kingdom of Spain High income: OECD
## 10                                  Republic of Finland High income: OECD
## 11                                      French Republic High income: OECD
## 12 United Kingdom of Great Britain and Northern Ireland High income: OECD
## 13                                    Hellenic Republic High income: OECD
## 14                                  Republic of Hungary High income: OECD
## 15                                              Ireland High income: OECD
## 16                                  Republic of Iceland High income: OECD
## 17                                      State of Israel High income: OECD
## 18                                     Italian Republic High income: OECD
## 19                                                Japan High income: OECD
## 20                                    Republic of Korea High income: OECD
##                        Region Lending.category Other.groups      Currency.Unit
## 1         East Asia & Pacific                                Australian dollar
## 2       Europe & Central Asia                     Euro area               Euro
## 3       Europe & Central Asia                     Euro area               Euro
## 4               North America                                  Canadian dollar
## 5       Europe & Central Asia                                      Swiss franc
## 6       Europe & Central Asia                                     Czech koruna
## 7       Europe & Central Asia                     Euro area               Euro
## 8       Europe & Central Asia                                     Danish krone
## 9       Europe & Central Asia                     Euro area               Euro
## 10      Europe & Central Asia                     Euro area               Euro
## 11      Europe & Central Asia                     Euro area               Euro
## 12      Europe & Central Asia                                   Pound sterling
## 13      Europe & Central Asia                     Euro area               Euro
## 14      Europe & Central Asia                                 Hungarian forint
## 15      Europe & Central Asia                     Euro area               Euro
## 16      Europe & Central Asia                                    Iceland krona
## 17 Middle East & North Africa                               Israeli new shekel
## 18      Europe & Central Asia                     Euro area               Euro
## 19        East Asia & Pacific                                     Japanese yen
## 20        East Asia & Pacific             IBRD                      Korean won
##    Latest.population.census Latest.household.survey
## 1                      2006
## 2                      2001
## 3                      2001
## 4                      2006
## 5                      2000
## 6                      2001               RHS, 1993
## 7                      2001
## 8                      2001
## 9                      2001
## 10                     2000
## 11           2006 (rolling)
## 12                     2001
## 13                     2001
## 14                     2001
## 15                     2006
## 16           Register based
## 17                     2008
## 18                     2001
## 19                     2005
## 20                     2005
##
## 1
## 2  A simple multiplier is used to convert the national currencies of EMU members to euros. The follo
## 3       A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 4
## 5
## 6
## 7         A simple multiplier is used to convert the national currencies of EMU members to euros. Th
## 8
## 9      A simple multiplier is used to convert the national currencies of EMU members to euros. The fo
## 10     A simple multiplier is used to convert the national currencies of EMU members to euros. The fo
## 11       A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 12
## 13       A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 14
## 15       A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 16
## 17
## 18       A simple multiplier is used to convert the national currencies of EMU members to euros. The
## 19
## 20
##    National.accounts.base.year National.accounts.reference.year
## 1                                                          2007
## 2                         2000                               NA
## 3                         2000                               NA
## 4                         2000                               NA
## 5                         2000                               NA
## 6                         2000                             1995
## 7                         2000                               NA
## 8                         2000                               NA
## 9                         2000                               NA
## 10                        2000                               NA
## 11                                                         2000
## 12                        2000                               NA
## 13                                                         2000
## 14                                                         2000
## 15                        2000                               NA
## 16                        2000                               NA
## 17                        2005                               NA
## 18                        2000                               NA
## 19                        2000                               NA
## 20                        2000                               NA
##    System.of.National.Accounts SNA.price.valuation
## 1                         1993                 VAB
## 2                         1993                 VAB
## 3                         1993                 VAB
## 4                         1993                 VAB
## 5                           NA                 VAB
## 6                         1993                 VAB
## 7                         1993                 VAB
## 8                         1993                 VAB
## 9                         1993                 VAB
## 10                        1993                 VAB
## 11                        1993                 VAB
## 12                        1993                 VAB
## 13                          NA                 VAB
## 14                        1993                 VAB
## 15                        1993                 VAB
## 16                          NA                 VAB
## 17                        1993                 VAP
## 18                        1993                 VAB
## 19                          NA                 VAB
## 20                        1993                 VAB
##    Alternative.conversion.factor PPP.survey.year
## 1                                           2005
## 2                                           2005
## 3                                           2005
## 4                                           2005
## 5                                           2005
## 6                                           2005
## 7                                           2005
## 8                                           2005
## 9                                           2005
## 10                                          2005
## 11                                          2005
## 12                                          2005
## 13                                          2005
## 14                                          2005
## 15                                          2005
## 16                                          2005
## 17                                          2005
## 18                                          2005
## 19                                          2005
## 20                                          2005
##    Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1                               BPM5
## 2                               BPM5
## 3                               BPM5
## 4                               BPM5
## 5                               BPM5
## 6                               BPM5
## 7                               BPM5
## 8                               BPM5
## 9                               BPM5
## 10                              BPM5
## 11                              BPM5
## 12                              BPM5
## 13                              BPM5
## 14                              BPM5
## 15                              BPM5
## 16                              BPM5
## 17                              BPM5
## 18                              BPM5
## 19                              BPM5
## 20                              BPM5
##    System.of.trade Government.Accounting.concept
## 1          General                  Consolidated
## 2          Special                  Consolidated
## 3          Special                  Consolidated
## 4          General                  Consolidated
## 5          Special                  Consolidated
## 6          General                  Consolidated
## 7          Special                  Consolidated
## 8          General                  Consolidated
## 9          Special                  Consolidated
## 10         General                  Consolidated
## 11         Special                  Consolidated
## 12         General                  Consolidated
## 13         Special                  Consolidated
## 14         Special                  Consolidated
## 15         General                  Consolidated
## 16         General                  Consolidated
## 17         Special                  Consolidated
## 18         Special                  Consolidated
## 19         General                  Consolidated
## 20         Special                  Consolidated
##    IMF.data.dissemination.standard
## 1                              SDDS
## 2                              SDDS
## 3                              SDDS
## 4                              SDDS
## 5                              SDDS
## 6                              SDDS
## 7                              SDDS
## 8                              SDDS
## 9                              SDDS
## 10                             SDDS
## 11                             SDDS
## 12                             SDDS
## 13                             SDDS
## 14                             SDDS
## 15                             SDDS
## 16                             SDDS
## 17                             SDDS
## 18                             SDDS
## 19                             SDDS
## 20                             SDDS
##    Source.of.most.recent.Income.and.expenditure.data
## 1                                        ES/BS, 1994
## 2                                            IS 2000
## 3                                          IHS, 2000
## 4                                          LFS, 2000
## 5                                        ES/BS, 2000
## 6                                            IS 1996
## 7                                          IHS, 2000
## 8                                           ITR 1997
## 9                                          IHS, 2000
## 10                                          IS, 2000
## 11                                    ES/BS, 1994/95
## 12                                          IS, 1999
## 13                                         IHS, 2000
## 14                                       ES/BS, 2004
## 15                                         IHS, 2000
## 16
## 17                                       ES/BS, 2001
## 18                                       ES/BS, 2000
## 19                                          IS, 1993
## 20                                       ES/BS, 1998
##    Vital.registration.complete     Latest.agricultural.census
## 1                          Yes                           2001
## 2                          Yes                      1999-2000
## 3                          Yes 1999-2000 (conducted annually)
## 4                          Yes                      1996/2001
## 5                          Yes                           2000
## 6                          Yes                           2000
## 7                          Yes                      1999-2000
## 8                          Yes                      1999-2000
## 9                          Yes                           1999
## 10                         Yes                      1999-2000
## 11                         Yes                      1999-2000
## 12                         Yes 1999-2000 (conducted annually)
## 13                         Yes                      1999-2000
## 14                         Yes                           2000
## 15                         Yes                           2000
## 16                         Yes
## 17                         Yes                           1981
## 18                         Yes                           2000
## 19                         Yes                           2000
## 20                         Yes                           2000
##    Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                    2004              2008                         2000
## 2                    2004              2008                         2000
## 3                    2004              2008                           NA
## 4                    2001              2008                         2000
## 5                      NA              2008                         2000
## 6                    2005              2008                         2000
## 7                    2004              2008                         2000
## 8                    2004              2008                         2000
## 9                    2004              2008                         2000
## 10                   2004              2008                         2000
## 11                   2004              2008                         2000
## 12                   2004              2008                         2000
## 13                   2003              2008                         2000
## 14                   2004              2008                         2000
## 15                   2004              2008                         2000
## 16                   2004              2008                         2000
## 17                   2004              2008                         2004
## 18                   2004              2008                         2000
## 19                   2004              2008                         2000
## 20                   2005              2008                         2000
##    X2.alpha.code WB.2.code     Table.Name     Short.Name
## 1             AU        AU      Australia      Australia
## 2             AT        AT        Austria        Austria
## 3             BE        BE        Belgium        Belgium
## 4             CA        CA         Canada         Canada
## 5             CH        CH    Switzerland    Switzerland
## 6             CZ        CZ Czech Republic Czech Republic
## 7             DE        DE        Germany        Germany
## 8             DK        DK        Denmark        Denmark
## 9             ES        ES          Spain          Spain
## 10            FI        FI        Finland        Finland
## 11            FR        FR         France         France
## 12            GB        GB United Kingdom United Kingdom
## 13            GR        GR         Greece         Greece
## 14            HU        HU        Hungary        Hungary
## 15            IE        IE        Ireland        Ireland
## 16            IS        IS        Iceland        Iceland
## 17            IL        IL         Israel         Israel
## 18            IT        IT          Italy          Italy
## 19            JP        JP          Japan          Japan
## 20            KR        KR    Korea, Rep.          Korea
```

```
 merge3<- filter(mergeData, Income.Group == "High income: nonOECD") ##Filter
summary(merge3)
```

```
##  Countrycode             rank          X.1            country
##  Length:37          Min.   : 19.00   Mode:logical   Length:37
##  Class :character   1st Qu.: 58.50   NA's:37        Class :character
##  Mode  :character   Median : 94.00                  Mode  :character
##                     Mean   : 91.91
##                     3rd Qu.:125.00
##                     Max.   :161.00
##                     NA's   :14
##   milDollars            X.4              X.5            X.6
##  Length:37          Length:37          Mode:logical   Mode:logical
##  Class :character   Class :character   NA's:37        NA's:37
##  Mode  :character   Mode  :character
##
##
##
##
##    X.7            X.8           Long.Name          Income.Group
##  Mode:logical   Mode:logical   Length:37          Length:37
##  NA's:37        NA's:37        Class :character   Class :character
##                                Mode  :character   Mode  :character
##
##
##
##
##    Region           Lending.category   Other.groups       Currency.Unit
##  Length:37          Length:37          Length:37          Length:37
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##  Latest.population.census Latest.household.survey Special.Notes
##  Length:37                Length:37               Length:37
##  Class :character         Class :character        Class :character
##  Mode  :character         Mode  :character        Mode  :character
##
```

```
##
##
##
##  National.accounts.base.year National.accounts.reference.year
##  Length:37                   Min.   :1997
##  Class :character            1st Qu.:2000
##  Mode  :character            Median :2000
##                              Mean   :2001
##                              3rd Qu.:2003
##                              Max.   :2007
##                              NA's   :32
##  System.of.National.Accounts SNA.price.valuation Alternative.conversion.factor
##  Min.   :1993                Length:37           Length:37
##  1st Qu.:1993                Class :character    Class :character
##  Median :1993                Mode  :character    Mode  :character
##  Mean   :1993
##  3rd Qu.:1993
##  Max.   :1993
##  NA's   :28
##  PPP.survey.year Balance.of.Payments.Manual.in.use
##  Min.   :2005    Length:37
##  1st Qu.:2005    Class :character
##  Median :2005    Mode  :character
##  Mean   :2005
##  3rd Qu.:2005
##  Max.   :2005
##  NA's   :22
##  External.debt.Reporting.status System.of.trade
##  Length:37                      Length:37
##  Class :character               Class :character
##  Mode  :character               Mode  :character
##
##
##
##
##  Government.Accounting.concept IMF.data.dissemination.standard
##  Length:37                     Length:37
##  Class :character              Class :character
##  Mode  :character              Mode  :character
##
##
##
##
##  Source.of.most.recent.Income.and.expenditure.data Vital.registration.complete
##  Length:37                                         Length:37
##  Class :character                                  Class :character
##  Mode  :character                                  Mode  :character
##
##
##
##
##  Latest.agricultural.census Latest.industrial.data Latest.trade.data
##  Length:37                  Min.   :1997           Min.   :2005
##  Class :character           1st Qu.:2005           1st Qu.:2007
##  Mode  :character           Median :2005           Median :2008
##                             Mean   :2004           Mean   :2008
##                             3rd Qu.:2005           3rd Qu.:2008
##                             Max.   :2005           Max.   :2008
##                             NA’s   :27             NA’s   :12
##  Latest.water.withdrawal.data X2.alpha.code       WB.2.code
##  Min.   :2000                 Length:37          Length:37
##  1st Qu.:2000                 Class :character   Class :character
##  Median :2000                 Mode  :character   Mode  :character
##  Mean   :2002
##  3rd Qu.:2003
##  Max.   :2006
##  NA’s   :24
##   Table.Name         Short.Name
##  Length:37          Length:37
##  Class :character   Class :character
##  Mode  :character   Mode  :character
##
##
##
##
```

```
head(merge3, n=20)
```

```
##    Countrycode rank X.1              country milDollars X.4 X.5 X.6 X.7 X.8
## 1          ABW  161  NA                Aruba     2,584       NA  NA  NA  NA
## 2          ADO   NA  NA              Andorra         ..      NA  NA  NA  NA
## 3          ARE   32  NA United Arab Emirates   348,595       NA  NA  NA  NA
## 4          BHR   93  NA              Bahrain    29,044       NA  NA  NA  NA
## 5          BHS  138  NA         Bahamas, The     8,149       NA  NA  NA  NA
## 6          BMU  149  NA              Bermuda     5,474       NA  NA  NA  NA
## 7          BRB  153  NA             Barbados     4,225       NA  NA  NA  NA
## 8          BRN  113  NA    Brunei Darussalam    16,954       NA  NA  NA  NA
## 9          CHI   NA  NA      Channel Islands         ..      NA  NA  NA  NA
## 10         CYM   NA  NA       Cayman Islands         ..      NA  NA  NA  NA
## 11         CYP  102  NA               Cyprus    22,767    d  NA  NA  NA  NA
## 12         EST  103  NA              Estonia    22,390       NA  NA  NA  NA
## 13         FRO   NA  NA       Faeroe Islands         ..      NA  NA  NA  NA
## 14         GNQ  110  NA    Equatorial Guinea    17,697       NA  NA  NA  NA
## 15         GRL   NA  NA            Greenland         ..      NA  NA  NA  NA
## 16         GUM   NA  NA                 Guam         ..      NA  NA  NA  NA
## 17         HKG   37  NA Hong Kong SAR, China   263,259       NA  NA  NA  NA
## 18         HRV   71  NA              Croatia    59,228       NA  NA  NA  NA
## 19         IMY   NA  NA          Isle of Man         ..      NA  NA  NA  NA
## 20         KWT   56  NA               Kuwait   160,913       NA  NA  NA  NA
##                                                                     Long.Name
## 1                                                                       Aruba
## 2                                                     Principality of Andorra
## 3                                                        United Arab Emirates
## 4                                                          Kingdom of Bahrain
## 5                                                 Commonwealth of The Bahamas
## 6                                                                The Bermudas
## 7                                                                    Barbados
## 8                                                           Brunei Darussalam
## 9                                                              Channel Islands
## 10                                                              Cayman Islands
## 11                                                          Republic of Cyprus
## 12                                                         Republic of Estonia
## 13                                                              Faeroe Islands
## 14                                               Republic of Equatorial Guinea
## 15                                                                   Greenland
## 16                                                                        Guam
## 17 Hong Kong Special Administrative Region of the People’s Republic of China
## 18                                                         Republic of Croatia
## 19                                                                 Isle of Man
## 20                                                             State of Kuwait
##            Income.Group                     Region Lending.category
## 1  High income: nonOECD  Latin America & Caribbean
## 2  High income: nonOECD      Europe & Central Asia
## 3  High income: nonOECD Middle East & North Africa
## 4  High income: nonOECD Middle East & North Africa
## 5  High income: nonOECD  Latin America & Caribbean
## 6  High income: nonOECD              North America
## 7  High income: nonOECD  Latin America & Caribbean
## 8  High income: nonOECD        East Asia & Pacific
## 9  High income: nonOECD      Europe & Central Asia
## 10 High income: nonOECD  Latin America & Caribbean
## 11 High income: nonOECD      Europe & Central Asia
## 12 High income: nonOECD      Europe & Central Asia
## 13 High income: nonOECD      Europe & Central Asia
## 14 High income: nonOECD         Sub-Saharan Africa             IBRD
## 15 High income: nonOECD      Europe & Central Asia
## 16 High income: nonOECD        East Asia & Pacific
## 17 High income: nonOECD        East Asia & Pacific
## 18 High income: nonOECD      Europe & Central Asia             IBRD
## 19 High income: nonOECD      Europe & Central Asia
## 20 High income: nonOECD Middle East & North Africa
##    Other.groups                    Currency.Unit Latest.population.census
## 1                                  Aruban florin                     2000
## 2                                           Euro           Register based
## 3                                  U.A.E. dirham                     2005
## 4                                 Bahraini dinar                     2001
## 5                                Bahamian dollar                     2000
## 6                                 Bermuda dollar                     2000
## 7                                Barbados dollar                     2000
## 8                                  Brunei dollar                     2001
## 9                Jersey pound and Guernsey pound                      2001
## 10                         Cayman Islands dollar                     1999
## 11    Euro area                             Euro                     2001
## 12                                Estonian kroon                     2000
## 13                                  Danish krone           Register based
## 14                                     CFA franc                     2002
## 15                                  Danish krone           Register based
## 16                                   U.S. dollar                     2000
## 17                              Hong Kong dollar                     2006
## 18                                 Croatian kuna                     2001
## 19                                    Manx pound                     2006
## 20                                 Kuwaiti dinar                     2005
##    Latest.household.survey
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11
## 12
## 13
## 14
## 15
## 16
## 17
## 18
## 19
## 20              FHS, 1996
##
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11 A simple multiplier is used to convert the national currencies of EMU members to euros. The follo
## 12
## 13
## 14
## 15
## 16
## 17
## 18
## 19
## 20
##    National.accounts.base.year National.accounts.reference.year
## 1                         1995                               NA
## 2                                                            NA
## 3                         1995                               NA
## 4                         1985                               NA
## 5                         2006                               NA
## 6                         1996                               NA
## 7                         1974                               NA
## 8                         2000                               NA
## 9                2007 and 2003                             2007
## 10                                                           NA
## 11                                                         2000
## 12                        2000                               NA
## 13                                                           NA
## 14                        2000                               NA
## 15                                                           NA
## 16                                                           NA
## 17                        2006                               NA
## 18                                                         1997
## 19                        2005                             2003
## 20                        1995                               NA
##    System.of.National.Accounts SNA.price.valuation
## 1                           NA
## 2                           NA
## 3                           NA                 VAB
## 4                           NA                 VAP
## 5                         1993                 VAB
## 6                           NA                 VAB
## 7                           NA                 VAB
## 8                           NA                 VAP
## 9                         1993                 VAB
## 10                          NA
## 11                          NA                 VAB
## 12                        1993                 VAB
## 13                          NA                 VAB
## 14                          NA                 VAB
## 15                          NA
## 16                          NA
## 17                        1993                 VAB
## 18                        1993                 VAB
## 19                          NA
## 20                          NA                 VAP
##    Alternative.conversion.factor PPP.survey.year
## 1                                             NA
## 2                                             NA
## 3                                             NA
## 4                                           2005
## 5                                             NA
## 6                                             NA
## 7                                             NA
## 8                                           2005
## 9                                             NA
## 10                                            NA
## 11                                          2005
## 12                       1987-95            2005
## 13                                            NA
## 14                       1965-84            2005
## 15                                            NA
## 16                                            NA
## 17                                          2005
## 18                                          2005
## 19                                            NA
## 20                                          2005
##    Balance.of.Payments.Manual.in.use External.debt.Reporting.status
## 1
## 2
## 3                                BPM4
## 4                                BPM5
## 5                                BPM5
## 6
## 7                                BPM5
## 8
## 9
## 10
## 11                               BPM5
## 12                               BPM5
## 13                               BPM5
## 14
## 15
## 16
## 17                               BPM5
## 18                               BPM5
## 19
## 20                               BPM5
##    System.of.trade Government.Accounting.concept
## 1          Special
## 2          General
## 3          General                  Consolidated
## 4          General                  Consolidated
## 5          General                     Budgetary
## 6
## 7          General                  Consolidated
## 8          General
## 9
## 10
## 11         General                  Consolidated
## 12         General                  Consolidated
## 13         General
## 14
## 15         General
## 16
## 17         General                  Consolidated
## 18         General                  Consolidated
## 19
## 20         Special                  Consolidated
##    IMF.data.dissemination.standard
## 1
## 2
## 3                              GDDS
## 4                              GDDS
## 5                              GDDS
## 6
## 7                              GDDS
## 8                              GDDS
## 9
## 10
## 11                             SDDS
## 12                             SDDS
## 13
## 14
## 15
## 16
## 17                            SDDS
## 18                            SDDS
## 19
## 20                            GDDS
##    Source.of.most.recent.Income.and.expenditure.data
## 1
## 2
## 3
## 4
## 5
## 6
## 7
## 8
## 9
## 10
## 11
## 12                                       ES/BS, 2004
## 13
## 14
## 15
## 16
## 17
## 18                                       ES/BS, 2005
## 19
## 20
##    Vital.registration.complete Latest.agricultural.census
## 1
## 2                          Yes
## 3                                                    1998
## 4                          Yes
## 5
## 6                          Yes
## 7                          Yes
## 8                          Yes
## 9                          Yes
## 10                         Yes
## 11                         Yes
## 12                         Yes                       2001
## 13
## 14
## 15                         Yes
## 16                         Yes
## 17                         Yes
## 18                         Yes                       2003
## 19                         Yes
## 20                         Yes                       1970
##    Latest.industrial.data Latest.trade.data Latest.water.withdrawal.data
## 1                       NA              2008                           NA
## 2                       NA              2006                           NA
## 3                       NA              2008                         2005
## 4                       NA              2007                         2003
## 5                     1997              2008                           NA
## 6                      NA              2008                           NA
## 7                      NA              2008                         2000
## 8                      NA              2006                           NA
## 9                      NA                NA                           NA
## 10                     NA                NA                           NA
## 11                   2005              2008                         2000
## 12                   2005              2008                         2000
## 13                     NA              2005                           NA
## 14                     NA                NA                         2000
## 15                     NA              2007                           NA
## 16                     NA                NA                           NA
## 17                     NA              2008                           NA
## 18                     NA              2008                           NA
## 19                     NA                NA                           NA
## 20                     NA              2007                         2002
##    X2.alpha.code WB.2.code           Table.Name           Short.Name
## 1              AW        AW                Aruba                Aruba
## 2              AD        AD              Andorra              Andorra
## 3              AE        AE United Arab Emirates United Arab Emirates
## 4              BH        BH              Bahrain              Bahrain
## 5              BS        BS         Bahamas, The          The Bahamas
## 6              BM        BM              Bermuda              Bermuda
## 7              BB        BB             Barbados             Barbados
## 8              BN        BN    Brunei Darussalam               Brunei
## 9                                Channel Islands      Channel Islands
## 10             KY        KY       Cayman Islands       Cayman Islands
## 11             CY        CY               Cyprus               Cyprus
## 12             EE        EE              Estonia              Estonia
## 13             FO        FO       Faeroe Islands       Faeroe Islands
## 14             GQ        GQ    Equatorial Guinea    Equatorial Guinea
## 15             GL        GL            Greenland            Greenland
## 16             GU        GU                 Guam                 Guam
## 17             HK        HK Hong Kong SAR, China Hong Kong SAR, China
## 18             HR        HR              Croatia              Croatia
## 19             IM        IM          Isle of Man          Isle of Man
## 20             KW        KW               Kuwait               Kuwait
```

```
intersect(names(gdp), names(education)) ##will show you which column names are shared between two or mo
```

```
## character(0)
```

#Cleaning and Tidying DATA

```
getwd()  ##for determining the working directory
```

```
## [1] "/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScience"
```

```
setwd("../") ##moves up one level of the working directory.

file.exists("directoryName")  ##looks for whether this directory exists, if not...
```

```
## [1] FALSE
```

```
dir.create("directoryName") ##will then create the directory.

if(!file.exists("data")) { ##checks whether file/directory exists, and if not, it creates one.
  dir.create("data")
}
```

###Importing/Downloading Files from the Internet

```
#how to download a file from the internet and store in a local file.
fileURL <- "https://data.baltimorecity.gov/api/views/dz54-2aru/rows.csv?accessType=DOWNLOAD"
download.file(fileURL, destfile = "./data/cameras.csv", method = "curl")  ##curl is essential because h
list.files("./data")
```

```
##  [1] "activity.csv"                        "cameras.csv"
##  [3] "education.csv"                       "gdp190.csv"
##  [5] "household_power_consumption.txt"     "hw1_data.csv"
##  [7] "idahoHousing.csv"                    "jeff.jpeg"
##  [9] "naturalgas.xlsx"                     "outcome-of-care-measures.csv"
## [11] "PM2-5_2000_2019_annual.txt"          "pml-testing.csv"
## [13] "pml-training.csv"                    "Respiration_2012_combined_demo.csv"
## [15] "reviews.csv"                         "solutions.csv"
## [17] "Source_Classification_Code.rds"      "StormData.csv"
## [19] "summarySCC_PM25.rds"                 "UCI HAR Dataset 2"
## [21] "Walk_Score.csv"
```

```
dateDownloaded <- date()
dateDownloaded  ##assigns the date to the downloaded file.
```

```
## [1] "Mon Nov  7 14:18:05 2022"
```

###Importing/Downloading XML Files

(code blanked due to url failure to call). library(XML) fileURL <- “http://www.w3schools.com/xml/simple.xml” doc <- xmlTreeParse(fileURL, useInternal = TRUE) rootNode <- xmlRoot(doc) xmlName(rootNode) ## Consider installing XML package.

rootNode[[1]] xmlSApply(rootNode, xmlValue) ##gets every value for every tagged element.

Example code #2 library(XML) fileURL <- “http://d396qusza40orc.cloudfront.net/getdata%2Fdata%2Frestaurants.xml” doc <- xmlTreeParse(fileURL, useInternal = TRUE) rootNode <- xmlRoot(doc) xmlName(rootNode)

xmlSApply(rootNode, xmlValue) write.table(rootNode, “rootNode.csv”)

###Reading and importing JSON files as data.frame

library(jsonlite) jsonData <- fromJSON(“https://api.github.con/users/jtleek/repos”) names(jsonData)

Can drill down further into the data. names(jsonData*Owner*)*names*(*jsondata*Owner$login)

myjson <- toJSON(iris, pretty = TRUE) ##converts data.frame into a JSON file output. cat(myjson) ##prints out

###Connecting to mySQL database

```r
library(RMySQL)
```

```
## Loading required package: DBI
```

```r
#"RMySQL" is pacgage needed to pull from SQL databases.
ucscDb <- dbConnect(MySQL(), user = "genome", host = "genome-mysql.cse.ucsc.edu")
result <- dbGetQuery(ucscDb, "show databases;"); dbDisconnect(ucscDb);
```

```
## [1] TRUE
```

```r
head(result)  ## this returns the list of databases (SQL), which house any number of tables, or data.fr
```

```
##   Database
## 1  acaChl1
## 2  ailMel1
## 3  allMis1
## 4  allSin1
## 5  amaVit1
## 6  anaPla1
```

```r
##In order to select further...
hg19 <- dbConnect(MySQL(), user= "genome", db= "hg19", host= "genome-mysql.cse.ucsc.edu")
allTables <- dbListTables(hg19)
length(allTables) ##returns the number of tables in the database. Can be a lot.
```

```
## [1] 12587
```

```r
allTables[1:10]  ## a way to view selected tables, which are 1 through 10 in the hg19 database.
```

```
##  [1] "HInv"                     "HInvGeneMrna"             "acembly"
##  [4] "acemblyClass"             "acemblyPep"               "affyCytoScan"
##  [7] "affyExonProbeAmbiguous" "affyExonProbeCore"        "affyExonProbeExtended"
## [10] "affyExonProbeFree"
```

```r
dbListFields(hg19, "affyU133Plus2")  ##This is a view of a specific table, and it returns the "fields"
```

```
##  [1] "bin"          "matches"     "misMatches"  "repMatches"  "nCount"
##  [6] "qNumInsert"  "qBaseInsert" "tNumInsert"  "tBaseInsert" "strand"
## [11] "qName"        "qSize"       "qStart"      "qEnd"        "tName"
## [16] "tSize"        "tStart"      "tEnd"        "blockCount"  "blockSizes"
## [21] "qStarts"      "tStarts"
```

```r
dbGetQuery(hg19, "select count(*) from affyU133Plus2")  ##sends a SQL language request to the database
```

```
##   count(*)
## 1    58463
```

```r
affyData <- dbReadTable(hg19, "affyU133Plus2")  ##This calls the data.frame from the SQL database. Meth
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 0 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 1 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 2 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 3 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 4 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 5 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 6 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 7 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 8 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 11 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 12 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 13 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 15 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 16 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 17 imported as
## numeric

## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 18 imported as
## numeric
```

```
head(affyData)
```

```
##   bin matches misMatches repMatches nCount qNumInsert qBaseInsert tNumInsert
## 1 585     530          4          0     23          3          41          3
## 2 585    3355         17          0    109          9          67          9
## 3 585    4156         14          0     83         16          18          2
## 4 585    4667          9          0     68         21          42          3
## 5 585    5180         14          0    167         10          38          1
## 6 585     468          5          0     14          0           0          0
##   tBaseInsert strand        qName qSize qStart qEnd tName     tSize tStart
## 1         898      -  225995_x_at   637      5  603  chr1 249250621  14361
## 2       11621      -  225035_x_at  3635      0 3548  chr1 249250621  14381
## 3          93      -  226340_x_at  4318      3 4274  chr1 249250621  14399
## 4        5743      - 1557034_s_at  4834     48 4834  chr1 249250621  14406
## 5          29      -    231811_at  5399      0 5399  chr1 249250621  19688
## 6           0      -    236841_at   487      0  487  chr1 249250621  27542
##    tEnd blockCount
## 1 15816          5
## 2 29483         17
## 3 18745         18
## 4 24893         23
## 5 25078         11
## 6 28029          1
##                                                                    blockSizes
## 1                                                           93,144,229,70,21,
## 2              73,375,71,165,303,360,198,661,201,1,260,250,74,73,98,155,163,
## 3                 690,10,32,33,376,4,5,15,5,11,7,41,277,859,141,51,443,1253,
## 4 99,352,286,24,49,14,6,5,8,149,14,44,98,12,10,355,837,59,8,1500,133,624,58,
## 5                                       131,26,1300,6,4,11,4,7,358,3359,155,
## 6                                                                        487,
##                                                                                                   qSta
## 1                                                                                    34,132,278,541,
## 2                        87,165,540,647,818,1123,1484,1682,2343,2545,2546,2808,3058,3133,3206,3317,3
## 3                   44,735,746,779,813,1190,1195,1201,1217,1223,1235,1243,1285,1564,2423,2565,2617,3
## 4 0,99,452,739,764,814,829,836,842,851,1001,1016,1061,1160,1173,1184,1540,2381,2441,2450,3951,4103,4
## 5                                                     0,132,159,1460,1467,1472,1484,1489,1497,1856,5
## 6
##
## 1
## 2                                     14381,14454,14969,15075,15240,15543,15903,16104,16853,17054,17
## 3                               14399,15089,15099,15131,15164,15540,15544,15549,15564,15569,15580,15
## 4 14406,20227,20579,20865,20889,20938,20952,20958,20963,20971,21120,21134,21178,21276,21288,21298,21
## 5                                                                         19688,19819,19845,21145,21
## 6
```

```
dbDisconnect(hg19) ##This is essential because it closes the connection to the mySQL server.
```

```
## [1] TRUE
```

###Reading and working with HDF5 file types

source(“http://bioconductor.org/biocLite.R”) ##initial loading of the hdf5 file type into R biocLite(“rhdf5”) library(hdf5) created = h5createFile("example.h5") created bioconductor.org/install in order to work with data type. For another time.

###Data scrapping from the WEB

con = url("http://scholar.google.com/citations?user=HI-I6C0AAAAJ&hl=en") ## establishes a connection to the referenced url htmlCode = readLines(con) ##readlines command reads data from the connection close(con) ##be sure to close the connection after use. htmlCode

Alternative avenue library(XML) url<- ("http://scholar.google.com/citations?user=HI-I6C0AAAAJ&hl=en") html <- htmlTreeParse(url, useInternalNodes = T)

xpathSApply(html, "//title", xmlValue)

###Subsetting Fundamentals- A Review

```
library(datasets) ##loads a generic dataset avaialbel in r as a library. We will use this for a data.fr
    head(airquality)  ##shows the airquality dataset from the above library.
```

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

```
    x <- airquality
    x[,1]  ## Subsetting the first column
```

```
##   [1]  41  36  12  18  NA  28  23  19   8  NA   7  16  11  14  18  14  34   6
##  [19]  30  11   1  11   4  32  NA  NA  NA  23  45 115  37  NA  NA  NA  NA  NA
##  [37]  NA  29  NA  71  39  NA  NA  23  NA  NA  21  37  20  12  13  NA  NA  NA
##  [55]  NA  NA  NA  NA  NA  NA  NA 135  49  32  NA  64  40  77  97  97  85  NA
##  [73]  10  27  NA   7  48  35  61  79  63  16  NA  NA  80 108  20  52  82  50
##  [91]  64  59  39   9  16  78  35  66 122  89 110  NA  NA  44  28  65  NA  22
## [109]  59  23  31  44  21   9  NA  45 168  73  NA  76 118  84  85  96  78  73
## [127]  91  47  32  20  23  21  24  44  21  28   9  13  46  18  13  24  16  13
## [145]  23  36   7  14  30  NA  14  18  20
```

```
    x[, "Ozone"] ##Subsetting the first column by name
```

```
##   [1]  41  36  12  18  NA  28  23  19   8  NA   7  16  11  14  18  14  34   6
##  [19]  30  11   1  11   4  32  NA  NA  NA  23  45 115  37  NA  NA  NA  NA  NA
##  [37]  NA  29  NA  71  39  NA  NA  23  NA  NA  21  37  20  12  13  NA  NA  NA
##  [55]  NA  NA  NA  NA  NA  NA  NA 135  49  32  NA  64  40  77  97  97  85  NA
##  [73]  10  27  NA   7  48  35  61  79  63  16  NA  NA  80 108  20  52  82  50
##  [91]  64  59  39   9  16  78  35  66 122  89 110  NA  NA  44  28  65  NA  22
## [109]  59  23  31  44  21   9  NA  45 168  73  NA  76 118  84  85  96  78  73
## [127]  91  47  32  20  23  21  24  44  21  28   9  13  46  18  13  24  16  13
## [145]  23  36   7  14  30  NA  14  18  20
```

```
x[1,]  ##subsetting the first row of a data.frame
```

```
##   Ozone Solar.R Wind Temp Month Day
## 1    41     190  7.4   67     5   1
```

```
na.omit(x[x$Ozone <= 20 & x$Temp > 70,])  ## subsetting data.frame x using two conditions or argume
```

```
##     Ozone Solar.R Wind Temp Month Day
## 3      12     149 12.6   74     5   3
## 22     11     320 16.6   73     5  22
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 73     10     264 14.3   73     7  12
## 76      7      48 14.3   80     7  15
## 82     16       7  6.9   74     7  21
## 87     20      81  8.6   82     7  26
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 114     9      36 14.3   72     8  22
## 130    20     252 10.9   80     9   7
## 137     9      24 10.9   71     9  14
## 138    13     112 11.5   71     9  15
## 141    13      27 10.3   76     9  18
## 143    16     201  8.0   82     9  20
## 151    14     191 14.3   75     9  28
## 152    18     131  8.0   76     9  29
```

```
x[which(x$Ozone <= 20 & x$Temp > 70),]  ##This returns the same as above, only more data is include
```

```
##     Ozone Solar.R Wind Temp Month Day
## 3      12     149 12.6   74     5   3
## 11      7      NA  6.9   74     5  11
## 22     11     320 16.6   73     5  22
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 73     10     264 14.3   73     7  12
## 76      7      48 14.3   80     7  15
## 82     16       7  6.9   74     7  21
## 87     20      81  8.6   82     7  26
## 94      9      24 13.8   81     8   2
## 95     16      77  7.4   82     8   3
## 114     9      36 14.3   72     8  22
## 130    20     252 10.9   80     9   7
## 137     9      24 10.9   71     9  14
## 138    13     112 11.5   71     9  15
## 141    13      27 10.3   76     9  18
## 143    16     201  8.0   82     9  20
## 151    14     191 14.3   75     9  28
## 152    18     131  8.0   76     9  29
```

###Sorting Fundamentals- A Review

```
library(datasets)
    head(airquality)
```

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

```
##Sorting the values in different ways
        sort(x$Solar.R)  ##Sorts the data in Solar.R column
```

```
##   [1]   7   8  13  14  19  20  24  24  25  27  31  36  37  44  47  48  49  51
##  [19]  59  64  65  66  71  77  78  81  82  83  91  92  92  95  98  99 101 112
##  [37] 115 118 120 127 127 131 135 137 137 138 139 139 145 148 149 150 153 157
##  [55] 167 175 175 175 183 186 187 188 189 190 190 191 191 192 193 194 197 201
##  [73] 203 207 212 213 215 220 220 220 222 223 223 223 224 225 229 230 236 236
##  [91] 237 237 238 238 238 238 242 244 248 250 250 252 252 253 254 255 255 256
## [109] 258 259 259 259 259 260 264 264 266 267 269 272 273 273 274 274 275 276
## [127] 279 284 285 286 287 290 291 291 294 295 299 307 313 314 320 322 322 323
## [145] 332 334
```

```
        sort(x$Solar.R, decreasing = TRUE)  ##Performs the same sort, but in decreasing order.
```

```
##   [1] 334 332 323 322 322 320 314 313 307 299 295 294 291 291 290 287 286 285
##  [19] 284 279 276 275 274 274 273 273 272 269 267 266 264 264 260 259 259 259
##  [37] 259 258 256 255 255 254 253 252 252 250 250 248 244 242 238 238 238 238
##  [55] 237 237 236 236 230 229 225 224 223 223 223 222 220 220 220 215 213 212
##  [73] 207 203 201 197 194 193 192 191 191 190 190 189 188 187 186 183 175 175
##  [91] 175 167 157 153 150 149 148 145 139 139 138 137 137 135 131 127 127 120
## [109] 118 115 112 101  99  98  95  92  92  91  83  82  81  78  77  71  66  65
## [127]  64  59  51  49  48  47  44  37  36  31  27  25  24  24  20  19  14  13
## [145]   8   7
```

```
        x[order(x$Ozone),]  ##orders the data based on ascending order of Ozone data.
```

```
##     Ozone Solar.R Wind Temp Month Day
## 21      1       8  9.7   59     5  21
## 23      4      25  9.7   61     5  23
## 18      6      78 18.4   57     5  18
## 11      7      NA  6.9   74     5  11
## 76      7      48 14.3   80     7  15
## 147     7      49 10.3   69     9  24
## 9       8      19 20.1   61     5   9
## 94      9      24 13.8   81     8   2
## 114     9      36 14.3   72     8  22
## 137     9      24 10.9   71     9  14
## 73     10     264 14.3   73     7  12
## 13     11     290  9.2   66     5  13
## 20     11      44  9.7   62     5  20
## 22     11     320 16.6   73     5  22
## 3      12     149 12.6   74     5   3
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 138    13     112 11.5   71     9  15
## 141    13      27 10.3   76     9  18
## 144    13     238 12.6   64     9  21
## 14     14     274 10.9   68     5  14
## 16     14     334 11.5   64     5  16
## 148    14      20 16.6   63     9  25
## 151    14     191 14.3   75     9  28
## 12     16     256  9.7   69     5  12
## 82     16       7  6.9   74     7  21
## 95     16      77  7.4   82     8   3
## 143    16     201  8.0   82     9  20
## 4      18     313 11.5   62     5   4
## 15     18      65 13.2   58     5  15
## 140    18     224 13.8   67     9  17
## 152    18     131  8.0   76     9  29
## 8      19      99 13.8   59     5   8
## 49     20      37  9.2   65     6  18
## 87     20      81  8.6   82     7  26
## 130    20     252 10.9   80     9   7
## 153    20     223 11.5   68     9  30
## 47     21     191 14.9   77     6  16
## 113    21     259 15.5   77     8  21
## 132    21     230 10.9   75     9   9
## 135    21     259 15.5   76     9  12
## 108    22      71 10.3   77     8  16
## 7      23     299  8.6   65     5   7
## 28     23      13 12.0   67     5  28
## 44     23     148  8.0   82     6  13
## 110    23     115  7.4   76     8  18
## 131    23     220 10.3   78     9   8
## 145    23      14  9.2   71     9  22
## 133    24     259  9.7   73     9  10
## 142    24     238 10.3   68     9  19
## 74     27     175 14.9   81     7  13
## 6      28      NA 14.9   66     5   6
## 105    28     273 11.5   82     8  13
## 136    28     238  6.3   77     9  13
## 38     29     127  9.7   82     6   7
## 19     30     322 11.5   68     5  19
## 149    30     193  6.9   70     9  26
## 111    31     244 10.9   78     8  19
## 24     32      92 12.0   61     5  24
## 64     32     236  9.2   81     7   3
## 129    32      92 15.5   84     9   6
## 17     34     307 12.0   66     5  17
## 78     35     274 10.3   82     7  17
## 97     35      NA  7.4   85     8   5
## 2      36     118  8.0   72     5   2
## 146    36     139 10.3   81     9  23
## 31     37     279  7.4   76     5  31
## 48     37     284 20.7   72     6  17
## 41     39     323 11.5   87     6  10
## 93     39      83  6.9   81     8   1
## 67     40     314 10.9   83     7   6
## 1      41     190  7.4   67     5   1
## 104    44     192 11.5   86     8  12
## 112    44     190 10.3   78     8  20
## 134    44     236 14.9   81     9  11
## 29     45     252 14.9   81     5  29
## 116    45     212  9.7   79     8  24
## 139    46     237  6.9   78     9  16
## 128    47      95  7.4   87     9   5
## 77     48     260  6.9   81     7  16
## 63     49     248  9.2   85     7   2
## 90     50     275  7.4   86     7  29
## 88     52      82 12.0   86     7  27
## 92     59     254  9.2   81     7  31
## 109    59      51  6.3   79     8  17
## 79     61     285  6.3   84     7  18
## 81     63     220 11.5   85     7  20
## 66     64     175  4.6   83     7   5
## 91     64     253  7.4   83     7  30
## 106    65     157  9.7   80     8  14
## 98     66      NA  4.6   87     8   6
## 40     71     291 13.8   90     6   9
## 118    73     215  8.0   86     8  26
## 126    73     183  2.8   93     9   3
## 120    76     203  9.7   97     8  28
## 68     77     276  5.1   88     7   7
## 96     78      NA  6.9   86     8   4
## 125    78     197  5.1   92     9   2
## 80     79     187  5.1   87     7  19
## 85     80     294  8.6   86     7  24
## 89     82     213  7.4   88     7  28
## 122    84     237  6.3   96     8  30
## 71     85     175  7.4   89     7  10
## 123    85     188  6.3   94     8  31
## 100    89     229 10.3   90     8   8
## 127    91     189  4.6   93     9   4
## 124    96     167  6.9   91     9   1
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 86    108     223  8.0   85     7  25
## 101   110     207  8.0   90     8   9
## 30    115     223  5.7   79     5  30
## 121   118     225  2.3   94     8  29
## 99    122     255  4.0   89     8   7
## 62    135     269  4.1   84     7   1
## 117   168     238  3.4   81     8  25
## 5      NA      NA 14.3   56     5   5
## 10     NA     194  8.6   69     5  10
## 25     NA      66 16.6   57     5  25
## 26     NA     266 14.9   58     5  26
## 27     NA      NA  8.0   57     5  27
## 32     NA     286  8.6   78     6   1
## 33     NA     287  9.7   74     6   2
## 34     NA     242 16.1   67     6   3
## 35     NA     186  9.2   84     6   4
## 36     NA     220  8.6   85     6   5
## 37     NA     264 14.3   79     6   6
## 39     NA     273  6.9   87     6   8
## 42     NA     259 10.9   93     6  11
## 43     NA     250  9.2   92     6  12
## 45     NA     332 13.8   80     6  14
## 46     NA     322 11.5   79     6  15
## 52     NA     150  6.3   77     6  21
## 53     NA      59  1.7   76     6  22
## 54     NA      91  4.6   76     6  23
## 55     NA     250  6.3   76     6  24
## 56     NA     135  8.0   75     6  25
## 57     NA     127  8.0   78     6  26
## 58     NA      47 10.3   73     6  27
## 59     NA      98 11.5   80     6  28
## 60     NA      31 14.9   77     6  29
## 61     NA     138  8.0   83     6  30
## 65     NA     101 10.9   84     7   4
## 72     NA     139  8.6   82     7  11
## 75     NA     291 14.9   91     7  14
## 83     NA     258  9.7   81     7  22
## 84     NA     295 11.5   82     7  23
## 102    NA     222  8.6   92     8  10
## 103    NA     137 11.5   86     8  11
## 107    NA      64 11.5   79     8  15
## 115    NA     255 12.6   75     8  23
## 119    NA     153  5.7   88     8  27
## 150    NA     145 13.2   77     9  27
```

```
        x[order(x$Ozone, x$Month),] ##Will order the data first by Ozone, and then by Month.
```

```
##     Ozone Solar.R Wind Temp Month Day
## 21      1       8  9.7   59     5  21
## 23      4      25  9.7   61     5  23
## 18      6      78 18.4   57     5  18
## 11      7      NA  6.9   74     5  11
## 76      7      48 14.3   80     7  15
## 147     7      49 10.3   69     9  24
## 9       8      19 20.1   61     5   9
## 94      9      24 13.8   81     8   2
## 114     9      36 14.3   72     8  22
## 137     9      24 10.9   71     9  14
## 73     10     264 14.3   73     7  12
## 13     11     290  9.2   66     5  13
## 20     11      44  9.7   62     5  20
## 22     11     320 16.6   73     5  22
## 3      12     149 12.6   74     5   3
## 50     12     120 11.5   73     6  19
## 51     13     137 10.3   76     6  20
## 138    13     112 11.5   71     9  15
## 141    13      27 10.3   76     9  18
## 144    13     238 12.6   64     9  21
## 14     14     274 10.9   68     5  14
## 16     14     334 11.5   64     5  16
## 148    14      20 16.6   63     9  25
## 151    14     191 14.3   75     9  28
## 12     16     256  9.7   69     5  12
## 82     16       7  6.9   74     7  21
## 95     16      77  7.4   82     8   3
## 143    16     201  8.0   82     9  20
## 4      18     313 11.5   62     5   4
## 15     18      65 13.2   58     5  15
## 140    18     224 13.8   67     9  17
## 152    18     131  8.0   76     9  29
## 8      19      99 13.8   59     5   8
## 49     20      37  9.2   65     6  18
## 87     20      81  8.6   82     7  26
## 130    20     252 10.9   80     9   7
## 153    20     223 11.5   68     9  30
## 47     21     191 14.9   77     6  16
## 113    21     259 15.5   77     8  21
## 132    21     230 10.9   75     9   9
## 135    21     259 15.5   76     9  12
## 108    22      71 10.3   77     8  16
## 7      23     299  8.6   65     5   7
## 28     23      13 12.0   67     5  28
## 44     23     148  8.0   82     6  13
## 110    23     115  7.4   76     8  18
## 131    23     220 10.3   78     9   8
## 145    23      14  9.2   71     9  22
## 133    24     259  9.7   73     9  10
## 142    24     238 10.3   68     9  19
## 74     27     175 14.9   81     7  13
## 6      28      NA 14.9   66     5   6
## 105    28     273 11.5   82     8  13
## 136    28     238  6.3   77     9  13
## 38     29     127  9.7   82     6   7
## 19     30     322 11.5   68     5  19
## 149    30     193  6.9   70     9  26
## 111    31     244 10.9   78     8  19
## 24     32      92 12.0   61     5  24
## 64     32     236  9.2   81     7   3
## 129    32      92 15.5   84     9   6
## 17     34     307 12.0   66     5  17
## 78     35     274 10.3   82     7  17
## 97     35      NA  7.4   85     8   5
## 2      36     118  8.0   72     5   2
## 146    36     139 10.3   81     9  23
## 31     37     279  7.4   76     5  31
## 48     37     284 20.7   72     6  17
## 41     39     323 11.5   87     6  10
## 93     39      83  6.9   81     8   1
## 67     40     314 10.9   83     7   6
## 1      41     190  7.4   67     5   1
## 104    44     192 11.5   86     8  12
## 112    44     190 10.3   78     8  20
## 134    44     236 14.9   81     9  11
## 29     45     252 14.9   81     5  29
## 116    45     212  9.7   79     8  24
## 139    46     237  6.9   78     9  16
## 128    47      95  7.4   87     9   5
## 77     48     260  6.9   81     7  16
## 63     49     248  9.2   85     7   2
## 90     50     275  7.4   86     7  29
## 88     52      82 12.0   86     7  27
## 92     59     254  9.2   81     7  31
## 109    59      51  6.3   79     8  17
## 79     61     285  6.3   84     7  18
## 81     63     220 11.5   85     7  20
## 66     64     175  4.6   83     7   5
## 91     64     253  7.4   83     7  30
## 106    65     157  9.7   80     8  14
## 98     66      NA  4.6   87     8   6
## 40     71     291 13.8   90     6   9
## 118    73     215  8.0   86     8  26
## 126    73     183  2.8   93     9   3
## 120    76     203  9.7   97     8  28
## 68     77     276  5.1   88     7   7
## 96     78      NA  6.9   86     8   4
## 125    78     197  5.1   92     9   2
## 80     79     187  5.1   87     7  19
## 85     80     294  8.6   86     7  24
## 89     82     213  7.4   88     7  28
## 122    84     237  6.3   96     8  30
## 71     85     175  7.4   89     7  10
## 123    85     188  6.3   94     8  31
## 100    89     229 10.3   90     8   8
## 127    91     189  4.6   93     9   4
## 124    96     167  6.9   91     9   1
## 69     97     267  6.3   92     7   8
## 70     97     272  5.7   92     7   9
## 86    108     223  8.0   85     7  25
## 101   110     207  8.0   90     8   9
## 30    115     223  5.7   79     5  30
## 121   118     225  2.3   94     8  29
## 99    122     255  4.0   89     8   7
## 62    135     269  4.1   84     7   1
## 117   168     238  3.4   81     8  25
## 5      NA      NA 14.3   56     5   5
## 10     NA     194  8.6   69     5  10
## 25     NA      66 16.6   57     5  25
## 26     NA     266 14.9   58     5  26
## 27     NA      NA  8.0   57     5  27
## 32     NA     286  8.6   78     6   1
## 33     NA     287  9.7   74     6   2
## 34     NA     242 16.1   67     6   3
## 35     NA     186  9.2   84     6   4
## 36     NA     220  8.6   85     6   5
## 37     NA     264 14.3   79     6   6
## 39     NA     273  6.9   87     6   8
## 42     NA     259 10.9   93     6  11
## 43     NA     250  9.2   92     6  12
## 45     NA     332 13.8   80     6  14
## 46     NA     322 11.5   79     6  15
## 52     NA     150  6.3   77     6  21
## 53     NA      59  1.7   76     6  22
## 54     NA      91  4.6   76     6  23
## 55     NA     250  6.3   76     6  24
## 56     NA     135  8.0   75     6  25
## 57     NA     127  8.0   78     6  26
## 58     NA      47 10.3   73     6  27
## 59     NA      98 11.5   80     6  28
## 60     NA      31 14.9   77     6  29
## 61     NA     138  8.0   83     6  30
## 65     NA     101 10.9   84     7   4
## 72     NA     139  8.6   82     7  11
## 75     NA     291 14.9   91     7  14
## 83     NA     258  9.7   81     7  22
## 84     NA     295 11.5   82     7  23
## 102    NA     222  8.6   92     8  10
## 103    NA     137 11.5   86     8  11
## 107    NA      64 11.5   79     8  15
## 115    NA     255 12.6   75     8  23
## 119    NA     153  5.7   88     8  27
## 150    NA     145 13.2   77     9  27
```

```
        ##plyr is a package that is useful for sorting. Use help.
```

###Editing text variables

```
##Using previous example data for GDP...
fileURL1 = "https://d396qusza40orc.cloudfront.net/getdata%2Fdata%2FGDP.csv"
download.file(fileURL1, destfile ="/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScien
gdp <- read.csv("/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScience/data/gdp190.csv
names(gdp)
```

```
##  [1] "X"                            "Gross.domestic.product.2012"
##  [3] "X.1"                          "X.2"
##  [5] "X.3"                          "X.4"
##  [7] "X.5"                          "X.6"
##  [9] "X.7"                          "X.8"
```

```
      gdp2 <- dplyr::rename(gdp, Countrycode = X, country = X.2, milDollars = X.3, rank = Gross.domesti

tolower(names(gdp2))  ##can be used to avoid mistakes by lowering the cases of all of the column names.
```

```
##  [1] "countrycode" "rank"        "x.1"         "country"     "mildollars"
##  [6] "x.4"         "x.5"         "x.6"         "x.7"         "x.8"
```

```
splitname <-  strsplit(names(gdp2), "\\.") ##This splits apart a name based on a defined element, in thi
splitname[[3]]
```

```
## [1] "X" "1"
```

```
sub("_", "", names(gdp2))  ##this removes the underscore from column names and replaced them with "" bla
```

```
##  [1] "Countrycode" "rank"        "X.1"         "country"     "milDollars"
##  [6] "X.4"         "X.5"         "X.6"         "X.7"         "X.8"
```

```
##example
testName <- "This_is_a_test"
sub("_", "", testName) ##will return only a single underscore removed.
```

```
## [1] "Thisis_a_test"
```

```
gsub("_", "", testName) ##will remove them all.
```

```
## [1] "Thisisatest"
```

```
grep("number of character", gdp2$country)
```

```
## integer(0)
```

```
table(grepl("integer, number of character", gdp2$rank)) ##will present the number of instances the integ
```

```
##
## FALSE
##   330
```

```
substr("Ronald McDonald", 1, 6) ##subsets the string between the first and fifth character + one space
```

```
## [1] "Ronald"
```

###Regular Expressions - strings and patterns

```
# ^I Think    will match strings that begin with "I think"
# morning$    will match strings that end in the word morning.
# [Pp][Ee][Nn][Ii][Ss]      will match any form of penis, no matter which words are capitalized.
# ^[Ii] am     combining different character classes.
# ^[0-9][a-zA-z] This will look for any set of numbers (0-9), as well as any letters in the alphabet th
# .           (period) refers to ANY character. 9.11 could be 9-11, 9/11, 9:11 etc...
# flood|fire  will return one or the other. |   represents or
# ?           represents anything optional
# (.*)        will look for any string/character, any number of time that are within parentheses.
#  +([a-zA-Z]+) +\1 +  space then one or more characters then space then a copy of first expressio. "bl
```

###Idaho Housing Example- Value above 1mil

```
fileURL <- "https://d396qusza40orc.cloudfront.net/getdata%2Fdata%2Fss06hid.csv?accessType=DOWNLOAD"
download.file(fileURL, destfile = "/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScien
list.files("./data")
```

```
##  [1] "activity.csv"                      "cameras.csv"
##  [3] "education.csv"                     "gdp190.csv"
##  [5] "household_power_consumption.txt"   "hw1_data.csv"
##  [7] "idahoHousing.csv"                  "jeff.jpeg"
##  [9] "naturalgas.xlsx"                   "outcome-of-care-measures.csv"
## [11] "PM2-5_2000_2019_annual.txt"        "pml-testing.csv"
## [13] "pml-training.csv"                  "Respiration_2012_combined_demo.csv"
## [15] "reviews.csv"                       "solutions.csv"
## [17] "Source_Classification_Code.rds"    "StormData.csv"
## [19] "summarySCC_PM25.rds"               "UCI HAR Dataset 2"
## [21] "Walk_Score.csv"
```

```
dateDownloaded <- date()
dateDownloaded
```

```
## [1] "Mon Nov  7 14:18:10 2022"
```

```
    idaho <- read.csv("/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScience/data/idah
    head(idaho)
```

```
##   RT SERIALNO DIVISION PUMA REGION ST  ADJUST WGTP NP TYPE ACR AGS BDS BLD BUS
## 1  H      186        8  700      4 16 1015675   89  4    1   1  NA   4   2   2
## 2  H      306        8  700      4 16 1015675  310  1    1  NA  NA   1   7  NA
## 3  H      395        8  100      4 16 1015675  106  2    1   1  NA   3   2   2
## 4  H      506        8  700      4 16 1015675  240  4    1   1  NA   4   2   2
## 5  H      835        8  800      4 16 1015675  118  4    1   2   1   5   2   2
## 6  H      989        8  700      4 16 1015675  115  4    1   1  NA   3   2   2
##   CONP ELEP FS FULP GASP HFL INSP KIT MHP MRGI MRGP MRGT MRGX PLM RMS RNTM RNTP
## 1   NA  180  0    2    3   3  600   1  NA    1 1300    1    1   1   9   NA   NA
## 2   NA   60  0    2    3   3   NA   1  NA   NA   NA   NA   NA   1   2    2  600
## 3   NA   70  0    2   30   1  200   1  NA   NA   NA   NA    3   1   7   NA   NA
## 4   NA   40  0    2   80   1  200   1  NA    1  860    1    1   1   6   NA   NA
## 5   NA  250  0    2    3   3  700   1  NA    1 1900    1    1   1   7   NA   NA
## 6   NA  130  0    2    3   3  250   1  NA    1  700    1    1   1   6   NA   NA
##   SMP TEL TEN VACS VAL VEH WATP YBL FES  FINCP FPARC GRNTP GRPIP HHL HHT  HINCP
## 1  NA   1   1   NA  17   3  840   5   2 105600     2    NA    NA   1   1 105600
## 2  NA   1   3   NA  NA   1    1   3  NA     NA    NA   660    23   1   4  34000
## 3  NA   1   2   NA  18   2   50   5   7   9400     2    NA    NA   1   3   9400
## 4 400   1   1   NA  19   3  500   2   1  66000     1    NA    NA   1   1  66000
## 5 650   1   1   NA  20   5    2   3   1  93000     2    NA    NA   1   1  93000
## 6 400   1   1   NA  15   2 1200   5   2  61000     1    NA    NA   1   1  61000
##   HUGCL HUPAC HUPAOC HUPARC LNGI MV NOC NPF NPP NR NRC OCPIP PARTNER PSF R18
## 1     0     2      2      2    1  4   2   4   0  0   2    18       0   0   1
## 2     0     4      4      4    1  3   0  NA   0  0   0    NA       0   0   0
## 3     0     2      2      2    1  2   1   2   0  0   1    23       0   0   1
## 4     0     1      1      1    1  3   2   4   0  0   2    26       0   0   1
## 5     0     2      2      2    1  1   1   4   0  0   1    36       0   0   1
## 6     0     1      1      1    1  4   2   4   0  0   2    26       0   0   1
##   R60 R65 RESMODE SMOCP SMX SRNT SVAL TAXP WIF WKEXREL WORKSTAT FACRP FAGSP
## 1   0   0       1  1550   3    0    1   24   3       2        3     0     0
## 2   0   0       2    NA  NA    1    0   NA  NA      NA       NA     0     0
## 3   0   0       1   179  NA    0    1   16   1      13       13     0     0
## 4   0   0       2  1422   1    0    1   31   2       2        1     0     0
## 5   0   0       1  2800   1    0    1   25   3       1        1     0     0
## 6   0   0       2  1330   2    0    1    7   1       7        3     0     0
##   FBDSP FBLDP FBUSP FCONP FELEP FFSP FFULP FGASP FHFLP FINSP FKITP FMHP FMRGIP
## 1     0     0     0     0     0    0     0     0     0     0     0    0      0
## 2     0     0     0     0     0    0     0     0     0     0     0    0      0
## 3     0     0     0     0     0    0     0     0     0     0     0    0      0
## 4     0     0     0     0     0    0     0     0     0     0     0    0      0
## 5     0     0     0     0     0    0     0     0     0     0     0    0      0
## 6     0     0     0     0     0    0     0     0     0     1     0    0      0
##   FMRGP FMRGTP FMRGXP FMVYP FPLMP FRMSP FRNTMP FRNTP FSMP FSMXHP FSMXSP FTAXP
## 1     0      0      0     0     0     0      0     0    0      0      0     0
## 2     0      0      0     0     0     0      0     0    0      0      0     0
## 3     0      0      0     0     0     0      0     0    0      0      0     0
## 4     0      0      0     0     0     0      0     0    0      0      0     0
## 5     0      0      0     0     0     0      0     0    0      0      0     0
## 6     0      0      0     0     0     0      0     0    0      0      0     1
##   FTELP FTENP FVACSP FVALP FVEHP FWATP FYBLP wgtp1 wgtp2 wgtp3 wgtp4 wgtp5
## 1     0     0      0     0     0     0     0    87    28   156    95    26
## 2     0     0      0     0     0     0     1   539   363   293   422   566
## 3     0     0      0     0     0     0     0   187    35   184   178    83
## 4     0     0      0     0     0     0     0   232   406   234   270   249
## 5     0     0      0     0     0     0     0   107   194   129    41   156
## 6     0     0      0     0     0     1     0   191   197   127   115   115
##   wgtp6 wgtp7 wgtp8 wgtp9 wgtp10 wgtp11 wgtp12 wgtp13 wgtp14 wgtp15 wgtp16
## 1    25    95    93    93     91     87    166     90     25    153     89
## 2   289    87   242   453    453    334    358    414    102    281     99
## 3    95    31    32   177    118    110    114    184    107     95    115
## 4   242   406   249   287     67     72    413    399     77    245    424
## 5   174    47   113   101     33    115     52    113     95    135    206
## 6   107   119    34    32     30    123    199    117     33    109    117
##   wgtp17 wgtp18 wgtp19 wgtp20 wgtp21 wgtp22 wgtp23 wgtp24 wgtp25 wgtp26 wgtp27
## 1    148     82     25    180     90     24    140     92     25     27     86
## 2    108    278    131    407    447    264    352    238    390    336    122
## 3     33    118    120     37    184     35    176    176    110    103     29
## 4     67     63    226    254    238     69    238    255    239    248     69
## 5    100    185    135    279    116     33    105    244     38     30    230
## 6     31    115    201    190    184    198    113    109    117    111    110
##   wgtp28 wgtp29 wgtp30 wgtp31 wgtp32 wgtp33 wgtp34 wgtp35 wgtp36 wgtp37 wgtp38
## 1     84     87     93     90    149     91     28    143     81    144     95
## 2    374    482    468    335    251    613    104    284    116     91    326
## 3     30    197    127     92    118    177     99     99    109     34    100
## 4    234    247    437    423     74     61    401    267     72    388    335
## 5    123    123    243    120    238     98     90    107     44    122     32
## 6     33     37     36    110    183    114     35    134    119     32    121
##   wgtp39 wgtp40 wgtp41 wgtp42 wgtp43 wgtp44 wgtp45 wgtp46 wgtp47 wgtp48 wgtp49
## 1     27     22     90    171     27     83    153    148     92     91     91
## 2    102    361    107    253    321    289     96    343    564    274    118
## 3    105     33    173     36    168    175     99    103     30     35    155
## 4    229    236    239     65    259    247    230    225     82    220    233
## 5    127    195    116     36    135    237     33     33    249    102     84
## 6    188     33     34     32    109    115    115    112    119    192    186
##   wgtp50 wgtp51 wgtp52 wgtp53 wgtp54 wgtp55 wgtp56 wgtp57 wgtp58 wgtp59 wgtp60
## 1     93     90     26     94    142     24     91     29     84    148     30
## 2    118    321    261    130    463    294    479    391    307    476    283
## 3    102     95    107    185    120    114    113     36    115    103     29
## 4    419    390     69     74    391    276     70    422    409    223    245
## 5    224    119    250    119    125    126     32    112     33    131     45
## 6    213    106     34    124    179    106    107    190    112     34     35
##   wgtp61 wgtp62 wgtp63 wgtp64 wgtp65 wgtp66 wgtp67 wgtp68 wgtp69 wgtp70 wgtp71
## 1     93    143     24     88    147    145     91     83     83     86     81
## 2    116    353    323    374    106    236    380    313     90     94    292
## 3    183     35    179    169     95    110     28     34    233     97    123
## 4    269    488    221    250    247    240    415    234    219     66     68
## 5    101    165    125     41    191    195     49    119     92     44    127
## 6     32     34    119    123    122    121    123    196    196    207    120
##   wgtp72 wgtp73 wgtp74 wgtp75 wgtp76 wgtp77 wgtp78 wgtp79 wgtp80
## 1     27     93    151     28     79     25    101    157    129
## 2    401     81    494    346    496    615    286    454    260
## 3    119    168    107     95    101     30    124    106     31
## 4    359    385     71    234    421     76     77    242    231
## 5     36    119    121    116    209     97    176    144     38
## 6     34    109    199    116    110    211    120     31    189
```

```
    #s <- split(idaho, idaho$VAL)  ##splitting the dataset idaho by the value - a good way to get summa


    idVAL <- subset(idaho, VAL == 24)  ##subset of the dataset for code24, which means more than one mi
    nrow(idVAL) ##counts the number of entries.
```

```
## [1] 53
```

###Idaho Housing Example- 10 acre plots who sold more than 10K in ag products

```
agricultureLogical <- filter(idaho, AGS == 6 & ACR == 3) ##This does not preserve row names when filter
head(agricultureLogical)
```

```
##   RT SERIALNO DIVISION PUMA REGION ST  ADJUST WGTP NP TYPE ACR AGS BDS BLD BUS
## 1  H    30346        8  400      4 16 1015675  120  4    1   3   6   3   2   2
## 2  H    53292        8  300      4 16 1015675   26  3    1   3   6   2   3   2
## 3  H    56299        8  800      4 16 1015675   97  2    1   3   6   2   2   2
## 4  H   101282        8  800      4 16 1015675   76  2    1   3   6   3   2   2
## 5  H   120351        8  800      4 16 1015675   51  5    1   3   6   5   2   2
## 6  H   122802        8  800      4 16 1015675   63  5    1   3   6   3   2   2
##   CONP ELEP FS FULP GASP HFL INSP KIT MHP MRGI MRGP MRGT MRGX PLM RMS RNTM RNTP
## 1   NA  150  0    2    3   3  600   1  NA    1 1400    1    1   1   5   NA   NA
## 2   NA  120  0 1000    3   6 1500   1  NA    2 1400    2    1   1   4   NA   NA
## 3   NA   80  0    2  110   1   NA   1  NA   NA   NA   NA   NA   1   5   NA   NA
## 4   NA   70  0  850    3   4  860   1  NA    2  600    2    1   1   9   NA   NA
## 5   NA   80  0    2   10   2    0   1  NA   NA   NA   NA    3   1   9   NA   NA
## 6   NA  150  0    2    3   3 4800   1  NA    2 1100    2    1   1   6   NA   NA
##   SMP TEL TEN VACS VAL VEH WATP YBL FES  FINCP FPARC GRNTP GRPIP HHL HHT  HINCP
## 1  NA   1   1   NA  20   2    2   3   1  62600     2    NA    NA   3   1  62600
## 2  NA   1   1   NA  11   3  100   5   1 120000      2    NA    NA   1   1 120000
## 3  NA   1   4   NA  NA   2    2   9   2  23200      4    NA    NA   1   1  23200
## 4  NA   1   1   NA  14   4    2   9   1  27500      4    NA    NA   1   1  27500
## 5  NA   1   2   NA  24   2    2   1   2  41500      3    NA    NA   1   1  41500
## 6  NA   1   1   NA  24   3    2   5   1   5200      2    NA    NA   2   1   5200
##   HUGCL HUPAC HUPAOC HUPARC LNGI MV NOC NPF NPP NR NRC OCPIP PARTNER PSF R18
## 1     0     2      2      2    1  1   2   4   0  0   2    30       0   0   1
## 2     0     2      2      2    1  6   1   3   0  0   1    18       0   0   1
## 3     0     4      4      4    1  4   0   2   0  0   0    NA       0   0   0
## 4     0     4      4      4    1  7   0   2   0  0   0    39       0   0   0
## 5     0     1      1      1    1  1   3   5   0  0   3     7       0   0   1
## 6     0     2      2      2    1  5   3   5   0  0   3   101       0   0   1
##   R60 R65 RESMODE SMOCP SMX SRNT SVAL TAXP WIF WKEXREL WORKSTAT FACRP FAGSP
## 1   0   0       1  1550   3    0    0   24   2       1        1     0     0
## 2   0   0       1  1819   3    0    0   22   2       1        1     0     0
## 3   2   0       2    NA  NA    0    0   NA   1       3        3     0     1
## 4   1   0       1   883   3    0    0   18   2       2        1     0     0
## 5   0   0       1   257  NA    0    0   32   2       2        3     0     0
## 6   0   0       1  2233   3    0    0   65   2       2        1     0     0
##   FBDSP FBLDP FBUSP FCONP FELEP FFSP FFULP FGASP FHFLP FINSP FKITP FMHP FMRGIP
## 1     0     0     0     0     0    0     0     0     0     0     0    0      0
## 2     0     0     0     0     0    0     0     0     0     0     0    0      0
## 3     0     0     0     0     0    0     0     0     0     0     0    0      0
## 4     0     0     0     0     0    0     0     0     0     1     0    0      0
## 5     0     0     0     0     0    0     0     0     0     0     0    0      0
## 6     0     0     0     0     0    0     0     0     0     0     0    0      0
##   FMRGP FMRGTP FMRGXP FMVYP FPLMP FRMSP FRNTMP FRNTP FSMP FSMXHP FSMXSP FTAXP
## 1     0      0      0     0     0     1      0     0    0      0      0     0
## 2     0      0      0     0     0     0      0     0    0      0      0     0
## 3     0      0      0     0     0     0      0     0    0      0      0     0
## 4     1      0      0     0     0     0      0     0    0      0      0     0
## 5     0      0      0     0     0     0      0     0    0      0      0     0
## 6     1      0      0     0     0     0      0     0    0      0      0     0
##   FTELP FTENP FVACSP FVALP FVEHP FWATP FYBLP wgtp1 wgtp2 wgtp3 wgtp4 wgtp5
## 1     0     0      0     0     0     0     0    40   137   142   226   155
## 2     0     0      0     0     0     0     0     7    32    31     8     7
## 3     0     0      0     0     0     0     0   138    96    30   102   213
## 4     0     0      0     0     0     0     0    65   125    82    68   109
## 5     0     0      0     0     0     0     0    13    21    65   110    42
## 6     0     0      0     0     0     0     0    20    72    17    58    57
##   wgtp6 wgtp7 wgtp8 wgtp9 wgtp10 wgtp11 wgtp12 wgtp13 wgtp14 wgtp15 wgtp16
## 1   115    96   130   160    151     89     46     33    185    200     31
## 2     9    10    29     7     24      8     31     26     32     28      8
## 3   104    87   160    99     28     23     23    106     81     93     93
## 4   119   128   138    77    160     79    108     56     55     83    101
## 5    12    47    52    16     49    120     98     74     47     43     54
## 6   108    62   107    66     93     61     77     18     65     51     16
##   wgtp17 wgtp18 wgtp19 wgtp20 wgtp21 wgtp22 wgtp23 wgtp24 wgtp25 wgtp26 wgtp27
## 1    114    303     59    167    179    160    143     25    135     95     97
## 2      9     24     25     32     21     48     42     26     27     21     28
## 3    104    194    150     26    149    101     29     97    140     84    100
## 4    119    146     89     18     57     27     74     55     30     24     24
## 5     56     47     12     13     89     93     46     13     48    104     50
## 6    129     98     22    123     63    110     53     15    102     74    105
##   wgtp28 wgtp29 wgtp30 wgtp31 wgtp32 wgtp33 wgtp34 wgtp35 wgtp36 wgtp37 wgtp38
## 1     95     26    100    110    254    244     33     37    239     75     26
## 2     42     26     51     28     50     47     45     48     30     24     49
## 3    212    120     38     32     29     98     99     99     99    109    162
## 4     20     81     36     72     24     75     92     87     85     24     26
## 5     38     95     55     17     17     15     51     43     53     54     49
## 6     72     19     69     18    104     69     17     24     63     51     66
##   wgtp39 wgtp40 wgtp41 wgtp42 wgtp43 wgtp44 wgtp45 wgtp46 wgtp47 wgtp48 wgtp49
## 1    284     98    195    121    126     42    180    130     93    152     35
## 2     51     45     36     24     27     50     42     56     56     35     44
## 3    177    160     29    118    156     96     32     88    109     35     90
## 4     91    142     70    124     80     73    139    126    116    151     73
## 5     74     13     97     77     44     15     46     93     43     42     84
## 6     72     76     26     79     17     64     62     98     58    101     72
##   wgtp50 wgtp51 wgtp52 wgtp53 wgtp54 wgtp55 wgtp56 wgtp57 wgtp58 wgtp59 wgtp60
## 1    128     76    231    202     41     32    166    148     46    210    142
## 2     23     45     26     22     25     28     52     52     32     31     22
## 3    195    152    143    119    111     80     93     92     26     29    158
## 4    140     79    121     67     81     90    102    171    124     70     17
## 5     44     13     15     19     54     50     43     48     63     94     88
## 6    113     50     61     19     54     65     23    117    101     19     99
##   wgtp61 wgtp62 wgtp63 wgtp64 wgtp65 wgtp66 wgtp67 wgtp68 wgtp69 wgtp70 wgtp71
## 1     34    225    168    126    119    100    124    150    129    116     96
## 2     23      6      9     26     23     30     34     10     21      6     23
## 3     24     96    179     98     27     97    101     22     97    153    141
## 4     71     22    101     71     22     25     25     20     76     29     62
## 5     15     17     43     84     52     13     51     49     17     44     96
## 6     55    118     68     24     92     49    109     51     17     63     16
##   wgtp72 wgtp73 wgtp74 wgtp75 wgtp76 wgtp77 wgtp78 wgtp79 wgtp80
## 1     29     41    202    187     51     83    158     42    112
## 2      8     14      8      8     24     25      8      6      8
## 3    176    126     83     94    114    103     33     33     28
## 4     18     82     78     70     66     23     19     67    114
## 5     93     86     55     61     55     45     73     17     95
## 6    103     65     19     15     76     66     66     70     55
```

```
idaho[which(idaho$AGS == 6 & idaho$ACR == 3), ]  ##which conditional statement, which looks at which ho
```

```
##      RT SERIALNO DIVISION PUMA REGION ST  ADJUST WGTP NP TYPE ACR AGS BDS BLD
## 125   H    30346        8  400      4 16 1015675  120  4    1   3   6   3   2
## 238   H    53292        8  300      4 16 1015675   26  3    1   3   6   2   3
## 262   H    56299        8  800      4 16 1015675   97  2    1   3   6   2   2
## 470   H   101282        8  800      4 16 1015675   76  2    1   3   6   3   2
## 555   H   120351        8  800      4 16 1015675   51  5    1   3   6   5   2
## 568   H   122802        8  800      4 16 1015675   63  5    1   3   6   3   2
## 608   H   133128        8  300      4 16 1015675   15  2    1   3   6   1   2
## 643   H   140896        8  400      4 16 1015675   72  2    1   3   6   4   2
## 787   H   169806        8  800      4 16 1015675   62  1    1   3   6   4   2
## 808   H   173013        8  500      4 16 1015675   77  2    1   3   6   3   2
## 824   H   176884        8  900      4 16 1015675   88  1    1   3   6   4   2
## 849   H   183434        8  500      4 16 1015675   54  2    1   3   6   3   2
## 952   H   203578        8  800      4 16 1015675   70  2    1   3   6   3   2
## 955   H   204262        8  200      4 16 1015675   24  2    1   3   6   3   2
## 1033  H   223184        8  100      4 16 1015675   22  5    1   3   6   3   2
## 1265  H   270844           8  300        4 16 1015675   67  2     1   3   6   4   2
## 1275  H   272251           8  800        4 16 1015675   24  2     1   3   6   3   2
## 1315  H   278331           8  300        4 16 1015675  163  3     1   3   6   5   2
## 1388  H   293603           8  300        4 16 1015675   73  4     1   3   6   5   2
## 1607  H   341269           8  900        4 16 1015675  146  2     1   3   6   4   2
## 1629  H   347362           8  900        4 16 1015675  126  2     1   3   6   3   2
## 1651  H   352408           8  400        4 16 1015675   52  2     1   3   6   3   2
## 1856  H   395701           8  300        4 16 1015675   40  2     1   3   6   3   2
## 1919  H   409401           8  800        4 16 1015675   22  2     1   3   6   3   2
## 2101  H   444160           8  800        4 16 1015675  371  2     1   3   6   4   2
## 2194  H   465760           8  200        4 16 1015675   24  4     1   3   6   4   2
## 2403  H   510757           8  400        4 16 1015675   24  3     1   3   6   3   2
## 2443  H   519912           8  800        4 16 1015675   42  2     1   3   6   2   2
## 2539  H   537967           8  300        4 16 1015675   83  3     1   3   6   3   2
## 2580  H   546403           8  200        4 16 1015675   27  2     1   3   6   3   2
## 2655  H   562425           8  800        4 16 1015675   20  1     1   3   6   3   2
## 2680  H   568199           8  800        4 16 1015675   56  2     1   3   6   4   2
## 2740  H   582651           8  800        4 16 1015675   25  3     1   3   6   3   2
## 2838  H   602451           8  200        4 16 1015675   20  5     1   3   6   5   2
## 2965  H   629385           8  400        4 16 1015675   81  6     1   3   6   4   2
## 3131  H   663781           8  200        4 16 1015675  101  2     1   3   6   4   2
## 3133  H   663980           8  200        4 16 1015675   29  5     1   3   6   4   2
## 3163  H   669264           8  900        4 16 1015675   28  4     1   3   6   5   2
## 3291  H   697597           8  900        4 16 1015675   96  1     1   3   6   2   2
## 3370  H   713267           8  400        4 16 1015675   76  1     1   3   6   3   2
## 3402  H   719327           8  900        4 16 1015675   61  2     1   3   6   4   2
## 3585  H   753565           8  100        4 16 1015675   73  2     1   3   6   3   2
## 3652  H   768891           8  700        4 16 1015675  101  2     1   3   6   3   2
## 3852  H   811442           8  700        4 16 1015675   82  2     1   3   6   3   2
## 3862  H   814501           8  900        4 16 1015675  118  2     1   3   6   3   2
## 3912  H   824349           8  200        4 16 1015675   26  1     1   3   6   2   1
## 4023  H   851272           8  800        4 16 1015675   27  1     1   3   6   3   2
## 4045  H   856978           8  800        4 16 1015675   30  4     1   3   6   3   2
## 4107  H   868742           8  400        4 16 1015675  116  2     1   3   6   4   1
## 4113  H   870102           8  500        4 16 1015675   71  2     1   3   6   2   2
## 4117  H   871902           8  900        4 16 1015675   77  2     1   3   6   4   2
## 4185  H   886139           8  800        4 16 1015675   25  2     1   3   6   3   2
## 4198  H   889923           8  400        4 16 1015675   97  2     1   3   6   3   1
## 4310  H   911139           8  300        4 16 1015675  107  5     1   3   6   4   2
## 4343  H   917116           8  100        4 16 1015675  130  2     1   3   6   3   2
## 4354  H   919435           8  800        4 16 1015675   27  2     1   3   6   3   2
## 4448  H   935532           8  800        4 16 1015675   88  2     1   3   6   4   2
## 4453  H   936344           8  800        4 16 1015675  161  5     1   3   6   5   2
## 4461  H   937676           8  900        4 16 1015675   90  2     1   3   6   2   2
## 4718  H   989499           8  800        4 16 1015675   21  4     1   3   6   3   2
## 4817  H  1012635           8  900        4 16 1015675  181  2     1   3   6   4   2
## 4835  H  1017721           8  800        4 16 1015675   30  1     1   3   6   1   2
## 4910  H  1031731           8  800        4 16 1015675  386  2     1   3   6   3   2
## 5140  H  1073024           8  900        4 16 1015675   17  6     1   3   6   5   2
## 5199  H  1085013           8  800        4 16 1015675  107  3     1   3   6   3   2
## 5236  H  1095632           8  900        4 16 1015675   13  2     1   3   6   5   2
## 5326  H  1114504           8  200        4 16 1015675   22  2     1   3   6   2   2
## 5417  H  1134401           8  800        4 16 1015675   80  2     1   3   6   3   2
## 5531  H  1156976           8  100        4 16 1015675  154  2     1   3   6   3   2
## 5574  H  1163909        8  500      4 16 1015675   73  2    1   3   6   5   2
## 5894  H  1228279        8  900      4 16 1015675   22  2    1   3   6   5   2
## 6033  H  1261283        8  900      4 16 1015675   18  2    1   3   6   3   2
## 6044  H  1264322        8  400      4 16 1015675  233  2    1   3   6   4   2
## 6089  H  1273785        8  200      4 16 1015675   96  2    1   3   6   4   1
## 6275  H  1314024        8  800      4 16 1015675   68  2    1   3   6   4   2
## 6376  H  1334157        8  300      4 16 1015675   75  2    1   3   6   4   2
## 6420  H  1343898        8  800      4 16 1015675   22  4    1   3   6   5   2
##      BUS CONP ELEP FS FULP GASP HFL INSP KIT MHP MRGI MRGP MRGT MRGX PLM RMS
## 125    2   NA  150  0    2    3   3  600   1  NA    1 1400    1    1   1   5
## 238    2   NA  120  0 1000    3   6 1500   1  NA    2 1400    2    1   1   4
## 262    2   NA   80  0    2  110   1   NA   1  NA   NA   NA   NA   NA   1   5
## 470    2   NA   70  0  850    3   4  860   1  NA    2  600    2    1   1   9
## 555    2   NA   80  0    2   10   2    0   1  NA   NA   NA   NA    3   1   9
## 568    2   NA  150  0    2    3   3 4800   1  NA    2 1100    2    1   1   6
## 608    2   NA  100  0  770    3   4 2000   1  NA    2  870    2    1   1   5
## 643    2   NA  130  0    2    3   2  800   1  NA   NA   NA   NA    3   1   9
## 787    2   NA  100  0    2    3   3 1500   1  NA   NA   NA   NA    3   1   8
## 808    2   NA   50  0    2   70   3  200   1  NA    1  900    2    1   1   6
## 824    2   NA   30  0 3500    3   4  300   1  NA   NA   NA   NA    3   1   9
## 849    2   NA  200  0  500    3   6  500   1  NA   NA   NA   NA    3   1   5
## 952    2   NA   50  0  600    3   5  200   1  NA   NA   NA   NA    3   1   5
## 955    2   NA   80  0  500    3   3  600   1  NA   NA   NA   NA    3   1   6
## 1033   2   NA  160  0    2    3   6  870   1  NA    1 1700    1    1   1   6
## 1265   2   NA  140  0    2    3   6  600   1  NA   NA   NA   NA    3   1   8
## 1275   2   NA  180  0    2    3   3  800   1  NA   NA   NA   NA    3   1   7
## 1315   2   NA   70  0  740    3   5  450   1  NA   NA   NA   NA    3   1   9
## 1388   2   NA  410  0    2    3   3  800   1  NA    1 1100    1    1   1   8
## 1607   2   NA  180  0    2    3   3 1000   1  NA    2  390    2    1   1   8
## 1629   2   NA   80  0    2  180   2  330   1  NA   NA   NA   NA    3   1   9
## 1651   2   NA   60  0    2    3   3    0   1  NA   NA   NA   NA    3   1   5
## 1856   2   NA   60  0    2    3   6  500   1  NA   NA   NA   NA    3   1   8
## 1919   2   NA   50  0  600   50   6  650   1  NA    2 1400    2    1   1   6
## 2101   2   NA  410  0    2    3   3 4800   1  NA    1 4800    1    1   1   8
## 2194   2   NA   80  0    2  250   2   NA   1  NA   NA   NA   NA   NA   1   7
## 2403   2   NA  120  0  380    3   4 1400   1  NA   NA   NA   NA    3   1   8
## 2443   2   NA   40  0    2    3   3  240   1  NA   NA   NA   NA    3   1   7
## 2539   2   NA  100  0    2    3   3  500   1  NA    1  580    1    1   1   9
## 2580   2   NA  200  0   50    3   6  200   1  NA   NA   NA   NA    3   1   9
## 2655   2   NA   60  0  600    3   4   NA   1  NA   NA   NA   NA   NA   1   9
## 2680   2   NA  100  0 1200    3   4 4800   1  NA   NA   NA   NA    3   1   6
## 2740   2   NA  150  0    2    3   3 1000   1  NA   NA   NA   NA    3   1   5
## 2838   2   NA  130  0  100   80   2 1300   1  NA    2  850    2    1   1   9
## 2965   2   NA  130  0  300    3   6   NA   1  NA   NA   NA   NA   NA   1   7
## 3131   2   NA   90  0 1500    3   4  250   1  NA   NA   NA   NA    3   1   7
## 3133   2   NA  190  0 1000    3   4  730   1  NA    2 1400    1    1   1   7
## 3163   2   NA   60  0    2   80   2  850   1  NA    2  750    2    1   1   9
## 3291   2   NA   50  0  600    3   5    0   2  NA   NA   NA   NA    3   1   4
## 3370   1   NA   40  0    2    3   3  500   1  NA    1  500    2    1   1   8
## 3402   2   NA   40  0 1800  100   4    0   1  NA   NA   NA   NA    3   1   7
## 3585   2   NA   70  0 1800   90   2 1400   1  NA    2  200    2    1   1   9
## 3652   1   NA    1  0 2100    3   4 4800   1  NA    2  660    2    1   1   5
## 3852   2   NA   90  0 2000    3   4   NA   1  NA   NA   NA   NA   NA   1   8
## 3862   2   NA  180  0  150    3   4 2000   1  NA   NA   NA   NA    3   1   8
## 3912   2   NA  110  0 1000    3   4  130   1 700   NA   NA   NA    3   1   5
## 4023   2   NA   40  0  400  100   5  400   1  NA   NA   NA   NA    3   1   5
## 4045   2   NA  130  0    2    3   6  500   1  NA    1 1100    2    1   1   6
## 4107   2   NA  180  0  200    3   6  630   1 510    2 1600    2    1   1   7
## 4113   2   NA  190  0  600    3   6 4800   1  NA   NA   NA   NA    3   1   7
## 4117   1   NA   70  0    2   50   2  400   1  NA    2  500    2    1   1   9
## 4185   2   NA   70  0    2  100   2   20   1  NA    2  500    2    1   1   9
## 4198   2   NA  110  0    2    3   3 1500   1 700    2 1100    2    1   1   5
## 4310   2   NA  300  0    2   20   6  600   1  NA   NA   NA   NA    3   1   6
## 4343   2   NA  120  0    2    4   6 2500   1  NA   NA   NA   NA    3   1   5
## 4354   2   NA  130  0    2    3   3 1600   1  NA    2 1000    2    1   1   5
## 4448   2   NA  100  0    2    3   9 1300   1  NA    1  610    1    1   1   8
## 4453   2   NA  240  0    2    3   3  700   1  NA    2 1800    2    1   1   9
## 4461   2   NA   40  0    2    4   2 2000   1  NA   NA   NA   NA    3   1   5
## 4718   2   NA  200  0  120   50   3  400   1  NA    1  500    1    1   1   6
## 4817   2   NA   60  0    2  380   2 4800   1  NA    2  330    2    1   1   9
## 4835   2   NA   20  0  700    3   6    0   1  NA   NA   NA   NA    3   1   5
## 4910   2   NA  110  0 1800    3   4  590   1  NA   NA   NA   NA    3   1   8
## 5140   2   NA  170  0  700    3   5   NA   1  NA   NA   NA   NA   NA   1   9
## 5199   2   NA  200  0    2    3   3  700   1  NA    1  830    1    1   1   5
## 5236   2   NA   30  0    2  100   2  800   1  NA   NA   NA   NA    3   1   8
## 5326   2   NA  190  0 1200  200   2   NA   1  NA   NA   NA   NA   NA   1   5
## 5417   2   NA  250  0    2    3   3  400   1  NA   NA   NA   NA    3   1   7
## 5531   1   NA  170  0 1800   80   2 1400   1  NA   NA   NA   NA    3   1   7
## 5574   2   NA   70  0  820    3   5    0   1  NA   NA   NA   NA    3   1   9
## 5894   2   NA   80  0    2    3   3  300   1  NA   NA   NA   NA    3   1   9
## 6033   2   NA  130  0    2   80   2 1200   1  NA    1  480    1    1   1   5
## 6044   2   NA  120  0 1000    3   6   NA   1  NA   NA   NA   NA   NA   1   7
## 6089   2   NA   90  0    2    3   6  450   1   0   NA   NA   NA    3   1   9
## 6275   2   NA  180  0  300    3   3  700   1  NA   NA   NA   NA    3   1   7
## 6376   1   NA   80  0    2    3   2  430   1  NA    2  900    2    1   1   8
## 6420   2   NA   90  0    2   30   6 1000   1  NA    1  990    1    1   1   7
##      RNTM RNTP SMP TEL TEN VACS VAL VEH WATP YBL FES  FINCP FPARC GRNTP GRPIP
## 125    NA   NA  NA   1   1   NA  20   2    2   3   1  62600     2    NA    NA
## 238    NA   NA  NA   1   1   NA  11   3  100   5   1 120000     2    NA    NA
## 262    NA   NA  NA   1   4   NA  NA   2    2   9   2  23200     4    NA    NA
## 470    NA   NA  NA   1   1   NA  14   4    2   9   1  27500     4    NA    NA
## 555    NA   NA  NA   1   2   NA  24   2    2   1   2  41500     3    NA    NA
## 568    NA   NA  NA   1   1   NA  24   3    2   5   1   5200     2    NA    NA
## 608    NA   NA  NA   1   1   NA  22   4    2   9   2  32200     4    NA    NA
## 643    NA   NA  NA   1   2   NA  17   2    2   8   2  32000     4    NA    NA
## 787    NA   NA  NA   1   2   NA  24   2    2   6  NA     NA    NA    NA    NA
## 808    NA   NA  NA   1   1   NA  20   5    2   2   2 120000     4    NA    NA
## 824    NA   NA  NA   1   2   NA  10   2    2   8  NA     NA    NA    NA    NA
## 849    NA   NA  NA   1   2   NA  14   3    2   9   4  12000     4    NA    NA
## 952    NA   NA  NA   1   2   NA  15   2    2   9   2  24430     4    NA    NA
## 955    NA   NA  NA   1   2   NA  13   2    2   9   4  46000     4    NA    NA
## 1033   NA   NA 340   1   1   NA  23   4    2   3   2  88700     2    NA    NA
## 1265   NA   NA  NA   1   2   NA  16   3    2   7   2  28060     4    NA    NA
## 1275   NA   NA  NA   1   2   NA  14   3    2   8   1  35700     4    NA    NA
## 1315   NA   NA  NA   1   2   NA  14   3    2   9   1  44000     4    NA    NA
## 1388   NA   NA  NA   1   1   NA  15   2   40   9   1 227400     2    NA    NA
## 1607   NA   NA  40   1   1   NA  17   2    2   4   1  78870     4    NA    NA
## 1629   NA   NA  NA   1   2   NA  11   1    2   9   4  54600     4    NA    NA
## 1651   NA   NA  NA   1   2   NA   8   2    2   9   2  43300     4    NA    NA
## 1856   NA   NA  NA   1   2   NA  24   5    2   9   1  26100     4    NA    NA
## 1919   NA   NA  NA   1   1   NA  22   4    2   9   1  47200     4    NA    NA
## 2101   NA   NA  NA   1   1   NA  23   3    2   5   1  26400     4    NA    NA
## 2194   NA   NA  NA   1   4   NA  NA   4    2   9   1  27340     2    NA    NA
## 2403   NA   NA  NA   1   2   NA  14   5    2   6   4  41600     4    NA    NA
## 2443   NA   NA  NA   1   2   NA  11   3    2   9   4  25300     4    NA    NA
## 2539   NA   NA  NA   1   1   NA  18   3    2   5   1 102400     4    NA    NA
## 2580   NA   NA  NA   1   2   NA  14   3    2   6   2  28100     4    NA    NA
## 2655   NA   NA  NA   1   4   NA  NA   2    2   9  NA     NA    NA    NA    NA
## 2680   NA   NA  NA   1   2   NA  23   0    2   6   3  25880     4    NA    NA
## 2740   NA   NA  NA   1   2   NA  21   3    2   6   3  52700     4    NA    NA
## 2838   NA   NA  NA   1   1   NA  17   4    2   9   1  42160     4    NA    NA
## 2965    2  400  NA   1   3   NA  NA   4    2   8   2  40800     2   555    16
## 3131   NA   NA  NA   1   2   NA  16   3    2   3   1  46520     4    NA    NA
## 3133   NA   NA  NA   1   1   NA  20   2    2   2   1  73000     2    NA    NA
## 3163   NA   NA  NA   1   1   NA  15   3    2   9   1  53500     2    NA    NA
## 3291   NA   NA  NA   2   2   NA   2   2    2   9  NA     NA    NA    NA    NA
## 3370   NA   NA  NA   1   1   NA  20   2    2   1  NA     NA    NA    NA    NA
## 3402   NA   NA  NA   1   2   NA  10   2  410   9   4  73500     4    NA    NA
## 3585   NA   NA  NA   1   1   NA  24   3    2   3   2  53060     4    NA    NA
## 3652   NA   NA  NA   1   1   NA  16   2    2   7   2  23900     4    NA    NA
## 3852   NA   NA  NA   1   4   NA  NA   3    2   8   5  50300     2    NA    NA
## 3862   NA   NA  NA   1   2   NA  22   2    2   9   4  19500     4    NA    NA
## 3912   NA   NA  NA   1   2   NA   9   2  780   5  NA     NA    NA    NA    NA
## 4023   NA   NA  NA   1   2   NA  12   3    2   9  NA     NA    NA    NA    NA
## 4045   NA   NA  NA   1   1   NA  22   2    2   7   1  45500     2    NA    NA
## 4107   NA   NA  NA   1   1   NA  23   2    2   3   1  83000     4    NA    NA
## 4113   NA   NA  NA   1   2   NA  18   2    2   9   4  28000     4    NA    NA
## 4117   NA   NA 200   1   1   NA  16   2    2   5   2  59970     4    NA    NA
## 4185   NA   NA  NA   1   1   NA  14   5    2   9   2 168100     4    NA    NA
## 4198   NA   NA  NA   1   1   NA  22   2    2   3   1  55000     4    NA    NA
## 4310   NA   NA  NA   1   2   NA  18   6    2   9   1  20350     2    NA    NA
## 4343   NA   NA  NA   1   2   NA  22   3    2   3   1  24460     4    NA    NA
## 4354   NA   NA  NA   1   1   NA  12   4    2   5   1  42200     4    NA    NA
## 4448   NA   NA  NA   1   1   NA  15   3    2   9   1  65000     4    NA    NA
## 4453   NA   NA  NA   1   1   NA  22   5    2   9   2  60100     3    NA    NA
## 4461   NA   NA  NA   1   2   NA  22   2    2   2   2 273000     4    NA    NA
## 4718   NA   NA  NA   1   1   NA  16   5    2   8   3 125500     4    NA    NA
## 4817   NA   NA  NA   1   1   NA  24   1    2   9   2  27800     4    NA    NA
## 4835   NA   NA  NA   1   2   NA  21   1    2   9  NA     NA    NA    NA    NA
## 4910   NA   NA  NA   1   2   NA  16   3    2   6   4  36100     4    NA    NA
## 5140   NA   NA  NA   1   4   NA  NA   3    2   9   1  97000     2    NA    NA
## 5199   NA   NA  NA   1   1   NA  16   4    2   5   1  14200     1    NA    NA
## 5236   NA   NA  NA   1   2   NA  17   2  160   7   1  39421     4    NA    NA
## 5326   NA   NA  NA   1   4   NA  NA   2    2   9   4  17300     4    NA    NA
## 5417   NA   NA  NA   1   2   NA  18   3    2   6   1  52102     4    NA    NA
## 5531   NA   NA  NA   1   2   NA  19   2    2   4   4  30801     4    NA    NA
## 5574   NA   NA  NA   1   2   NA  15   6    2   9   4  28100     4    NA    NA
## 5894   NA   NA  NA   1   2   NA  17   3    2   5   1  57800     4    NA    NA
## 6033   NA   NA  NA   1   1   NA  11   2    2   9   4  32000     4    NA    NA
## 6044   NA   NA  NA   1   4   NA  NA   2    2   9   6   9000     2    NA    NA
## 6089   NA   NA  NA   1   2   NA  10   2    2   5   2  41000     4    NA    NA
## 6275   NA   NA  NA   1   2   NA  16   4    2   6   1  41000     4    NA    NA
## 6376   NA   NA 300   1   1   NA  16   5    2   8   2  74701     4    NA    NA
## 6420   NA   NA  NA   1   1   NA  24   2  360   4   3  78760     2    NA    NA
##      HHL HHT  HINCP HUGCL HUPAC HUPAOC HUPARC LNGI MV NOC NPF NPP NR NRC OCPIP
## 125    3   1  62600     0     2      2      2    1  1   2   4   0  0   2    30
## 238    1   1 120000     0     2      2      2    1  6   1   3   0  0   1    18
## 262    1   1  23200     0     4      4      4    1  4   0   2   0  0   0    NA
## 470    1   1  27500     0     4      4      4    1  7   0   2   0  0   0    39
## 555    1   1  41500     0     1      1      1    1  1   3   5   0  0   3     7
## 568    2   1   5200     0     2      2      2    1  5   3   5   0  0   3   101
## 608    1   1  32200     0     4      4      4    1  7   0   2   0  0   0    53
## 643    1   1  32000     0     4      4      4    1  6   0   2   0  0   0    11
## 787    1   4  30700     0     4      4      4    1  7   0  NA   0  0   0    28
## 808    1   1 120000     0     4      4      4    1  3   0   2   0  0   0    11
## 824    1   6  17280     0     4      4      4    1  7   0  NA   0  0   0    28
## 849    3   1  12000     0     4      4      4    1  6   0   2   0  0   0    37
## 952    1   1  24430     0     4      4      4    1  7   0   2   0  0   0     8
## 955    1   1  46000     0     4      4      4    1  7   0   2   0  0   0     9
## 1033   1   1  88700     1     2      2      2    1  3   2   5   0  0   2    30
## 1265   1   1  28060     0     4      4      4    1  7   0   2   0  0   0    17
## 1275   1   1  35700     0     4      4      4    1  7   0   2   0  0   0    16
## 1315   2   1  44000     0     4      4      4    1  7   0   3   0  0   0     8
## 1388   1   1 227400     0     2      2      2    1  5   2   4   0  0   2     8
## 1607   1   1  78870     0     4      4      4    1  6   0   2   0  0   0    12
## 1629   1   1  54600     0     4      4      4    1  7   0   2   0  0   0     9
## 1651   1   1  43300     0     4      4      4    1  7   0   2   0  0   0     2
## 1856   3   1  26100     0     4      4      4    1  7   0   2   0  0   0    12
## 1919   1   1  47200     0     4      4      4    1  4   0   2   0  0   0    44
## 2101   1   1  26400     0     4      4      4    1  7   0   2   0  0   0   101
## 2194   1   1  27340     0     2      2      2    1  5   1   4   0  0   1    NA
## 2403   1   1  41600     0     4      4      4    1  3   0   3   0  0   0    14
## 2443   1   1  25300     0     4      4      4    1  7   0   2   0  0   0     6
## 2539   1   1 102400     0     4      4      4    1  5   0   3   0  0   0     8
## 2580   1   1  28100     0     4      4      4    1  6   0   2   0  0   0    17
## 2655   1   6  13000     0     4      4      4    1  7   0  NA   0  0   0    NA
## 2680   3   1  25880     0     4      4      4    1  7   0   2   0  0   0    39
## 2740   2   1  52700     0     4      4      4    1  5   0   3   0  0   0     9
## 2838   2   1  42160     0     4      4      4    1  5   0   5   0  0   0    42
## 2965   1   1  40800     0     2      2      2    1  3   4   6   0  0   4    NA
## 3131   1   1  46520     0     4      4      4    1  4   0   2   0  0   0     8
## 3133   1   1  73000     0     2      2      2    1  3   3   5   0  0   3    29
## 3163   1   1  53500     0     2      2      2    1  3   2   4   0  0   2    24
## 3291   1   4  22000     0     4      4      4    1  7   0  NA   0  0   0     5
## 3370   1   4  26000     0     4      4      4    1  1   0  NA   0  0   0    26
## 3402   1   1  73500     0     4      4      4    1  7   0   2   0  0   0     8
## 3585   1   1  53060     0     4      4      4    1  4   0   2   0  0   0    23
## 3652   1   1  23900     0     4      4      4    1  7   0   2   0  0   0    79
## 3852   1   2  50300     0     2      2      2    1  6   1   2   0  0   1    NA
## 3862   1   1  19500     0     4      4      4    1  7   0   2   0  0   0    28
## 3912   1   4  58800     0     4      4      4    1  6   0  NA   0  0   0     8
## 4023   1   4 165000     0     4      4      4    1  6   0  NA   0  0   0     2
## 4045   1   1  45500     0     2      2      2    1  6   1   4   0  0   1    39
## 4107   1   1  83000     0     4      4      4    1  5   0   2   0  0   0    29
## 4113   2   1  28000     0     4      4      4    1  3   0   2   0  0   0    36
## 4117   1   1  59970     0     4      4      4    1  5   0   2   0  0   0    21
## 4185   1   1 168100     0     4      4      4    1  5   0   2   0  0   0     8
## 4198   1   1  55000     0     4      4      4    1  5   0   2   0  0   0    32
## 4310   1   1  20350     0     2      2      2    1  5   1   5   0  0   1    23
## 4343   1   1  24460     0     4      4      4    1  4   0   2   0  0   0    21
## 4354   1   1  42200     0     4      4      4    1  6   0   2   0  0   0    39
## 4448   2   1  65000     0     4      4      4    1  5   0   2   0  0   0    13
## 4453   1   1  60100     0     3      3      3    1  3   3   5   0  0   3    48
## 4461   2   1 273000     0     4      4      4    1  4   0   2   0  0   0     2
## 4718   1   1 125500     0     4      4      4    1  7   0   4   0  0   0     7
## 4817   1   1  27800     0     4      4      4    1  5   0   2   0  0   0    66
## 4835   1   4  15500     0     4      4      4    1  7   0  NA   0  0   0    25
## 4910   1   1  36100     0     4      4      4    1  7   0   2   0  0   0    13
## 5140   1   1  97000     0     2      2      2    1  6   4   6   0  0   4    NA
## 5199   1   1  14200     0     1      1      1    1  5   1   3   0  0   1    87
## 5236   5   1  39421     0     4      4      4    1  5   0   2   0  0   0    12
## 5326   1   1  17300     0     4      4      4    1  7   0   2   0  0   0    NA
## 5417   1   1  52102     0     4      4      4    1  7   0   2   0  0   0    10
## 5531   1   1  30801     0     4      4      4    1  6   0   2   0  0   0    24
## 5574   1   1  28100     0     4      4      4    1  7   0   2   0  0   0    10
## 5894   1   1  57800     0     4      4      4    1  6   0   2   0  0   0     3
## 6033   1   1  32000     0     4      4      4    1  7   0   2   0  0   0    26
## 6044   1   2   9000     0     2      4      2    1  5   0   2   0  0   1    NA
## 6089   1   1  41000     0     4      4      4    1  6   0   2   0  0   0     5
## 6275   1   1  41000     0     4      4      4    1  7   0   2   0  0   0    15
## 6376   1   1  74701     0     4      4      4    1  7   0   2   0  0   0    22
## 6420   1   1  78760     0     2      2      2    1  1   2   4   0  0   2    17
##      PARTNER PSF R18 R60 R65 RESMODE SMOCP SMX SRNT SVAL TAXP WIF WKEXREL
## 125        0   0   1   0   0       1  1550   3    0    0   24   2       1
## 238        0   0   1   0   0       1  1819   3    0    0   22   2       1
## 262        0   0   0   2   0       2    NA  NA    0    0   NA   1       3
## 470        0   0   0   1   0       1   883   3    0    0   18   2       2
## 555        0   0   1   0   0       1   257  NA    0    0   32   2       2
## 568        0   0   1   0   0       1  2233   3    0    0   65   2       2
## 608        0   0   0   2   2       2  1409   3    0    0   37   1       6
## 643        0   0   0   0   0       1   289  NA    0    0   23   1       6
## 787        0   0   0   1   1       1   725  NA    0    0   64  NA      NA
## 808        0   0   0   2   0       1  1120   3    0    0   24   1       3
## 824        0   0   0   1   1       2   397  NA    0    0   14  NA      NA
## 849        0   0   0   2   2       1   367  NA    0    0   22   0       9
## 952        0   0   0   2   2       1   159  NA    0    0   12   1       3
## 955        0   0   0   2   2       1   347  NA    0    0   33   0       9
## 1033       0   0   1   1   1       1  2200   2    0    0   39   2       5
## 1265       0   0   0   2   2       1   395  NA    0    0   36   1       3
## 1275       0   0   0   2   1       1   479  NA    0    0   39   2       5
## 1315       0   0   0   1   1       1   290  NA    0    0   26   3       5
## 1388       0   0   1   0   0       1  1513   3    0    0   37   2       5
## 1607       0   0   0   2   1       1   768   2    0    0   20   2       5
## 1629       0   0   0   2   2       1   430  NA    0    0   29   0       9
## 1651       0   0   0   2   2       1    60  NA    0    0    1   1       6
## 1856       0   0   0   0   0       2   252  NA    0    0   30   1       8
## 1919       0   0   0   0   0       1  1721   3    0    0   26   2       5
## 2101       0   0   0   0   0       2  5210   3    0    0   48   2       2
## 2194       0   0   1   0   0       1    NA  NA    0    0   NA   3       2
## 2403       0   0   0   0   0       1   479  NA    0    0   37   2       8
## 2443       0   0   0   2   2       1   125  NA    0    0   17   0       9
## 2539       0   0   0   0   0       1   680   3    0    0   23   3       1
## 2580       0   0   0   2   1       1   404  NA    0    0   34   1       3
## 2655       0   0   0   1   1       1    NA  NA    0    0   NA  NA      NA
## 2680       0   0   0   2   2       1   833  NA    0    0   40   1       8
## 2740       0   0   0   1   0       2   375  NA    0    0   29   3       2
## 2838       0   0   0   0   0       1  1459   3    0    0   46   3       2
## 2965       0   0   1   0   0       1    NA  NA    0    0   NA   2       2
## 3131       0   0   0   2   2       1   303  NA    0    0   18   2       5
## 3133       0   0   1   0   0       1  1734   3    0    0   40   2       2
## 3163       0   0   1   0   0       1  1061   3    0    0   24   2       2
## 3291       0   0   0   1   1       2   100  NA    0    0    1  NA      NA
## 3370       0   0   0   1   0       1   565   3    0    0    8  NA      NA
## 3402       0   0   0   2   2       1   493  NA    0    0   32   0       9
## 3585       0   0   0   2   1       1  1029   3    0    0   60   2       5
## 3652       0   0   0   2   0       1  1568   3    0    0   52   1       7
## 3852       0   0   1   0   0       1    NA  NA    0    0   NA   1      10
## 3862       0   0   0   2   2       1   460  NA    0    0   24   0       9
## 3912       0   0   0   1   1       1   402  NA    0    0   20  NA      NA
## 4023       0   0   0   0   0       1   273  NA    0    0   18  NA      NA
## 4045       0   0   1   0   0       2  1480   3    0    0   42   3       2
## 4107       0   0   0   0   0       1  2005   3    0    0   25   2       4
## 4113       0   0   0   0   0       1   832  NA    0    0   35   1       6
## 4117       0   0   0   0   0       1  1045   2    0    0   35   1       3
## 4185       0   0   0   0   0       1  1139   3    0    0   63   1       6
## 4198       0   0   0   0   0       1  1451   3    0    0   16   2       2
## 4310       0   1   1   0   0       2   395  NA    0    0    8   3       1
## 4343       0   0   0   0   0       2   424  NA    0    0   23   2       5
## 4354       0   0   0   0   0       1  1388   3    0    0   27   2       2
## 4448       0   0   0   0   0       1   710   3    0    0   22   2       1
## 4453       0   0   1   0   0       2  2381   3    0    0   46   1       3
## 4461       0   0   0   2   2       1   378  NA    0    0   32   1       6
## 4718       0   0   0   1   1       2   760   3    0    0   29   3       4
## 4817       0   0   0   1   0       2  1537   3    0    0   56   2       1
## 4835       0   0   0   1   0       1   328  NA    0    0   42  NA      NA
## 4910       0   0   0   2   2       2   388  NA    0    0   20   0       9
## 5140       0   0   1   0   0       1    NA  NA    0    0   NA   2       1
## 5199       0   0   1   0   0       1  1030   3    0    0   42   2       2
## 5236       0   0   0   0   0       1   398  NA    0    0   34   2       5
## 5326       0   0   0   2   0       1    NA  NA    0    0   NA   0       9
## 5417       0   0   0   2   2       1   433  NA    0    0   30   2       1
## 5531       0   0   0   2   2       1   609  NA    0    0   23   0       9
## 5574       0   0   0   2   2       1   240  NA    0    0   24   0       9
## 5894       0   0   0   1   0       1   155  NA    0    0   14   2       2
## 6033       0   0   0   0   0       1   690   3    0    0   11   1       6
## 6044       0   0   1   0   0       1    NA  NA    0    0   NA   2      11
## 6089       0   0   0   1   0       2   170  NA    0    0   12   1       7
## 6275       0   0   0   1   0       1   513  NA    0    0   42   2       2
## 6376       0   0   0   0   0       1  1395   2    0    0   21   2       2
## 6420       0   0   1   0   0       2  1140   3    0    0   62   2       2
##       WORKSTAT FACRP FAGSP FBDSP FBLDP FBUSP FCONP FELEP FFSP FFULP FGASP FHFLP
## 125          1     0     0     0     0     0     0     0    0     0     0     0
## 238          1     0     0     0     0     0     0     0    0     0     0     0
## 262          3     0     1     0     0     0     0     0    0     0     0     0
## 470          1     0     0     0     0     0     0     0    0     0     0     0
## 555          3     0     0     0     0     0     0     0    0     0     0     0
## 568          1     0     0     0     0     0     0     0    0     0     0     0
## 608          3     0     0     0     0     0     0     0    0     1     0     0
## 643          3     0     0     0     0     0     0     0    0     0     0     0
## 787         NA     0     0     0     0     0     0     0    0     1     1     0
## 808          3     0     0     0     0     0     0     0    0     0     0     0
## 824         NA     0     1     0     0     0     0     0    0     0     0     0
## 849          9     0     0     0     0     0     0     0    0     0     0     0
## 952          3     0     0     0     0     0     0     0    0     0     0     0
## 955          9     0     0     0     0     0     0     0    0     0     0     0
## 1033         3     0     0     0     0     0     0     0    0     0     0     0
## 1265         3     0     0     0     0     0     0     0    0     0     0     0
## 1275         1     0     0     0     0     0     0     0    0     0     0     0
## 1315         1     0     0     0     0     0     0     0    0     0     0     0
## 1388         1     0     0     0     0     0     0     0    0     0     0     0
## 1607         1     0     0     0     0     0     0     0    0     0     1     0
## 1629         9     0     0     0     0     0     0     0    0     1     0     0
## 1651         3     0     0     0     0     0     0     0    0     0     0     0
## 1856         2     0     0     0     0     0     0     0    0     0     0     0
## 1919         1     0     0     0     0     0     0     0    0     0     0     0
## 2101         1     0     0     0     0     0     0     0    0     0     0     0
## 2194         1     0     0     0     0     0     0     0    0     0     0     0
## 2403         9     0     0     0     0     0     0     0    0     0     0     0
## 2443         9     0     0     0     0     0     0     0    0     0     0     0
## 2539         1     0     0     0     0     0     0     0    0     0     0     0
## 2580         3     0     0     0     0     0     0     0    0     0     0     0
## 2655        NA     0     0     0     0     0     0     0    1     0     1     0
## 2680         7     0     0     0     0     0     0     0    0     0     0     0
## 2740         7     0     0     0     0     0     0     0    0     1     0     0
## 2838         1     0     0     0     0     0     0     0    0     0     0     0
## 2965         3     0     0     0     0     0     0     0    0     0     1     0
## 3131         1     0     0     0     0     0     0     0    0     0     0     0
## 3133         1     0     0     0     0     0     0     0    0     0     0     0
## 3163         1     0     0     0     0     0     0     0    0     0     0     0
## 3291        NA     0     0     0     0     0     0     0    0     0     0     0
## 3370        NA     0     0     0     0     0     0     0    0     0     1     0
## 3402         9     0     0     0     0     0     0     0    0     0     0     0
## 3585         3     0     0     0     0     0     0     0    0     0     0     0
## 3652         3     0     0     0     0     0     0     0    0     0     0     0
## 3852        10     0     0     0     0     0     0     0    0     0     0     0
## 3862         9     0     0     0     0     0     0     0    0     0     0     0
## 3912        NA     1     1     0     0     0     0     0    0     0     1     0
## 4023        NA     0     0     0     0     0     0     0    0     0     1     0
## 4045         1     0     0     0     0     0     0     0    0     0     0     0
## 4107         1     0     0     0     0     0     0     0    0     0     0     0
## 4113         9     0     0     0     0     0     0     0    0     0     0     0
## 4117         3     0     0     0     0     0     0     0    0     0     0     0
## 4185         3     0     0     0     0     0     0     0    0     0     0     0
## 4198         2     0     0     0     0     0     0     0    0     0     0     0
## 4310         1     0     1     0     0     0     0     0    0     0     0     0
## 4343         1     0     1     0     0     0     0     0    0     0     1     0
## 4354         1     0     0     0     0     0     0     0    0     0     0     0
## 4448         1     0     0     0     0     0     0     0    0     0     0     0
## 4453        3     0     0     0     0     0     0     0    0     0     0     0
## 4461        3     0     0     0     0     0     0     0    0     0     0     0
## 4718        7     0     1     0     0     0     0     0    0     0     0     0
## 4817        3     0     0     0     0     0     0     0    0     0     0     0
## 4835       NA     0     0     0     0     0     0     0    0     1     1     0
## 4910        9     0     0     0     0     0     0     0    0     0     0     0
## 5140        1     0     0     0     0     0     0     0    0     0     0     0
## 5199        1     0     0     0     0     0     0     0    0     0     1     0
## 5236        1     0     0     0     0     0     0     0    0     1     0     0
## 5326        9     0     0     0     0     0     0     0    0     0     0     0
## 5417        1     0     0     0     0     0     0     0    0     0     0     0
## 5531        9     0     0     0     0     0     0     0    0     0     0     0
## 5574        9     0     0     0     0     0     0     0    0     0     0     0
## 5894        1     0     0     0     0     0     0     0    0     0     0     0
## 6033        9     0     0     0     0     0     0     0    0     0     1     0
## 6044       12     0     0     0     0     0     0     0    0     0     0     0
## 6089        3     0     1     0     0     0     0     0    0     0     0     0
## 6275        1     0     0     0     0     0     0     0    0     0     1     0
## 6376        3     0     0     0     0     0     0     0    0     0     0     0
## 6420        7     0     0     0     0     0     0     0    0     1     0     0
##      FINSP FKITP FMHP FMRGIP FMRGP FMRGTP FMRGXP FMVYP FPLMP FRMSP FRNTMP FRNTP
## 125      0     0    0      0     0      0      0     0     0     1      0     0
## 238      0     0    0      0     0      0      0     0     0     0      0     0
## 262      0     0    0      0     0      0      0     0     0     0      0     0
## 470      1     0    0      0     1      0      0     0     0     0      0     0
## 555      0     0    0      0     0      0      0     0     0     0      0     0
## 568      0     0    0      0     1      0      0     0     0     0      0     0
## 608      0     0    0      0     0      0      0     0     0     0      0     0
## 643      0     0    0      0     0      0      0     0     0     0      0     0
## 787      0     0    0      0     0      0      0     0     0     0      0     0
## 808      0     0    0      0     0      0      0     0     0     0      0     0
## 824      1     0    0      0     0      0      0     0     0     0      0     0
## 849      0     0    0      0     0      0      0     0     0     1      0     0
## 952      1     0    0      0     0      0      0     0     0     0      0     0
## 955      0     0    0      0     0      0      0     0     0     0      0     0
## 1033     0     0    0      0     0      0      0     0     0     0      0     0
## 1265     0     0    0      0     0      0      0     0     0     0      0     0
## 1275     0     0    0      0     0      0      0     0     0     0      0     0
## 1315     1     0    0      0     0      0      0     0     0     0      0     0
## 1388     0     0    0      1     1      1      1     0     0     0      0     0
## 1607     0     0    0      0     0      0      0     0     0     0      0     0
## 1629     0     0    0      0     0      0      0     0     0     0      0     0
## 1651     0     0    0      0     0      0      0     0     0     0      0     0
## 1856     1     0    0      0     0      0      0     0     0     0      0     0
## 1919     0     0    0      0     0      0      0     0     0     0      0     0
## 2101     1     0    0      0     0      0      0     0     0     0      0     0
## 2194     0     0    0      0     0      0      0     0     0     0      0     0
## 2403     0     0    0      0     0      0      0     0     0     0      0     0
## 2443     0     0    0      0     0      0      0     0     0     0      0     0
## 2539     0     0    0      0     0      0      0     0     0     0      0     0
## 2580     0     0    0      0     0      0      0     0     0     0      0     0
## 2655     0     0    0      0     0      0      0     0     0     0      0     0
## 2680     0     0    0      0     0      0      0     0     0     0      0     0
## 2740     0     0    0      0     0      0      0     0     0     0      0     0
## 2838     0     0    0      0     0      0      0     0     0     0      0     0
## 2965     0     0    0      0     0      0      0     0     0     0      0     0
## 3131     0     0    0      0     0      0      0     0     0     0      0     0
## 3133     0     0    0      0     0      0      0     0     0     0      0     0
## 3163     0     0    0      0     0      0      0     0     0     0      0     0
## 3291     1     0    0      0     0      0      0     0     0     0      0     0
## 3370     0     0    0      0     0      0      0     0     0     1      0     0
## 3402     0     0    0      0     0      0      0     0     0     0      0     0
## 3585     0     0    0      0     0      0      0     0     0     0      0     0
## 3652     0     0    0      0     1      0      0     0     0     0      0     0
## 3852     0     0    0      0     0      0      0     0     0     0      0     0
## 3862     0     0    0      0     0      0      0     0     0     0      0     0
## 3912     0     0    0      0     0      0      0     0     0     0      0     0
## 4023     1     0    0      0     0      0      0     0     0     0      0     0
## 4045     1     0    0      0     0      0      0     0     0     0      0     0
## 4107     0     0    0      0     0      0      0     0     0     0      0     0
## 4113     0     0    0      0     0      0      0     0     0     0      0     0
## 4117     1     0    0      0     1      0      0     0     0     0      0     0
## 4185     0     0    0      0     1      0      0     0     0     0      0     0
## 4198     0     0    0      0     0      0      0     0     0     0      0     0
## 4310     1     0    0      0     0      0      0     0     0     0      0     0
## 4343     0     0    0      0     0      0      0     0     0     0      0     0
## 4354     0     0    0      0     0      0      0     0     0     0      0     0
## 4448     1     0    0      0     1      0      0     0     0     0      0     0
## 4453     0     0    0      0     0      0      0     0     0     0      0     0
## 4461     0     0    0      0     0      0      0     0     0     0      0     0
## 4718     0     0    0      1     0      0      0     0     0     0      0     0
## 4817     0     0    0      1     1      0      0     0     0     0      0     0
## 4835     0     0    0      0     0      0      0     0     0     0      0     0
## 4910     1     0    0      0     0      0      0     0     0     0      0     0
## 5140     0     0    0      0     0      0      0     0     0     0      0     0
## 5199     1     0    0      1     1      1      0     0     0     0      0     0
## 5236     0     0    0      0     0      0      0     0     0     0      0     0
## 5326     0     0    0      0     0      0      0     0     0     0      0     0
## 5417     0     0    0      0     0      0      0     0     0     0      0     0
## 5531     1     0    0      0     0      0      0     0     0     1      0     0
## 5574     0     0    0      0     0      0      0     0     0     0      0     0
## 5894     0     0    0      0     0      0      0     0     0     0      0     0
## 6033     1     0    0      1     1      1      1     0     0     0      0     0
## 6044     0     0    0      0     0      0      0     0     0     0      0     0
## 6089     1     0    0      0     0      0      0     0     0     0      0     0
## 6275     0     0    0      0     0      0      0     0     0     0      0     0
## 6376     0     0    0      0     0      0      0     0     0     0      0     0
## 6420     1     0    0      1     1      1      0     0     0     0      0     0
##      FSMP FSMXHP FSMXSP FTAXP FTELP FTENP FVACSP FVALP FVEHP FWATP FYBLP wgtp1
## 125     0      0      0     0     0     0      0     0     0     0     0    40
## 238     0      0      0     0     0     0      0     0     0     0     0     7
## 262     0      0      0     0     0     0      0     0     0     0     0   138
## 470     0      0      0     0     0     0      0     0     0     0     0    65
## 555     0      0      0     0     0     0      0     0     0     0     0    13
## 568     0      0      0     0     0     0      0     0     0     0     0    20
## 608     0      0      0     0     0     0      0     0     0     0     0    26
## 643     0      0      0     0     0     0      0     0     0     0     0    60
## 787     0      0      0     0     0     0      0     0     0     1     0    60
## 808     0      0      0     1     0     0      0     0     0      0     0    21
## 824     0      0      0     1     0     0      0     0     0      0     0    26
## 849     0      0      0     0     0     0      0     0     0      0     0    83
## 952     0      0      0     1     0     0      0     1     0      0     0    67
## 955     0      0      0     0     0     0      0     0     0      0     0     3
## 1033    0      0      0     0     0     0      0     0     0      0     0     7
## 1265    0      0      0     0     0     0      0     0     0      0     0    62
## 1275    0      0      0     0     0     0      0     0     0      0     0    39
## 1315    0      0      0     0     0     0      0     0     0      0     0   301
## 1388    1      0      0     0     0     0      0     0     0      1     0    56
## 1607    1      0      0     0     0     0      0     0     0      0     0   173
## 1629    0      0      0     0     0     0      0     0     0      0     0   140
## 1651    0      0      0     0     0     0      0     0     0      0     0    48
## 1856    0      0      0     1     0     0      0     0     0      0     0    10
## 1919    0      0      0     0     0     0      0     0     0      0     0    25
## 2101    0      0      0     1     0     0      0     0     0      0     0   367
## 2194    0      0      0     0     0     0      0     0     0      0     0    15
## 2403    0      0      0     0     0     0      0     0     0      0     0    30
## 2443    0      0      0     0     0     0      0     0     0      0     0    39
## 2539    0      0      0     0     0     0      0     0     0      0     0   146
## 2580    0      0      0     0     0     0      0     0     0      0     0    38
## 2655    0      0      0     0     0     0      0     0     0      1     0     6
## 2680    0      0      0     0     0     0      0     0     0      0     0    17
## 2740    0      0      0     0     0     0      0     0     0      1     0    58
## 2838    0      0      0     0     0     0      0     0     0      0     0    16
## 2965    0      0      0     0     0     0      0     0     0      1     0    24
## 3131    0      0      0     0     0     0      0     0     0      0     0   125
## 3133    0      0      0     0     0     0      0     0     0      0     0    30
## 3163    0      0      0     0     0     0      0     0     0      0     0    42
## 3291    0      0      0     0     0     0      0     0     0      0     0   199
## 3370    0      0      0     0     0     0      0     0     0      0     0    94
## 3402    0      0      0     0     0     0      0     0     0      0     0    63
## 3585    0      0      0     0     0     0      0     0     0      0     0    20
## 3652    0      0      0     0     0     0      0     0     0      0     0    31
## 3852    0      0      0     0     0     0      0     0     0      0     0   164
## 3862    0      0      0     0     0     0      0     0     0      0     0   158
## 3912    0      0      0     0     0     0      0     0     0      0     0     8
## 4023    0      0      0     0     0     0      0     0     0      1     0    55
## 4045    0      0      0     0     0     0      0     0     0      0     0    33
## 4107    0      0      0     0     0     0      0     0     0      0     0    47
## 4113    0      0      0     0     0     0      0     0     0      0     0   119
## 4117    1      1      0     1     0     0      0     0     0      0     0    78
## 4185    0      0      0     0     0     0      0     0     0      0     0    49
## 4198    0      0      0     0     0     0      0     0     0      0     0    95
## 4310    0      0      0     1     0     0      0     1     0      0     0    32
## 4343    0      0      0     0     0     0      0     0     0      0     0   188
## 4354    0      0      0     0     0     0      0     0     0      0     0    10
## 4448    0      0      0     0     0     0      0     0     0      0     0    86
## 4453    0      0      0     0     0     0      0     0     0      0     0   253
## 4461    0      0      0     0     0     0      0     0     0      0     0    97
## 4718    0      0      0     0     0     0      0     0     0      0     0    21
## 4817    0      0      0     0     0     0      0     0     0      0     0   183
## 4835    0      0      0     0     0     0      0     0     0      1     0    28
## 4910    0      0      0     1     0     0      0     1     0      0     0   612
## 5140    0      0      0     0     0     0      0     0     0     0     0    42
## 5199    1      0      0     1     0     0      0     1     0     0     0    27
## 5236    0      0      0     0     0     0      0     0     0     0     0    11
## 5326    0      0      0     0     0     0      0     0     0     0     0    23
## 5417    0      0      0     0     0     0      0     0     0     0     0    95
## 5531    0      0      0     1     0     0      0     0     0     0     0    47
## 5574    0      0      0     0     0     0      0     0     0     0     0    84
## 5894    0      0      0     0     0     0      0     0     0     0     0    25
## 6033    1      1      1     0     0     0      0     0     0     0     0    35
## 6044    0      0      0     0     0     0      0     0     0     0     0   334
## 6089    0      0      0     1     0     0      0     1     0     0     0   162
## 6275    0      0      0     0     0     0      0     0     0     0     0    73
## 6376    0      0      0     0     0     0      0     0     0     0     0   106
## 6420    1      0      0     1     0     0      0     0     0     1     1    35
##       wgtp2 wgtp3 wgtp4 wgtp5 wgtp6 wgtp7 wgtp8 wgtp9 wgtp10 wgtp11 wgtp12
## 125     137   142   226   155   115    96   130   160    151     89     46
## 238      32    31     8     7     9    10    29     7     24      8     31
## 262      96    30   102   213   104    87   160    99     28     23     23
## 470     125    82    68   109   119   128   138    77    160     79    108
## 555      21    65   110    42    12    47    52    16     49    120     98
## 568      72    17    58    57   108    62   107    66     93     61     77
## 608      25    14    12    15    13    11     5     4      5     13     16
## 643      17    57    88    23    56   102   113   113     70     80     99
## 787      19   104    65    15    20    61    60    77     71     56    108
## 808      27   136    75    77    21   108    82    76    139     80     67
## 824     173    23    94   119   158   152    91    23    197    102     98
## 849     104    82    98    18    54    49    94    13     63     56     20
## 952      59    73    72    77    20    22    23    70    134     70     17
## 955      32    28    21    22    11     8    26     7     24     20     33
## 1033     36     5    23    26    41    35    42    23     21      7     32
## 1265     78   102    86   115    97    19    50   147     72     40    104
## 1275     26    25     6     8    44    39     6    24     40      7      7
## 1315    130    47   198   184   217    61   149    39    219    175    244
## 1388     28   129   148    25    60    75    21    71     20     69     75
## 1607     60   151    42   162   146    47   133   276     42     37    272
## 1629     95   122    45    36    42   107   226   137     42    164    162
## 1651     70    49    88    65    44    50    19    47     12     46     61
## 1856     14    86    41    11    86    75    31    32     13     47     44
## 1919     21    36    38    37    20     7    23    44     32     24     37
## 2101    357   589   353   560   376   365   446   314    127    455    447
## 2194     19     8    37    28    42    36    29    48      8     25     30
## 2403     18    44    46    30    20     9    26    34     20     25     46
## 2443     45    11    33    46    37    46    13    48     40     93     54
## 2539    113    19    65   152    73    83   164    97     18     23     21
## 2580     10    40    54    35    31    25     8    29     53     40     52
## 2655     20    21    22    27    31    20    30     7     35      7     19
## 2680    113   117    15    50    97    22    15    47     51     97     58
## 2740     22    21    12    15    44    49     8    21     51      7     10
## 2838     46    36    21     5    37     5    19    22     19     17     18
## 2965     76   143    90    71   110    79    32    29     20     77     78
## 3131    155   198   123    44    97   139   120   112    216     78     28
## 3133     44    43    46    31    30    36    25    31      9      6      9
## 3163     50    31    25    27    33    35    12     9     10     30     49
## 3291    112    30   125    92   211    94    33   124     51    117     86
## 3370    57   112    84    82   152    79    30   108    138     22     61
## 3402    27    23    18    50   107    74    23    63     69     18     58
## 3585    23    22    22   138    68    60    18   121     74     82    105
## 3652    95   162    94    87   170   107    28    30     32    104     97
## 3852    83    77   143    70   148    83    86    87     24     81     21
## 3862    40   207   109    30    38    39   119   189     33    119    125
## 3912    21    35    32    28    39    26     8     6      8     30     32
## 4023    44    43    27     8    30    39    26    27     49     33      6
## 4045    30    50    51     7     8    57    30     7     56     69     34
## 4107   121    86    31    42    38    24   111    54    138     36    127
## 4113    75    78    22   121    65    64   116    61     78    117     64
## 4117    89    83    22    25    18    70   139    59     22     79     91
## 4185     8     9    29     9    31    23    42    24     39     25     46
## 4198    88   174   150   154    28    21   142   248     28     94    129
## 4310   146   146    87   119   164   114    40    38     23    100     91
## 4343    32    32   140   152   175   113   146   142    154    176    106
## 4354     7     9    31    29    27    32    40    44     45     61     22
## 4448   149    81    72    97   106   141   105    82     31     33    142
## 4453   196   177    52    44   232   273    52   181    269     70     63
## 4461    96    90    85    85    22    35    30   101    138     97     26
## 4718    17    23    42    34    19    22    18    39      7     34     19
## 4817   344   201    67   179   169    54   156   263    265    265    192
## 4835    32    28    31    65    25    25    10     9     59     47      9
## 4910   106   119   122   121   576   381   392   135    678    433    397
## 5140    30    23    17     4    16    32    22    11     33     19      5
## 5199   113   116   108    97    98   160   163   214    133     27    118
## 5236    11     5    15    12    10    12     4    12     12     22     18
## 5326    39     7    23     7     7    22     7    34     26     17     20
## 5417   124    70    24    79    80    16    54   132    116     93     52
## 5531    48   288   155    51   231   187   162   166     49    112    126
## 5574    69    85    70   113   133    21   119    66     69     20     19
## 5894     5    22    38    33    31    23    20    17     17     20      7
## 6033    30    18    22    16    15    14     5     5      5     18     47
## 6044    74    84   322   303   401   257   153   174    276    448    203
## 6089   102    90   209    93    28    48    35   104     77     77    116
## 6275    18    19    21    69   149    79    25    70     55     24     71
## 6376    29    21    28    76   130    77    20   107     85     21     80
## 6420    44    41    26     8    22    36    20    25     41     22      7
##      wgtp13 wgtp14 wgtp15 wgtp16 wgtp17 wgtp18 wgtp19 wgtp20 wgtp21 wgtp22
## 125      33    185    200     31    114    303     59    167    179    160
## 238      26     32     28      8      9     24     25     32     21     48
## 262     106     81     93     93    104    194    150     26    149    101
## 470      56     55     83    101    119    146     89     18     57     27
## 555      74     47     43     54     56     47     12     13     89     93
## 568      18     65     51     16    129     98     22    123     63    110
## 608      13      5     13     16      5     10     19     21     22     22
## 643      83     99     27     19     15     80    135     24     91    129
## 787      53     15     96     56     86     69     23     91     62     18
## 808     136     76     73     81    138     27     20     81    123    144
## 824      76     79     23     24     80     92     87     27     72     92
## 849      46     56     13     58     57     48     18     20     50     49
## 952      50     61     21     69    122     98    130     19     69     56
## 955      46     32     20     28      7     36     16     45     16      7
## 1033     19      7     21     23     27     20      6      7     26     22
## 1265     81     18     22     23     74     84     72     24     65     82
## 1275     24     22     44     20     21     25     23     22      7     27
## 1315    152    150    169    312    294     48    191    176    145    198
## 1388     68    107     66    147     84     76    121    117     73    118
## 1607    162    160    261    122    236    154    158    224    137     33
## 1629     32    157    353    192    215    175     95     46    126    123
## 1651     23     64     70     15     17     74     54     20     42     17
## 1856     42     35     12     43     28     41     58     84     10     11
## 1919     23      6      7      7     20     16     22     45     29     21
## 2101    132    402    392    143    336    113    432    718    299    347
## 2194     18      6     27     38     24      7      7     25     26     24
## 2403     25      9      7      7     25     22     32      9     26     20
## 2443     13     13     68     39      8     91     95     55     32     40
## 2539     67     95     79     77     77    128    163     35    167     74
## 2580     35      7     28      9     28     34     10     38     29     54
## 2655      5      7     19     21     21     17     17     15     16     34
## 2680     58     50     53     96     48     56     18     78     77     16
## 2740     28     23     43     22     33     26     30     23     44     28
## 2838     23     36      5     20     17      7      7     17      7     19
## 2965     68     78     80    146    142    138     81     20     25     78
## 3131     29     28    108    117    146     98     75    163     22     23
## 3133     26     42     32      8     28     30     12     10     26      8
## 3163     27      8     30     35      9     30     53     58     55     59
## 3291     21     38    121     86    132     89    107    134    154    120
## 3370     70     24     59     19    152    101     64    144     25     99
## 3402     88     75     82     55     52     73     62    106     57     20
## 3585     77    102     94     61     67     71    140     71    103    116
## 3652     94     97    110    169    181    168     94     29     30     92
## 3852     80     74     27     95    131     25     22     26     25     86
## 3862    109    122    218    278    119    130    120    101    211     33
## 3912     22     24     23     59     46     51     38      7      9     22
## 4023      5      8     27     29     25     23     29     37      9      7
## 4045     27      8     31     25     30     30      9     28     30     32
## 4107    122    129    107     28     33    104    122    114    102    134
## 4113     70     74    121     21     21     21     21     71     22     68
## 4117     26     74    126    124    123    107    102    117     94     82
## 4185     28     27      7     25     21      7     39     37     24     28
## 4198     37     32     73     83    169     99     96    117     92    107
## 4310     89    125    106    179    171    160    119     49     39     94
## 4343    151     43     35    174    191     34    123    123    268     42
## 4354      7     25     36     24     25     36     31      8      9     10
## 4448    116     28    101    133     25     27     84     84     99     28
## 4453    136    163    269    142    178    190    159    173    305    161
## 4461    106     74     27    115    133    154    155     27     80    101
## 4718      5      8      7     22     36      5     23     21     26     19
## 4817    193    155    140    185     57     66     68    243    171    305
## 4835     30     50      9      8     30     25     50     31     31     29
## 4910    570    380    417    619    426    434    412    662    461    375
## 5140      3      4     18     16     14     21     20      5     34     28
## 5199    183     90    114    174     81     30     27     30     37    131
## 5236      3      1     17     10      3     28     25     10     12     16
## 5326     38     21      7     24     38     36     23     16     23      7
## 5417     93    128     95     80     23     27     26     32     62     17
## 5531    152    139     39    158    140    196    250    200     42     54
## 5574     23     87     73    118     22     63    115    142     26     24
## 5894      9      5     20     46     24      7     25      7     22     51
## 6033     22      5     20     20      6     23     30      5      5      5
## 6044    309     98     63    362    449     74    203    274     76    319
## 6089    111    191    173    138    107     36     96     26    140     80
## 6275     85     76    115     77     57     66     72    105     59     21
## 6376     87     99    117     72     55     67    114     24     77    128
## 6420      7      6     24     22     27     29     24     40      6      7
##      wgtp23 wgtp24 wgtp25 wgtp26 wgtp27 wgtp28 wgtp29 wgtp30 wgtp31 wgtp32
## 125     143     25    135     95     97     95     26    100    110    254
## 238      42     26     27     21     28     42     26     51     28     50
## 262      29     97    140     84    100    212    120     38     32     29
## 470      74     55     30     24     24     20     81     36     72     24
## 555      46     13     48    104     50     38     95     55     17     17
## 568      53     15    102     74    105     72     19     69     18    104
## 608      11     13     20     15     15      4      3      5     16     27
## 643      71     74    110     68     18     20     26     80     74     69
## 787      97     74     20     19     68     64     79     72     57    113
## 808      22     75     75    104     21     73     81     21     72     76
## 824     105    140     91     96     98     29    100     89    126     31
## 849      54     49     46     14     81     65     61     95     95     58
## 952      63     83     69    123    143    120     83     22     64     99
## 955       7     41     28     24     25     18     20      7     44     23
## 1033     24     40      6     23     20     23     37      7     21     20
## 1265    124     97    105     62     16     53    135     76     54    120
## 1275     26     41     35      7      7     47     27      8     48     45
## 1315    207    364    220     45    266     62    162    109     32    136
## 1388     20     19    110     73     98    110     70    121     69     81
## 1607    129     55    179    136     45    151    259     47     38    182
## 1629    134    165    232    158     84     27    122    169    123    138
## 1651     43     17     76     59     43     73     46     83     60     55
## 1856     67     34      8     49     77     41     38     17     39     46
## 1919      7      7      6     28     36     18      7     38     26      7
## 2101    159    320    119    352    362    133    346    586    120    108
## 2194     42      9     22      7      5     24      7     37     26     27
## 2403     44     52     36     16      7     23     42     27     22     52
## 2443    101     43     44     40     44     70     51     59      8     12
## 2539     24    103    157     81     90    134     88     36     25     29
## 2580      9     10     34     24     30     52     20      7     30      5
## 2655      7      6     20     20     38     17     18     19     22     35
## 2680     24    105     55     14    100     92     52     61     14     58
## 2740     21      7      9     30     38     12     27     33      6      8
## 2838     21      6     21     20     22      7     35     31     37     44
## 2965    147    104     73    107     78     32     27     22     78     71
## 3131     30    105    205     95     29     94    101     26     97    173
## 3133      7      8     29     28     27     26     30     57     59     58
## 3163     33     22     21     30     44     10      8     11     25     39
## 3291     32    110     74    173     99     33    105     31    176     71
## 3370     28     64     56     15     83    179     16     37    152     50
## 3402     18     14     55     93     78     29     52     57     17     41
## 3585    117    123     22     65     53    103     26     70     59     21
## 3652    172    104     93    179    106     33     32     30    102    108
## 3852     86     25     89     23     82     85     80    139     82    143
## 3862    219    122     36     32     37    129    164     43    137    105
## 3912     38     23     27     42     20      7      8     10     30     28
## 4023      8     27     46     25      7     33     33      8     23     41
## 4045     11      8     45     45      9     34     57     11      9     29
## 4107    146    147    114    107    149    202    125    126     94    241
## 4113     70    120     22     64     75     19     75     66     21     81
## 4117     71     23     24     22     71    126     63     31    131     75
## 4185     27     47     24      9     55     31     39     26      7     30
## 4198    210     85     76     32     44    158    125     28    110    130
## 4310    195    136    120    179    116     29     32     46    117    125
## 4343     42    142    135    225    127    143    115    148    251    156
## 4354      7     25     35     27     23     24     48     48     49     24
## 4448     82     72     79     74     24     78     96    179    130     19
## 4453    147     42     43    289    227     37    173    286     45     50
## 4461     77     72     91    141    162    144     69     33     94    133
## 4718     23     35     34     18     24     23     32      7     31     19
## 4817    180     86    186    168     70    163    227    220    257    217
## 4835     31     30     10     29     36     58     60      9      8     47
## 4910    421    348    405    340    582    118    322    412    120    123
## 5140     28     18      5     20     32     20     16     24     16      5
## 5199    130    114    115    128    165    121    150    162     34    108
## 5236     26     16     14     12     16     27     12     12      4      3
## 5326     52     25     47     46     23     47      7     17     27     22
## 5417     79    130     92     86    101     75     27     24     28     67
## 5531    299    164     40    230    340    163    159     63    131    130
## 5574    123    133     72     78     85     79     21    113     67     77
## 5894     26      6      7      5     13     20     27     19     16     34
## 6033     18     16     17     15     18     30     28     27     18      5
## 6044    450    247    144     65    307    203    210    290     91    240
## 6089    113    192     88     22     34     31     89     97     90     90
## 6275     23     17     74    113     55     22     56     50     23    102
## 6376    131    142     65     23     77    123    109     94    102     44
## 6420      7     22     37     17      7     27     24      9     24     34
##      wgtp33 wgtp34 wgtp35 wgtp36 wgtp37 wgtp38 wgtp39 wgtp40 wgtp41 wgtp42
## 125     244     33     37    239     75     26    284     98    195    121
## 238      47     45     48     30     24     49     51     45     36     24
## 262      98     99     99     99    109    162    177    160     29    118
## 470      75     92     87     85     24     26     91    142     70    124
## 555      15     51     43     53     54     49     74     13     97     77
## 568      69     17     24     63     51     66     72     76     26     79
## 608      13      3     18     14      4     13     29      5      5      3
## 643      64     71    120    125    142     64     18    106     64     26
## 787      48     25    114     57    124     58     18    119     62     17
## 808      21     82     86     84     21    134    134     78    118    123
## 824     146    166    102    101     26     23    147    111    162     28
## 849      17     14     60    102     15     88     53     56     88     86
## 952      59     81    124     77     23     22     21     22     74     74
## 955      23     30      9     48     20     28      9     38     20      5
## 1033     39     27     45     40      5      6     20     25     38      7
## 1265     79     14     18     20     67     77     74     24     62     72
## 1275     25     26      8     28     25     25     26     22      7     30
## 1315     44    254    249    176    221    210     76    292     54    159
## 1388     75     26     76     22     59     78     29    126     94    146
## 1607    134    128    241    164    211    160    192     36    130    240
## 1629    176    141     29     32     56    152    158     39    131    152
## 1651     89     50     18     87     65     16     41     60     76     98
## 1856     53     41     14     48     47     57     49     40     92     64
## 1919     20     38     35     37     22     17     28      7     22     25
## 2101    590    430    413    560    332    643    413    128    377    343
## 2194     23     50     21      6     36     46     34     16     19     18
## 2403     20      6      8      8     20     28     43     56     23     24
## 2443     56     63     15     41     72     13     16     41     41     44
## 2539    104     81     71     70     74    112    106    165     27     90
## 2580      6     56     26     34     25     27     45     31     33     51
## 2655     22     21      5      7     36     33      5     32      5     21
## 2680     49     46     64     17     47     56    124     59     17    108
## 2740     19     22     71     49     45     25     25     28     44     28
## 2838      5     19     25     32      5     17     21     33     24     36
## 2965     74     69     74    163    131    133     82    136    141     85
## 3131    138    174    117    102    103     84     91     38    139    147
## 3133     26      7     26     59     34     29     47      9     33      8
## 3163     33      8     25     30      9     23     46      9      7      8
## 3291     22     33    116    123     89     93    105    154    162     82
## 3370     84    113     67    113     86     65     84    177     22    100
## 3402     86     88    109     67     60     63     52     18     64    120
## 3585     97     73     22     90    112     78     19     76    137     89
## 3652    103    105    101    157    169    166    109     30     31    108
## 3852     78     77    139     88     24    136    149    133    134     75
## 3862    114    108    207    216    124    106    107    137     34    201
## 3912     23     16     26     49     42     38     26     41     45     18
## 4023     37     44     27     27     41     27     26      8     39     46
## 4045     27     56     32     24     37     42     50     49     34     36
## 4107    234    230    204     97    116    197    161     46     29    128
## 4113     69     71     21    121    133    126    119     75     22     77
## 4117     16     68    148    133    117     87     83    124     78     59
## 4185      9     46     28      9      8     34     26     28     51      8
## 4198     24     26    102     92    144    110    119    109     81     81
## 4310    131    103     94    149    165    146     82    222    206    117
## 4343    149     43     38    221    281     41    138    142    195     44
## 4354      7     24     55     24     30     68     22      7      9      6
## 4448     25    167     83     25    187    161     84     76     75     25
## 4453    183    157    244    145    181    143    172    203     58    140
## 4461    101     84    113     76     28     30     38    122     83     83
## 4718      5      3      7     22     38      7     23     22     20     20
## 4817    219    196    212    179     54     70     54     69    180     66
## 4835     24     11     53     53     32     32      8     32     36     30
## 4910    399    511    552    391    139    508    146    466    672    111
## 5140      5      3     18     20     18     16     13      5     29     28
## 5199    188     82     82    196    102     36     39    195    156    103
## 5236     16     23      5     10     25      5      6     11     13     13
## 5326      7     26     44     17      6      7     20     28     22     37
## 5417     66    112    111     69    139    168    154    155     61    110
## 5531    165    114     41    216    151    334    281    149    249    268
## 5574     91     19    107     77     68     22     64     74     86     83
## 5894     45     44     23      7     20     41     19      3     22     37
## 6033     20     36     20     20     38     18      5     31     32     38
## 6044    196    382    380     69     86    336    212    292    416     85
## 6089     93    137    131    130     84     24     89    122     31    105
## 6275    122     98    132     68     52     73     71     21     69    126
## 6376     23     20     17     67     62     72     75    173     92     25
## 6420     36     37     22     21     27     18     26     10     42     41
##      wgtp43 wgtp44 wgtp45 wgtp46 wgtp47 wgtp48 wgtp49 wgtp50 wgtp51 wgtp52
## 125     126     42    180    130     93    152     35    128     76    231
## 238      27     50     42     56     56     35     44     23     45     26
## 262     156     96     32     88    109     35     90    195    152    143
## 470      80     73    139    126    116    151     73    140     79    121
## 555      44     15     46     93     43     42     84     44     13     15
## 568      17     64     62     98     58    101     72    113     50     61
## 608      13     13     20     20     13     27     26     33     19      5
## 643      72     67     23     67    112    112    111     90     81     74
## 787     124     53     17     17     53     61     63     77     62    115
## 808      23     78     77    125     22     96     65     20     85     76
## 824     163     73     28     27     23     90    126     25     99     82
## 849      91     90     17     57     51     95     17     62     63     16
## 952      72     57     54    123    114    110     71     23     58    117
## 955       7     38     63     31     24     34     23      7     35     16
## 1033     33     22     27      8      9      7     27     20     47      7
## 1265    102    103    112     76     22     68     98     69     72    116
## 1275     25     44     46      7      6     47     19      7     39     37
## 1315    278    195    256    227    206    111    390     69    162     49
## 1388     26     27    134     67     69    146     75    120     68     82
## 1607    169    216    143    149    286    168     44    236    299     49
## 1629    111    208    187    252    150     29     98    229     96    107
## 1651     67     77     38     43     74     23     55     18     50     34
## 1856     10     38     87     12     11     50     48     59     31     38
## 1919     44     35     44     20      7     27     35     25     25     61
## 2101    530    382    638    400    383    518    350    124    466    495
## 2194     40      5     23      7      7     31     10     58     29     30
## 2403      7      7      8     22     42     30      6     27     20      7
## 2443     10     37     35     33     39     15     46     36     79     95
## 2539    179     79     27     80     75     24     72    128    151    183
## 2580      7      7     26     32     37     46     21     10     42     10
## 2655     19     18     32     31     17     27      5     32      7     18
## 2680    107     16     53     79     14     15     47     52     78     65
## 2740     28     11      9     32     41      5     19     49      7     10
## 2838     44     19      7     41      5     24     21     20     19     23
## 2965     27     84     72     23     92    169    126    143    109     70
## 3131    141     88     41    124    179    114     95    158    106     38
## 3133      8     10     26     25     25     24     30     54     48     48
## 3163     26     26     33     29     28     52     52     72     36     12
## 3291     29    131    127    133     97     27     87     30    174    116
## 3370     34     64     80     18     49    197     18     19    121     47
## 3402    112     86     68     22     54     96     58     64     82     64
## 3585    126    124     19     74     69    135     21     75     71     22
## 3652    153     92    104    164     97     26     29     29    100    111
## 3852     88    136     98    132     75     94     75     24     79     25
## 3862     46    105    174    197    191     86     40    197    110    121
## 3912      7     24     21      7     29     48     40     54     31     26
## 4023     47     25      8     31     46     23     32     39     28     14
## 4045     10      7     49     57      8     27     65      9      8     39
## 4107    140     43     39     40     30    105     48    119     40    109
## 4113     73    118     20     70     66     20     67     66     19     68
## 4117     64     22     24     24     76    117     75     32     91    106
## 4185      7     30      9     28     25     47     23     49     26     39
## 4198    130     98    100     26     24    165    187     34    106    146
## 4310     41    101    112     31     93    179    155    168    116    140
## 4343     38    134    157    224    125    118    141    152    259    128
## 4354      9     25     26     25     28     31     63     46     45     30
## 4448     93     81     67     82     26    107     92    112    142     30
## 4453    160    332    272     53     42    264    138     41    226    274
## 4461     86     79     92     24     28     34     85    157     85     26
## 4718     19     30     44     26     25     17     38      5     31     19
## 4817    221    279    163    158    251    199     55     51     60    202
## 4835     30     33      6     33     33     57     51      8      8     50
## 4910    117    131    114    667    399    380    104    637    407    394
## 5140     28     16      5     26     40     22     15     23     16      5
## 5199    110     91    122    117     28     34     34    120    180    126
## 5236      3     14     15     10     11      5     13     12     21     20
## 5326      8     26      7      8     25      8     45     20     19     26
## 5417     66     26     97     88     23     80    116    130    107     66
## 5531     35    158    212     46     40    126    121    201    149    185
## 5574     73     89     18     22    121     19     58     64    121    120
## 5894     19      5      8      7     23     23     21     22     16     41
## 6033     19     21     15     22     20      5      5      5     16     31
## 6044     65    187    234    386    244    239    159    218    452    210
## 6089     98     32    103    154    169    183     88     91     99     93
## 6275    118     97     51     24     66    102     65     70    108     78
## 6376     22     25     64    104     93     30     80     61     26     72
## 6420     39     28      6     19     34     27     24     46     23      7
##      wgtp53 wgtp54 wgtp55 wgtp56 wgtp57 wgtp58 wgtp59 wgtp60 wgtp61 wgtp62
## 125     202     41     32    166    148     46    210    142     34    225
## 238      22     25     28     52     52     32     31     22     23      6
## 262     119    111     80     93     92     26     29    158     24     96
## 470      67     81     90    102    171    124     70     17     71     22
## 555      19     54     50     43     48     63     94     88     15     17
## 568      19     54     65     23    117    101     19     99     55    118
## 608      13     23     17     11     19     13      3      5      6      3
## 643      60     84     29     20     21     77    110     31     83    137
## 787      57     17    106     59    121     57     19    110     60     21
## 808      23     90     74     68     20    131    134     82     21     21
## 824      94    103    149    148     80     97    100    137     68     91
## 849      51     48     14     58     52     59     18     11     54     54
## 952      70     74    113     67     18     20     23    135     74     93
## 955      22     24      8     30     17     20      5     26      6     19
## 1033     24     43     23     25     21     24     38     35     21     18
## 1265     65     28     21     19     59     54     68     19     82     81
## 1275     28     27      7     24     23     25     24     25     40     25
## 1315    150    163    161     51     40    209    145    205    127     61
## 1388     64     19     72     21     78     62     22     30     72     24
## 1607    133    137     63    142     36    192    136     67    126    238
## 1629    189     86     35     43     24    110    131    193    147    129
## 1651     10     43     76     15     17     70     54     15     49     25
## 1856     42     33     62     39     42     13     17     30     73     86
## 1919     25      5      5      7     21     20     26     52     32     26
## 2101    111    362    387    136    338    110    396    495    323    368
## 2194     21     39     26      7     24     41     40     27     22     24
## 2403     23     36     34     56     29     20     25     45     27     28
## 2443     16     12     65     47     10     69     72     42     43     39
## 2539     96     89     69     79     90     23     28    127     17     98
## 2580     10     51     34     49     24     30     55     33     37     14
## 2655      7      5     17     22     17     20     24     24     20     36
## 2680     63     45     50    112     56     42     16     72     85     15
## 2740     35     28     35     15     22     30     31     50     53     22
## 2838     19     33      5     20     25      5      6     23      5     24
## 2965     65     56     68     27     23     22     82    140    166     86
## 3131     30     31    115     86    107    102     91    138     30     29
## 3133     27      7     26     44     35     30     49     55     27     59
## 3163     28     31     30     27     41     39     10     10     10     10
## 3291     48     32    103    142     93    110    128    181    127     55
## 3370     62    147     64    127     84     75     77     24    128     62
## 3402     15     16     18     46     57     62     64     23     59     83
## 3585     63     63     24     71     83     61     20     62     19     23
## 3652    105     98    101    180    178    178    112     27     28    108
## 3852     89     82     23     78    135     25     28     24     23     75
## 3862    117    120     37     27    131    108    118    101     42    230
## 3912     24     22     26      7      7      8     36     40     33     24
## 4023     13      9     20     33     29     20     22     54      8      8
## 4045     38     42     25     37     32     20     50     38     27     28
## 4107    113    124    115     33     33    138     99    102    153    199
## 4113     71     71     18    118    120    122    126     66    132     60
## 4117     26     63    129    144    140     91     97    126     77     77
## 4185     28     30      7     27     29      8     43     50     23     25
## 4198     31     29     74     85    136    118    120     96    115    134
## 4310    125    117     88     29     35     33    128    161    129    132
## 4343    144     43     36    215    194     45    125    142    204     40
## 4354     10     27     38     31     28     33     28     10      7     10
## 4448     27    144     78     31    135    160    100     91    110    158
## 4453    194    190     49    146    162    217    155    125     43    163
## 4461    103     76     26     97    166    159    136     28     75     89
## 4718      5      6      7     22     32      5     21     20     23     22
## 4817    165    163    203    207    240    260    282     70    175     53
## 4835     32     10     48     58     29     28     11     37     28     30
## 4910    637    411    382    631    341    451    407    517    368    458
## 5140      6      7     16     18     15     13     14      5     23     33
## 5199     32     76     98     44     93    192    221    259    187    105
## 5236      2      4     25     16      3     19     20     10     10     12
## 5326     30     21      7     17     44     30     22     19     22      7
## 5417     73    104     93     73     22     25     25     22     65     24
## 5531    156    142    251    142    189     59     43    133    237    281
## 5574    115     71     67     24    128     70     22     19    125    125
## 5894     37     31     20      6     23     34     22     33     19     10
## 6033     17      5     17     16      3     19     30      5      7      7
## 6044    259     68     53    398    328     59    272    256     77    445
## 6089    103     31     26     28     96    133     90    156     30     87
## 6275     18     20     27     65     58     78     72     18     73     87
## 6376     92    125    133     73     90     77     74     23    104    126
## 6420      9      9     18     24     24     22     21     34      5      7
##      wgtp63 wgtp64 wgtp65 wgtp66 wgtp67 wgtp68 wgtp69 wgtp70 wgtp71 wgtp72
## 125     168    126    119    100    124    150    129    116     96     29
## 238       9     26     23     30     34     10     21      6     23      8
## 262     179     98     27     97    101     22     97    153    141    176
## 470      101     71     22     25     25     20     76     29     62     18
## 555       43     84     52     13     51     49     17     44     96     93
## 568       68     24     92     49    109     51     17     63     16    103
## 608       13     18     15     11     11     23     23     34     15      5
## 643       70     72    113     55     17     25     28     85     61     73
## 787       99     59     17     18     62     64     70     59     68    110
## 808      133     70     83     26    121     85     66    129     74     67
## 824       66     26    101     74     86    173     99     89     30    144
## 849       52     57     57     17     85     49     50    105     93     62
## 952       68     75     63     15     21     29     69    119     69     24
## 955       15     24     47      8      9     46      7     21     23     25
## 1033      23      7     42     26     22     25      5     37     19     18
## 1265     112     94    117     64     22     61     81     76     77    101
## 1275      26      9      7     40     42      6     24     40      5      9
## 1315     155     42     56    210    161    272    159    222    264    170
## 1388     137    107     23     75     66     21     65     18     76     61
## 1607     134    237    188    123    189    129     41    237    262     49
## 1629     181     41     45     36    127    196     93     45    155    136
## 1651      55     15     51     41     50     76     42     89     54     42
## 1856      11     40     76     12      9     41     48     58     33     32
## 1919       5      5      5     19     42     24      7     28     22      9
## 2101     121    325    178    377    318    159    419    652    113    136
## 2194       7     58     22     48     51     21     49      7     24     26
## 2403       6      5      6     21     45     31      6     24     22     10
## 2443      82     48     55     52     30     52     47     52     10     17
## 2539     166     88     27     85     93     30     65    100    135    103
## 2580      57     48     25     20     18      9     29     36     23     40
## 2655       5      5     20     25     33     17     23     21     18     38
## 2680      19    108     65     18     99     85     47     72     15     66
## 2740      22      8      7     33     49     10     19     33      7      8
## 2838      26      5     19     22     18      5     32     38     37     29
## 2965      24     83     84     24     61    121    173    141     71     94
## 3131      26    118    141     94     26     88    104     28    110    149
## 3133      57     52     27     32     25     25     37      8      5      8
## 3163      25     23     28     37     35     49     61     58     26     10
## 3291      34    188    104    115     82     31     84     31    171    115
## 3370     140     96     71    196     65     18    157    123     32     71
## 3402     106     94     58     21     60     93     64     69     86     57
## 3585      21     25    114     69     85     30    124     73     79    109
## 3652     172    100     96    156    103     29     26     31    102     99
## 3852      88     25     84     28     79     78     88    159     76    142
## 3862      31    128    215    232    189    115     36    168    112    118
## 3912       6     21     27      7     27     58     49     45     33     27
## 4023       9     29     43     26     10     27     23      7     28     48
## 4045      53     59      8      9     57     29      7     43     54     30
## 4107     153    108    136    109    121    203    108    165    117    193
## 4113      71     21    115     70     67    125     76     76    118     80
## 4117      89     24     24     22     67    112     72     25     72     77
## 4185      31     37     27      7     47     22     41     28      7     23
## 4198     184     84    112     31     34    211    150     34    100    159
## 4310      39    117    119     33    124    229    146    131     99     77
## 4343      41    159    126    198    110     99    124    112    241    143
## 4354       8     30     26     27     33     25     43     37     45     21
## 4448     107     80     76    109    136     93     91     25     27    122
## 4453    157    245    247     37     42    280    167     48    351    284
## 4461     91     84    113    164    149    157     79     30     82    156
## 4718     21     37     38     22     24     28     34      7     37     21
## 4817    164    311    202    187    275    179     69     48     55    172
## 4835     30     34     48     23     35      8      9     52     45     12
## 4910    413    340    362    360    568    117    411    370    130    139
## 5140     35     15      3     18     40     16     15     30     15      3
## 5199    109    119    101    103     24     30     47    122    157    122
## 5236     23     18     15     13     12     20     13     11      3      5
## 5326     32     27     32     39     22     29      5     17     27     20
## 5417     72    122    123     82    121     90     26     30     27     97
## 5531     43    172    321     59     61    164    155    322    230    143
## 5574     22     23     68     77     76     73    130     23     78    103
## 5894     26     35     39     42     18     22     21     25     26      5
## 6033     23     19     18     18     33     43     23     28     17      5
## 6044    489    249    252     59    195    314    363    305     68    289
## 6089    105     42     98    162    172    147     94     98     75     75
## 6275    115    114     78     26     74    151     74     49    112     76
## 6376     88    117     70     23     73    125     75     76    170     70
## 6420      9     20     33     22      7     17     22      7     24     38
##      wgtp73 wgtp74 wgtp75 wgtp76 wgtp77 wgtp78 wgtp79 wgtp80
## 125      41    202    187     51     83    158     42    112
## 238      14      8      8     24     25      8      6      8
## 262     126     83     94    114    103     33     33     28
## 470      82     78     70     66     23     19     67    114
## 555      86     55     61     55     45     73     17     95
## 568      65     19     15     76     66     66     70     55
## 608      17     23     18     13     24     10      3     23
## 643      73     74    128    110    129     55     18    117
## 787      67     17    107     69     97     59     19     95
## 808     133     80     80     93    126     23     21     76
## 824      29     24     87     92    141    145     29     77
## 849      15     13     54     93     16    100     49     53
## 952      72     73     20     54    122    110    109    123
## 955      33     37     23     17      5     45     20     30
## 1033      6     22      7      7     33     39     25     23
## 1265     67     19     23     25     65     51     68     19
## 1275     28     21     44     27     24     27     29     24
## 1315    239     50     72    199    166    154    205     43
## 1388     78    108     71    118     70     72    119     19
## 1607    154    157     45    173     48    116    126    261
## 1629     38    142    191    195    234    132    189    202
## 1651     70     65     23     83     92     20     42     97
## 1856     35     33     61     47     42     14     12     37
## 1919     28     27     32     37     22     19     20     14
## 2101    506    402    422    560    350    607    436    157
## 2194     23      7     26     46     25      7      5     18
## 2403     19     37     46     39     19     23     30      7
## 2443     75     72     13     49     71     14     15     52
## 2539     77     99     75    110     89     25     23     36
## 2580     49      9     24      9     26     29      8     25
## 2655     19     24      9      6     34     41      6     31
## 2680     59     58     66     17     50     60    114     64
## 2740     24     24     47     33     34     24     36     13
## 2838      5     23     19     34      7     26     21     41
## 2965     92     70     64     25     26     22     74     20
## 3131    158    155     89    119    122    105     92     32
## 3133     29     46     27     11     30     29      6     37
## 3163     33     39     25     27     50     33     10     48
## 3291     50     20     67    103     81    125     95    122
## 3370     87     37     44     26    101     57     77     32
## 3402     20     16     18     62     69     68     57    100
## 3585     72     73    124     74     60     81    102     70
## 3652    100     97     95    187    174    182    100     32
## 3852     88     85    149     81     24    136    141    139
## 3862    158    114     42     39    100    134    118    110
## 3912     24     17     22     11      7      8     32      6
## 4023     53     43     22     30     20     19     22      7
## 4045     28      7     25     40     24     26      7     28
## 4107    204    170    187    114     90    167    183     44
## 4113     73     72    132     24     19     22     23     81
## 4117     29     95    130    111    115     83     78    110
## 4185      7     44     26      9      7     25     32     31
## 4198     28     36    124     86    162     88     87    158
## 4310    105    127     97     42     35     33    101     43
## 4343    102     39     38    203    194     48    171    140
## 4354      5     30     64     28     21     44     21      7
## 4448    121     24     97    150     27     29    101    116
## 4453    152    163     40    191    151    196    186    162
## 4461     88     97    151     96     29     30     30    180
## 4718      7      9      5     24     32      5     21     24
## 4817    172    178    233    211    250    275    255    246
## 4835     31     54      8      8     27     29     59     38
## 4910    361    710    485    395    116    535    131    342
## 5140      7      7     14     21     18     18     17      7
## 5199     32     78     92     31    102    174    158     56
## 5236     20     22      5     12     20      5      3     10
## 5326      7     19     46     29      7     10     19     28
## 5417     77     96     84     65    130    147    133    204
## 5531    165    143    214    123    105     60     48    161
## 5574     76    137     21     77     73    123     74     84
## 5894      5      7     22     31     15      7     20     25
## 6033     20     39     24     17     34     17      5     35
## 6044    222    339    410     63     74    346    225    227
## 6089    112     27     28     31     87    160     93     24
## 6275     15     19     24     71     60     65     81    124
## 6376     17     20     21     58     51     64     83    135
## 6420     43     40     19     26     23     24     25      5
```

```
head(idaho)
```

```
##   RT SERIALNO DIVISION PUMA REGION ST  ADJUST WGTP NP TYPE ACR AGS BDS BLD BUS
## 1  H      186        8  700      4 16 1015675   89  4    1   1  NA   4   2   2
## 2  H      306        8  700      4 16 1015675  310  1    1  NA  NA   1   7  NA
## 3  H      395        8  100      4 16 1015675  106  2    1   1  NA   3   2   2
## 4  H      506        8  700      4 16 1015675  240  4    1   1  NA   4   2   2
## 5  H      835        8  800      4 16 1015675  118  4    1   2   1   5   2   2
## 6  H      989        8  700      4 16 1015675  115  4    1   1  NA   3   2   2
##   CONP ELEP FS FULP GASP HFL INSP KIT MHP MRGI MRGP MRGT MRGX PLM RMS RNTM RNTP
## 1   NA  180  0    2    3   3  600   1  NA    1 1300    1    1   1   9   NA   NA
## 2   NA   60  0    2    3   3   NA   1  NA   NA   NA   NA   NA   1   2    2  600
## 3   NA   70  0    2   30   1  200   1  NA   NA   NA   NA    3   1   7   NA   NA
## 4   NA   40  0    2   80   1  200   1  NA    1  860    1    1   1   6   NA   NA
## 5   NA  250  0    2    3   3  700   1  NA    1 1900    1    1   1   7   NA   NA
## 6   NA  130  0    2    3   3  250   1  NA    1  700    1    1   1   6   NA   NA
##   SMP TEL TEN VACS VAL VEH WATP YBL FES  FINCP FPARC GRNTP GRPIP HHL HHT  HINCP
## 1  NA   1   1   NA  17   3  840   5   2 105600     2    NA    NA   1   1 105600
## 2  NA   1   3   NA  NA   1    1   3  NA     NA    NA   660    23   1   4  34000
## 3  NA   1   2   NA  18   2   50   5   7   9400     2    NA    NA   1   3   9400
## 4 400   1   1   NA  19   3  500   2   1  66000     1    NA    NA   1   1  66000
## 5 650   1   1   NA  20   5    2   3   1  93000     2    NA    NA   1   1  93000
## 6 400   1   1   NA  15   2 1200   5   2  61000     1    NA    NA   1   1  61000
##   HUGCL HUPAC HUPAOC HUPARC LNGI MV NOC NPF NPP NR NRC OCPIP PARTNER PSF R18
## 1     0     2      2      2    1  4   2   4   0  0   2    18       0   0   1
## 2     0     4      4      4    1  3   0  NA   0  0   0    NA       0   0   0
## 3     0     2      2      2    1  2   1   2   0  0   1    23       0   0   1
## 4     0     1      1      1    1  3   2   4   0  0   2    26       0   0   1
## 5     0     2      2      2    1  1   1   4   0  0   1    36       0   0   1
## 6     0     1      1      1    1  4   2   4   0  0   2    26       0   0   1
##   R60 R65 RESMODE SMOCP SMX SRNT SVAL TAXP WIF WKEXREL WORKSTAT FACRP FAGSP
## 1   0   0       1  1550   3    0    1   24   3       2        3     0     0
## 2   0   0       2    NA  NA    1    0   NA  NA      NA       NA     0     0
## 3   0   0       1   179  NA    0    1   16   1      13       13     0     0
## 4   0   0       2  1422   1    0    1   31   2       2        1     0     0
## 5   0   0       1  2800   1    0    1   25   3       1        1     0     0
## 6   0   0       2  1330   2    0    1    7   1       7        3     0     0
##   FBDSP FBLDP FBUSP FCONP FELEP FFSP FFULP FGASP FHFLP FINSP FKITP FMHP FMRGIP
## 1     0     0     0     0     0    0     0     0     0     0     0    0      0
## 2     0     0     0     0     0    0     0     0     0     0     0    0      0
## 3     0     0     0     0     0    0     0     0     0     0     0    0      0
## 4     0     0     0     0     0    0     0     0     0     0     0    0      0
## 5     0     0     0     0     0    0     0     0     0     0     0    0      0
## 6     0     0     0     0     0    0     0     0     0     1     0    0      0
##   FMRGP FMRGTP FMRGXP FMVYP FPLMP FRMSP FRNTMP FRNTP FSMP FSMXHP FSMXSP FTAXP
## 1     0      0      0     0     0     0      0     0    0      0      0     0
## 2     0      0      0     0     0     0      0     0    0      0      0     0
## 3     0      0      0     0     0     0      0     0    0      0      0     0
## 4     0      0      0     0     0     0      0     0    0      0      0     0
## 5     0      0      0     0     0     0      0     0    0      0      0     0
## 6     0      0      0     0     0     0      0     0    0      0      0     1
##   FTELP FTENP FVACSP FVALP FVEHP FWATP FYBLP wgtp1 wgtp2 wgtp3 wgtp4 wgtp5
## 1     0     0      0     0     0     0     0    87    28   156    95    26
## 2     0     0      0     0     0     0     1   539   363   293   422   566
## 3     0     0      0     0     0     0     0   187    35   184   178    83
## 4     0     0      0     0     0     0     0   232   406   234   270   249
## 5     0     0      0     0     0     0     0   107   194   129    41   156
## 6     0     0      0     0     0     1     0   191   197   127   115   115
##   wgtp6 wgtp7 wgtp8 wgtp9 wgtp10 wgtp11 wgtp12 wgtp13 wgtp14 wgtp15 wgtp16
## 1    25    95    93    93     91     87    166     90     25    153     89
## 2   289    87   242   453    453    334    358    414    102    281     99
## 3    95    31    32   177    118    110    114    184    107     95    115
## 4   242   406   249   287     67     72    413    399     77    245    424
## 5   174    47   113   101     33    115     52    113     95    135    206
## 6   107   119    34    32     30    123    199    117     33    109    117
##   wgtp17 wgtp18 wgtp19 wgtp20 wgtp21 wgtp22 wgtp23 wgtp24 wgtp25 wgtp26 wgtp27
## 1    148     82     25    180     90     24    140     92     25     27     86
## 2    108    278    131    407    447    264    352    238    390    336    122
## 3     33    118    120     37    184     35    176    176    110    103     29
## 4     67     63    226    254    238     69    238    255    239    248     69
## 5    100    185    135    279    116     33    105    244     38     30    230
## 6     31    115    201    190    184    198    113    109    117    111    110
##   wgtp28 wgtp29 wgtp30 wgtp31 wgtp32 wgtp33 wgtp34 wgtp35 wgtp36 wgtp37 wgtp38
## 1     84     87     93     90    149     91     28    143     81    144     95
## 2    374    482    468    335    251    613    104    284    116     91    326
## 3     30    197    127     92    118    177     99     99    109     34    100
## 4    234    247    437    423     74     61    401    267     72    388    335
## 5    123    123    243    120    238     98     90    107     44    122     32
## 6     33     37     36    110    183    114     35    134    119     32    121
##   wgtp39 wgtp40 wgtp41 wgtp42 wgtp43 wgtp44 wgtp45 wgtp46 wgtp47 wgtp48 wgtp49
## 1     27     22     90    171     27     83    153    148     92     91     91
## 2    102    361    107    253    321    289     96    343    564    274    118
## 3    105     33    173     36    168    175     99    103     30     35    155
## 4    229    236    239     65    259    247    230    225     82    220    233
## 5    127    195    116     36    135    237     33     33    249    102     84
## 6    188     33     34     32    109    115    115    112    119    192    186
##   wgtp50 wgtp51 wgtp52 wgtp53 wgtp54 wgtp55 wgtp56 wgtp57 wgtp58 wgtp59 wgtp60
## 1     93     90     26     94    142     24     91     29     84    148     30
## 2    118    321    261    130    463    294    479    391    307    476    283
## 3    102     95    107    185    120    114    113     36    115    103     29
## 4    419    390     69     74    391    276     70    422    409    223    245
## 5    224    119    250    119    125    126     32    112     33    131     45
## 6    213    106     34    124    179    106    107    190    112     34     35
##   wgtp61 wgtp62 wgtp63 wgtp64 wgtp65 wgtp66 wgtp67 wgtp68 wgtp69 wgtp70 wgtp71
## 1     93    143     24     88    147    145     91     83     83     86     81
## 2    116    353    323    374    106    236    380    313     90     94    292
## 3    183     35    179    169     95    110     28     34    233     97    123
## 4    269    488    221    250    247    240    415    234    219     66     68
## 5    101    165    125     41    191    195     49    119     92     44    127
## 6     32     34    119    123    122    121    123    196    196    207    120
##   wgtp72 wgtp73 wgtp74 wgtp75 wgtp76 wgtp77 wgtp78 wgtp79 wgtp80
## 1     27     93    151     28     79     25    101    157    129
## 2    401     81    494    346    496    615    286    454    260
## 3    119    168    107     95    101     30    124    106     31
## 4    359    385     71    234    421     76     77    242    231
## 5     36    119    121    116    209     97    176    144     38
## 6     34    109    199    116    110    211    120     31    189
```

###US DOH Example - Best Hospital by Lowest Mortality

```
outcome <- read.csv("./data/outcome-of-care-measures.csv", colClasses = "character")
ncol(outcome)
```

```
## [1] 46
```

```
nrow(outcome)
```

```
## [1] 4706
```

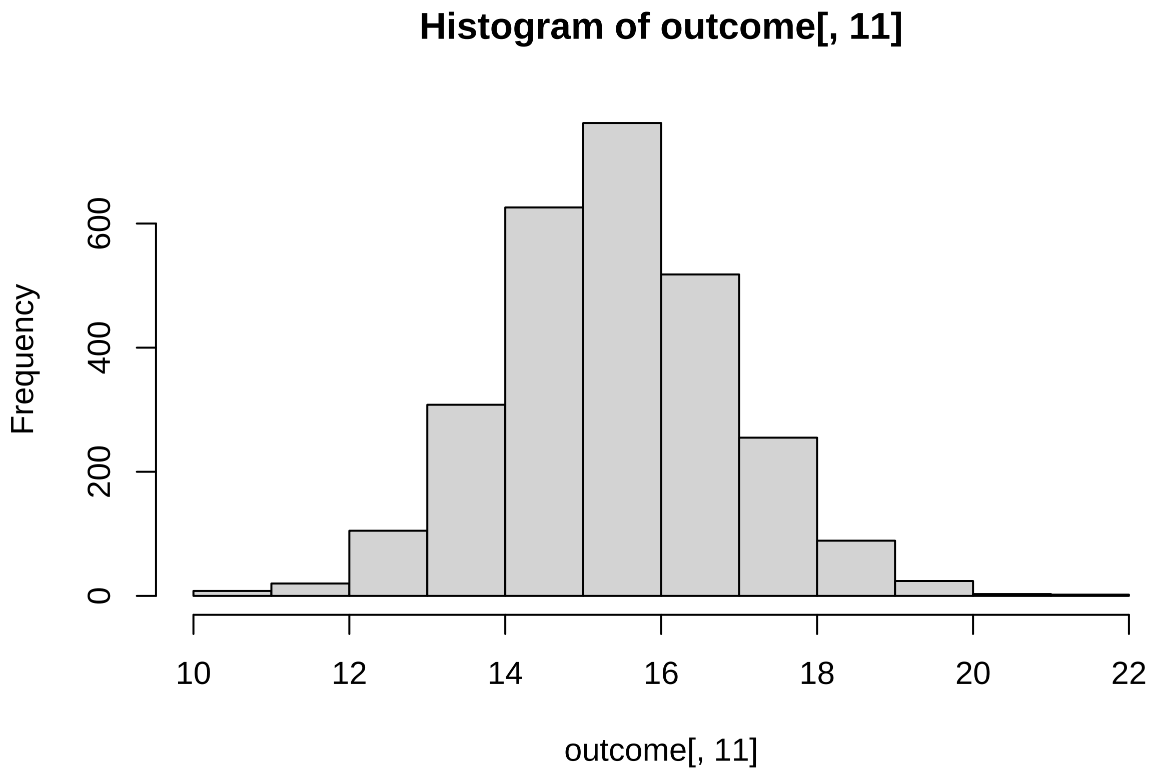
```
names(outcome)
```

```
##  [1] "Provider.Number"
##  [2] "Hospital.Name"
##  [3] "Address.1"
##  [4] "Address.2"
##  [5] "Address.3"
##  [6] "City"
##  [7] "State"
##  [8] "ZIP.Code"
##  [9] "County.Name"
## [10] "Phone.Number"
## [11] "Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [12] "Comparison.to.U.S..Rate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [13] "Lower.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [14] "Upper.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [15] "Number.of.Patients...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [16] "Footnote...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Attack"
## [17] "Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [18] "Comparison.to.U.S..Rate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [19] "Lower.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [20] "Upper.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [21] "Number.of.Patients...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [22] "Footnote...Hospital.30.Day.Death..Mortality..Rates.from.Heart.Failure"
## [23] "Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [24] "Comparison.to.U.S..Rate...Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [25] "Lower.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [26] "Upper.Mortality.Estimate...Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [27] "Number.of.Patients...Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [28] "Footnote...Hospital.30.Day.Death..Mortality..Rates.from.Pneumonia"
## [29] "Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [30] "Comparison.to.U.S..Rate...Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [31] "Lower.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [32] "Upper.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [33] "Number.of.Patients...Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [34] "Footnote...Hospital.30.Day.Readmission.Rates.from.Heart.Attack"
## [35] "Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [36] "Comparison.to.U.S..Rate...Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [37] "Lower.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [38] "Upper.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [39] "Number.of.Patients...Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [40] "Footnote...Hospital.30.Day.Readmission.Rates.from.Heart.Failure"
## [41] "Hospital.30.Day.Readmission.Rates.from.Pneumonia"
## [42] "Comparison.to.U.S..Rate...Hospital.30.Day.Readmission.Rates.from.Pneumonia"
## [43] "Lower.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Pneumonia"
## [44] "Upper.Readmission.Estimate...Hospital.30.Day.Readmission.Rates.from.Pneumonia"
## [45] "Number.of.Patients...Hospital.30.Day.Readmission.Rates.from.Pneumonia"
## [46] "Footnote...Hospital.30.Day.Readmission.Rates.from.Pneumonia"
```

```
    outcome[, 11] <- as.numeric(outcome[, 11]) ## assigning the 11th column, which is death rates from
```

```
## Warning: NAs introduced by coercion
```

```
    hist(outcome[, 11])  ##plotting a histogram of the dataset, column 11
```



```
##This code is meant to evaluate the hospital by state, which has the lowest mortality of three categor
best <- function(state, result, removeNA = TRUE) {
    outcome <- read.csv("./data/outcome-of-care-measures.csv", colClasses = "character") ##assigning the
    outcome[is.na(outcome)] <- ""  ##Initial attempt to remove NA from data.frame, but be careful of th
    shortdata <- as.data.frame(cbind(hospital <- outcome[, 2], ## assigning the columns of interest to 
                                     usstate <- outcome[, 7], #state
                                     ha <- outcome[, 11], #heart attack
                                     hf <- outcome[, 17],  #heart failure
                                     pne <- outcome[, 23]), stringAsFactors = FALSE) #Pneumonia
    colnames(shortdata) <- c("Hospital", "State", "Heart_Attack", "Heart_Failure", "Pneumonia") ##re-na
    shortdata$Heart_Attack <- as.numeric(as.character(shortdata$Heart_Attack)) ##defining the columns w
    shortdata$Heart_Failure <- as.numeric(as.character(shortdata$Heart_Failure))
    shortdata$Pneumonia <- as.numeric(as.character(shortdata$Pneumonia))
    shortdata

    sapply(shortdata, class)  ##a gut check to ensure that the columns of interest, the ones we wanted 
    ##The beginning of the conditional statement
     function_state <- state  ##This helps avoid confusion when we use the column name "State"
    if(!function_state %in% shortdata[, "State"]) { ## a logical operator that looks at whether the sta
      stop("invalid state") ##The function stops if the entered state doesn't match one in column "Stat
    }
      else if(!result %in% c("Heart_Attack", "Heart_Failure", "Pneumonia")) {  ##else if searches for t
        stop ("invalid outcome")
      }
          else {  ##If all of the above conditions are met, then we complete the conditional statement
              match <- which(shortdata[, "State"] == state) ##Which indices are TRUE? A logical object.
              call <- shortdata[match, ]
              value <- as.numeric(call[, eval(result)])
              mins <- min(value, na.rm = TRUE)
              output <- call[, "Hospital"][which(value == mins)]
              end <- output[order(output)]
          }

    end
}
```

###US DOH Example - Hospital Rank by Outcome per State

```
  rankhospital <- function(state, outcome, rank, removeNA = TRUE) {
    datafile <- read.csv("./data/outcome-of-care-measures.csv", colClasses = "character") ##assigning t
    datafile[is.na(datafile)] <- ""  ##Initial attempt to remove NA from data.frame, but be careful of
    shorty <- as.data.frame(cbind(hospital <- datafile[, 2], ## assigning the columns of interest to a
                                     usstate <- datafile[, 7], #state
                                     ha <- datafile[, 11], #heart attack
                                     hf <- datafile[, 17],  #heart failure
                                     pne <- datafile[, 23]), stringAsFactors = FALSE) #Pneumonia
    colnames(shorty) <- c("Hospital", "State", "Heart_Attack", "Heart_Failure", "Pneumonia") ##re-namin
    shorty$Heart_Attack <- as.numeric(as.character(shorty$Heart_Attack)) ##defining the columns with nu
    shorty$Heart_Failure <- as.numeric(as.character(shorty$Heart_Failure))
    shorty$Pneumonia <- as.numeric(as.character(shorty$Pneumonia))
    shorty


if (!state %in% shorty[, "State"]) {
        stop('invalid state')
    } else if (!outcome %in% c("Heart_Attack", "Heart_Failure", "Pneumonia")){
        stop('invalid outcome')
    } else if (is.numeric(rank)) {  ##rank is a function (use str(rank) for more info)
        call <- which(shorty[, "State"] == state) ##logical object looking at whether input state match
        value <- shorty[call, ]    ##assigns the called data to value as a data.frame
        value[, eval(outcome)] <- as.numeric(value[, eval(outcome)])  ##ensures that value is numeric w
        value <- value[order(value[, eval(outcome)], value[, "Hospital"]), ]
        output <- value[, "Hospital"][rank]
    } else if (!is.numeric(rank)){
        if (rank == "best") {
             output <- best(state, outcome)
        } else if (rank == "worst") {
                call <- which(shorty[, "State"] == state)
                value <- shorty[call, ]
                value[, eval(outcome)] <- as.numeric(value[, eval(outcome)])
                value <- value[order(value[, eval(outcome)], value[, "Hospital"], decreasing = TRUE), ]
                output <- value[, "Hospital"][1]
        } else {
            stop('invalid rank')
        }
    }
return(output)
}

##Example outputs
rankhospital("TX", "Heart_Attack", 1:8)
```

```
## Warning in rankhospital("TX", "Heart_Attack", 1:8): NAs introduced by coercion

## Warning in rankhospital("TX", "Heart_Attack", 1:8): NAs introduced by coercion

## Warning in rankhospital("TX", "Heart_Attack", 1:8): NAs introduced by coercion
```

```
## [1] "CYPRESS FAIRBANKS MEDICAL CENTER"
## [2] "HOUSTON NORTHWEST MEDICAL CENTER"
## [3] "METHODIST HOSPITAL,THE"
## [4] "PARKLAND HEALTH AND HOSPITAL SYSTEM"
## [5] "BAPTIST ST ANTHONYS HEALTH SYSTEM-BAPTIST CAMPUS"
## [6] "METHODIST WILLOWBROOK HOSPITAL"
## [7] "BRAZOSPORT REGIONAL HEALTH SYSTEM"
## [8] "DALLAS VA MEDICAL CENTER (VA NORTH TEXAS HEALTHCARE SYSTEM)"
```

```
rankhospital("TX", "Heart_Attack", "worst")
```

```
## Warning in rankhospital("TX", "Heart_Attack", "worst"): NAs introduced by
## coercion

## Warning in rankhospital("TX", "Heart_Attack", "worst"): NAs introduced by
## coercion

## Warning in rankhospital("TX", "Heart_Attack", "worst"): NAs introduced by
## coercion
```

```
## [1] "LAREDO MEDICAL CENTER"
```

###US DOH Example - Best Hospitals by Condition (listing states and names)

```
rankall <- function(outcome, num = "best"){
    ## Read outcome data
    datafile <- read.csv("./data/outcome-of-care-measures.csv", colClasses = "character")
    shorty <- as.data.frame(cbind(datafile[, 2],  # hospital
                            datafile[, 7],  # state
                            datafile[, 11],  # heart attack
                            datafile[, 17],  # heart failure
                            datafile[, 23]), # pneumonia
```

```r
                          stringsAsFactors = FALSE)
    colnames(shorty) <- c("Hospital", "State", "Heart_Attack", "Heart_Failure", "Pneumonia")
    shorty[, eval(outcome)] <- as.numeric(shorty[, eval(outcome)])



    if (!outcome %in% c("Heart_Attack", "Heart_Failure", "Pneumonia")){
        stop('invalid outcome')
    } else if (is.numeric(num)) {
        by_state <- with(shorty, split(shorty, State))
        ordered  <- list()
        for (i in seq_along(by_state)){
            by_state[[i]] <- by_state[[i]][order(by_state[[i]][, eval(outcome)],
                                                 by_state[[i]][, "Hospital"]), ]
            ordered[[i]]  <- c(by_state[[i]][num, "Hospital"], by_state[[i]][, "State"][1])
        }
        result <- do.call(rbind, ordered)
        output <- as.data.frame(result, row.names = result[, 2], stringsAsFactors = FALSE)
        names(output) <- c("Hospital", "State")
    } else if (!is.numeric(num)) {
        if (num == "best") {
            by_state <- with(shorty, split(shorty, State))
            ordered  <- list()
            for (i in seq_along(by_state)){
                by_state[[i]] <- by_state[[i]][order(by_state[[i]][, eval(outcome)],
                                                     by_state[[i]][, "Hospital"]), ]
                ordered[[i]]  <- c(by_state[[i]][1, c("Hospital", "State")])
            }
            result <- do.call(rbind, ordered)
            output <- as.data.frame(result, stringsAsFactors = FALSE)
            rownames(output) <- output[, 2]
        } else if (num == "worst") {
            by_state <- with(shorty, split(shorty, State))
            ordered  <- list()
            for (i in seq_along(by_state)){
                by_state[[i]] <- by_state[[i]][order(by_state[[i]][, eval(outcome)],
                                                     by_state[[i]][, "Hospital"],
                                                     decreasing = TRUE), ]
                ordered[[i]]  <- c(by_state[[i]][1, c("Hospital", "State")])
            }
            result <- do.call(rbind, ordered)
            output <- as.data.frame(result, stringsAsFactors = FALSE)
            rownames(output) <- output[, 2]
        } else {
            stop('invalid num')
        }
    }
return(output)
}
##Example outputs
r <- rankall("Heart_Attack", 4)
```

```
## Warning in rankall("Heart_Attack", 4): NAs introduced by coercion
```

```
head(rankall("Heart_Attack", "worst"))
```

```
## Warning in rankall("Heart_Attack", "worst"): NAs introduced by coercion
```

```
##                            Hospital State
## AK   MAT-SU REGIONAL MEDICAL CENTER    AK
## AL   HELEN KELLER MEMORIAL HOSPITAL    AL
## AR    MEDICAL CENTER SOUTH ARKANSAS    AR
## AZ      VERDE VALLEY MEDICAL CENTER    AZ
## CA METHODIST HOSPITAL OF SACRAMENTO    CA
## CO    NORTH SUBURBAN MEDICAL CENTER    CO
```

###Samsung SmartWatch Tidy Data Example

```
## http://archive.ics.uci.edu/ml/datasets/Human+Activity+Recognition+Using+Smartphones    The informati
## https://d396qusza40orc.cloudfront.net/getdata%2Fprojectfiles%2FUCI%20HAR%20Dataset.zip  The file

list.files("./run_analysis/UCI HAR Dataset/")
```

```
## [1] "activity_labels.txt" "features_info.txt"   "features.txt"
## [4] "README.txt"          "test"                "tidydata2"
## [7] "train"
```

```
datapath <-file.path("/Users/payashome/Documents/FMDtRH/R Studio/R Tutorials/R_4_DataScience/run_analysi
    files <- list.files(datapath, recursive = TRUE)  ##lists all files in the UCI folder
    files
```

```
##  [1] "activity_labels.txt"
##  [2] "features_info.txt"
##  [3] "features.txt"
##  [4] "README.txt"
##  [5] "test/Inertial Signals/body_acc_x_test.txt"
##  [6] "test/Inertial Signals/body_acc_y_test.txt"
##  [7] "test/Inertial Signals/body_acc_z_test.txt"
##  [8] "test/Inertial Signals/body_gyro_x_test.txt"
##  [9] "test/Inertial Signals/body_gyro_y_test.txt"
## [10] "test/Inertial Signals/body_gyro_z_test.txt"
## [11] "test/Inertial Signals/total_acc_x_test.txt"
## [12] "test/Inertial Signals/total_acc_y_test.txt"
## [13] "test/Inertial Signals/total_acc_z_test.txt"
## [14] "test/subject_test.txt"
## [15] "test/X_test.txt"
## [16] "test/y_test.txt"
## [17] "tidydata2"
## [18] "train/Inertial Signals/body_acc_x_train.txt"
## [19] "train/Inertial Signals/body_acc_y_train.txt"
## [20] "train/Inertial Signals/body_acc_z_train.txt"
## [21] "train/Inertial Signals/body_gyro_x_train.txt"
## [22] "train/Inertial Signals/body_gyro_y_train.txt"
## [23] "train/Inertial Signals/body_gyro_z_train.txt"
## [24] "train/Inertial Signals/total_acc_x_train.txt"
## [25] "train/Inertial Signals/total_acc_y_train.txt"
## [26] "train/Inertial Signals/total_acc_z_train.txt"
## [27] "train/subject_train.txt"
## [28] "train/X_train.txt"
## [29] "train/y_train.txt"
```

```
#install.packages("dplyr")  #Installing needed packages.
#install.packages("data.table")
library(dplyr)
library(data.table)

## We are going to read in the train, test, features and activities as seperate
setwd("./run_analysis/UCI HAR Dataset")
x_train <- read.table(file.path(datapath, "train", "X_train.txt"), header = FALSE)  ##here, file.path s
y_train <- read.table(file.path(datapath, "train", "Y_train.txt"), header = FALSE) ## reading in the y
train_sub <- read.table(file.path(datapath, "train", "subject_train.txt"), header = FALSE)
##_________________
x_test <- read.table(file.path(datapath, "test", "X_test.txt"), header = FALSE)  ##reading in data for
y_test <- read.table(file.path(datapath, "test", "Y_test.txt"), header = FALSE)
test_sub <- read.table(file.path(datapath, "test", "subject_test.txt"), header = FALSE)
##_________________
features <- read.table(file.path(datapath, "features.txt"), header = FALSE) ##reading in additional fil
actLabel <- read.table(file.path(datapath, "activity_labels.txt"), header = FALSE)
##_________________

colnames(x_train) = features[ ,2] ##defining the column names as a function of features, which has two
colnames(y_train) = "activityID"
colnames(train_sub) = "subjectID"

colnames(x_test) = features[ ,2] ##column names are same as in train.
colnames(y_test) = "activityID" #descriptive column names for the activity type.
colnames(test_sub) = "subjectID" #descriptive column name for the individual, i.e. 1 of 30 participants
colnames(actLabel) <- c('activityID', 'activityTYPE')  ##simply giving column names to the actLabel dat

combine_train <- cbind(y_train, train_sub, x_train)  ##when str(combine_train), we see activityID as fi
combine_test <- cbind(y_test, test_sub, x_test)
complete_data <- rbind(combine_train, combine_test) ##row binds the two datasets together.


##Extracting only the mean and st.dev from the data.frame
subfeatures <- features$V2[grep("mean\\(\\)|std\\(\\)", features$V2)]  ##similar to features[ , 2], ret
datas <- c("subjectID", "activityID", as.character(subfeatures))  ##assigning data from columns subject
complete_data <- subset(complete_data, select=datas )  ##final datal.frame which is a subset of the orig

names(complete_data) <- gsub("^t", "time", names(complete_data))  ##any string (i.e. column name) begin
names(complete_data) <- gsub("^f", "frequency", names(complete_data))  ## same for frequency
names(complete_data) <- gsub("Acc", "Accelerometer", names(complete_data))
names(complete_data) <- gsub("Gyro", "Gyroscope", names(complete_data))
names(complete_data) <- gsub("Mag", "Magnitude", names(complete_data))
names(complete_data) <- gsub("BodyBody", "body", names(complete_data))  ##clean up repeats of strings
head(complete_data) ##to gut check your changes.
```

```
##   subjectID activityID timeBodyAccelerometer-mean()-X
## 1         1          5                      0.2885845
## 2         1          5                      0.2784188
## 3         1          5                      0.2796531
## 4         1          5                      0.2791739
## 5         1          5                      0.2766288
## 6         1          5                      0.2771988
##   timeBodyAccelerometer-mean()-Y timeBodyAccelerometer-mean()-Z
## 1                    -0.02029417                     -0.1329051
## 2                    -0.01641057                     -0.1235202
## 3                    -0.01946716                     -0.1134617
## 4                    -0.02620065                     -0.1232826
## 5                    -0.01656965                     -0.1153619
## 6                    -0.01009785                     -0.1051373
##   timeBodyAccelerometer-std()-X timeBodyAccelerometer-std()-Y
## 1                    -0.9952786                    -0.9831106
## 2                    -0.9982453                    -0.9753002
## 3                    -0.9953796                    -0.9671870
## 4                    -0.9960915                    -0.9834027
## 5                    -0.9981386                    -0.9808173
## 6                    -0.9973350                    -0.9904868
##   timeBodyAccelerometer-std()-Z timeGravityAccelerometer-mean()-X
## 1                    -0.9135264                        0.9633961
## 2                    -0.9603220                        0.9665611
## 3                    -0.9789440                        0.9668781
## 4                    -0.9906751                        0.9676152
## 5                    -0.9904816                        0.9682244
## 6                    -0.9954200                        0.9679482
##   timeGravityAccelerometer-mean()-Y timeGravityAccelerometer-mean()-Z
## 1                        -0.1408397                        0.11537494
## 2                        -0.1415513                        0.10937881
## 3                        -0.1420098                        0.10188392
## 4                        -0.1439765                        0.09985014
## 5                        -0.1487502                        0.09448590
## 6                        -0.1482100                        0.09190972
##   timeGravityAccelerometer-std()-X timeGravityAccelerometer-std()-Y
## 1                       -0.9852497                       -0.9817084
## 2                       -0.9974113                       -0.9894474
## 3                       -0.9995740                       -0.9928658
## 4                       -0.9966456                       -0.9813928
## 5                       -0.9984293                       -0.9880982
## 6                       -0.9989793                       -0.9867539
##   timeGravityAccelerometer-std()-Z timeBodyAccelerometerJerk-mean()-X
## 1                       -0.8776250                         0.07799634
## 2                       -0.9316387                         0.07400671
## 3                       -0.9929172                         0.07363596
## 4                       -0.9784764                         0.07732061
## 5                       -0.9787449                         0.07344436
## 6                       -0.9973064                         0.07793244
##   timeBodyAccelerometerJerk-mean()-Y timeBodyAccelerometerJerk-mean()-Z
## 1                        0.005000803                       -0.067830808
## 2                        0.005771104                        0.029376633
## 3                        0.003104037                       -0.009045631
## 4                        0.020057642                       -0.009864772
## 5                        0.019121574                        0.016779979
## 6                        0.018684046                        0.009344434
##   timeBodyAccelerometerJerk-std()-X timeBodyAccelerometerJerk-std()-Y
## 1                        -0.9935191                        -0.9883600
## 2                        -0.9955481                        -0.9810636
## 3                        -0.9907428                        -0.9809556
## 4                        -0.9926974                        -0.9875527
## 5                        -0.9964202                        -0.9883587
## 6                        -0.9948136                        -0.9887145
##   timeBodyAccelerometerJerk-std()-Z timeBodyGyroscope-mean()-X
## 1                        -0.9935750               -0.006100849
## 2                        -0.9918457               -0.016111620
## 3                        -0.9896866               -0.031698294
## 4                        -0.9934976               -0.043409983
## 5                        -0.9924549               -0.033960416
## 6                        -0.9922663               -0.028775508
##   timeBodyGyroscope-mean()-Y timeBodyGyroscope-mean()-Z
## 1                -0.03136479                 0.10772540
## 2                -0.08389378                 0.10058429
## 3                -0.10233542                 0.09612688
## 4                -0.09138618                 0.08553770
## 5                -0.07470803                 0.07739203
## 6                -0.07039311                 0.07901214
##   timeBodyGyroscope-std()-X timeBodyGyroscope-std()-Y timeBodyGyroscope-std()-Z
## 1                -0.9853103                -0.9766234                -0.9922053
## 2                -0.9831200                -0.9890458                -0.9891212
## 3                -0.9762921                -0.9935518                -0.9863787
## 4                -0.9913848                -0.9924073                -0.9875542
## 5                -0.9851836                -0.9923781                -0.9874019
## 6                -0.9851808                -0.9921175                -0.9830768
##   timeBodyGyroscopeJerk-mean()-X timeBodyGyroscopeJerk-mean()-Y
## 1                    -0.09916740                    -0.05551737
## 2                    -0.11050283                    -0.04481873
## 3                    -0.10848567                    -0.04241031
## 4                    -0.09116989                    -0.03633262
## 5                    -0.09077010                    -0.03763253
## 6                    -0.09424758                    -0.04335526
##   timeBodyGyroscopeJerk-mean()-Z timeBodyGyroscopeJerk-std()-X
## 1                    -0.06198580                    -0.9921107
## 2                    -0.05924282                    -0.9898726
## 3                    -0.05582883                    -0.9884618
## 4                    -0.06046466                    -0.9911194
## 5                    -0.05828932                    -0.9913545
## 6                    -0.04193600                    -0.9916216
##   timeBodyGyroscopeJerk-std()-Y timeBodyGyroscopeJerk-std()-Z
## 1                    -0.9925193                    -0.9920553
## 2                    -0.9972926                    -0.9938510
## 3                    -0.9956321                    -0.9915318
## 4                    -0.9966410                    -0.9933289
## 5                    -0.9964730                    -0.9945110
## 6                    -0.9960147                    -0.9930906
##   timeBodyAccelerometerMagnitude-mean() timeBodyAccelerometerMagnitude-std()
## 1                            -0.9594339                           -0.9505515
## 2                            -0.9792892                           -0.9760571
## 3                            -0.9837031                           -0.9880196
## 4                            -0.9865418                           -0.9864213
## 5                            -0.9928271                           -0.9912754
## 6                            -0.9942950                           -0.9952490
##   timeGravityAccelerometerMagnitude-mean()
## 1                               -0.9594339
## 2                               -0.9792892
## 3                               -0.9837031
## 4                               -0.9865418
## 5                               -0.9928271
## 6                               -0.9942950
##   timeGravityAccelerometerMagnitude-std()
## 1                              -0.9505515
## 2                              -0.9760571
## 3                              -0.9880196
## 4                              -0.9864213
## 5                              -0.9912754
## 6                              -0.9952490
##   timeBodyAccelerometerJerkMagnitude-mean()
## 1                                -0.9933059
## 2                                -0.9912535
## 3                                -0.9885313
## 4                                -0.9930780
## 5                                -0.9934800
## 6                                -0.9930177
##   timeBodyAccelerometerJerkMagnitude-std() timeBodyGyroscopeMagnitude-mean()
## 1                               -0.9943364                        -0.9689591
## 2                               -0.9916944                        -0.9806831
## 3                               -0.9903969                        -0.9763171
## 4                               -0.9933808                        -0.9820599
## 5                               -0.9958537                        -0.9852037
## 6                               -0.9954243                        -0.9858944
##   timeBodyGyroscopeMagnitude-std() timeBodyGyroscopeJerkMagnitude-mean()
## 1                       -0.9643352                            -0.9942478
## 2                       -0.9837542                            -0.9951232
## 3                       -0.9860515                            -0.9934032
## 4                       -0.9873511                            -0.9955022
## 5                       -0.9890626                            -0.9958076
## 6                       -0.9864403                            -0.9952748
##   timeBodyGyroscopeJerkMagnitude-std() frequencyBodyAccelerometer-mean()-X
## 1                           -0.9913676                          -0.9947832
## 2                           -0.9961016                          -0.9974507
## 3                           -0.9950910                          -0.9935941
## 4                           -0.9952666                          -0.9954906
## 5                           -0.9952580                          -0.9972859
## 6                           -0.9952050                          -0.9966567
##   frequencyBodyAccelerometer-mean()-Y frequencyBodyAccelerometer-mean()-Z
## 1                          -0.9829841                          -0.9392687
## 2                          -0.9768517                          -0.9735227
## 3                          -0.9725115                          -0.9833040
## 4                          -0.9835697                          -0.9910798
## 5                          -0.9823010                          -0.9883694
## 6                          -0.9869395                          -0.9927386
##   frequencyBodyAccelerometer-std()-X frequencyBodyAccelerometer-std()-Y
## 1                         -0.9954217                         -0.9831330
## 2                         -0.9986803                         -0.9749298
## 3                         -0.9963128                         -0.9655059
## 4                         -0.9963121                         -0.9832444
## 5                         -0.9986065                         -0.9801295
## 6                         -0.9976438                         -0.9922637
##   frequencyBodyAccelerometer-std()-Z frequencyBodyAccelerometerJerk-mean()-X
## 1                         -0.9061650                              -0.9923325
## 2                         -0.9554381                              -0.9950322
## 3                         -0.9770493                              -0.9909937
## 4                         -0.9902291                              -0.9944466
## 5                         -0.9919150                              -0.9962920
## 6                         -0.9970459                              -0.9948507
##   frequencyBodyAccelerometerJerk-mean()-Y
## 1                              -0.9871699
## 2                              -0.9813115
## 3                              -0.9816423
## 4                              -0.9887272
## 5                              -0.9887900
## 6                              -0.9882443
##   frequencyBodyAccelerometerJerk-mean()-Z
## 1                              -0.9896961
## 2                              -0.9897398
## 3                              -0.9875663
## 4                              -0.9913542
## 5                              -0.9906244
## 6                              -0.9901575
##   frequencyBodyAccelerometerJerk-std()-X frequencyBodyAccelerometerJerk-std()-Y
## 1                             -0.9958207                             -0.9909363
## 2                             -0.9966523                             -0.9820839
## 3                             -0.9912488                             -0.9814148
## 4                             -0.9913783                             -0.9869269
## 5                             -0.9969025                             -0.9886067
## 6                             -0.9952180                             -0.9901788
##   frequencyBodyAccelerometerJerk-std()-Z frequencyBodyGyroscope-mean()-X
## 1                             -0.9970517                      -0.9865744
## 2                             -0.9926268                      -0.9773867
## 3                             -0.9904159                      -0.9754332
## 4                             -0.9943908                      -0.9871096
## 5                             -0.9929065                      -0.9824465
## 6                             -0.9930667                      -0.9848902
##   frequencyBodyGyroscope-mean()-Y frequencyBodyGyroscope-mean()-Z
## 1                      -0.9817615                      -0.9895148
## 2                      -0.9925300                      -0.9896058
## 3                      -0.9937147                      -0.9867557
## 4                      -0.9936015                      -0.9871913
## 5                      -0.9929838                      -0.9886664
## 6                      -0.9927862                      -0.9807784
##   frequencyBodyGyroscope-std()-X frequencyBodyGyroscope-std()-Y
## 1                     -0.9850326                     -0.9738861
## 2                     -0.9849043                     -0.9871681
## 3                     -0.9766422                     -0.9933990
## 4                     -0.9928104                     -0.9916460
## 5                     -0.9859818                     -0.9919558
## 6                     -0.9852871                     -0.9916595
##   frequencyBodyGyroscope-std()-Z frequencyBodyAccelerometerMagnitude-mean()
## 1                     -0.9940349                                 -0.9521547
## 2                     -0.9897847                                 -0.9808566
## 3                     -0.9873282                                 -0.9877948
## 4                     -0.9886776                                 -0.9875187
## 5                     -0.9879443                                 -0.9935909
## 6                     -0.9853661                                 -0.9948360
##   frequencyBodyAccelerometerMagnitude-std()
## 1                                -0.9561340
## 2                                -0.9758658
## 3                                -0.9890155
## 4                                -0.9867420
## 5                                -0.9900635
## 6                                -0.9952833
##   frequencybodyAccelerometerJerkMagnitude-mean()
## 1                                     -0.9937257
## 2                                     -0.9903355
## 3                                     -0.9892801
## 4                                     -0.9927689
## 5                                     -0.9955228
## 6                                     -0.9947329
##   frequencybodyAccelerometerJerkMagnitude-std()
## 1                                    -0.9937550
## 2                                    -0.9919603
## 3                                    -0.9908667
## 4                                    -0.9916998
## 5                                    -0.9943890
## 6                                    -0.9951562
##   frequencybodyGyroscopeMagnitude-mean() frequencybodyGyroscopeMagnitude-std()
## 1                             -0.9801349                            -0.9613094
## 2                             -0.9882956                            -0.9833219
## 3                             -0.9892548                            -0.9860277
## 4                             -0.9894128                            -0.9878358
## 5                             -0.9914330                            -0.9890594
## 6                             -0.9905000                            -0.9858609
##   frequencybodyGyroscopeJerkMagnitude-mean()
## 1                                 -0.9919904
## 2                                 -0.9958539
## 3                                 -0.9950305
## 4                                 -0.9952207
## 5                                 -0.9950928
## 6                                 -0.9951433
##   frequencybodyGyroscopeJerkMagnitude-std()
## 1                                -0.9906975
## 2                                -0.9963995
## 3                                -0.9951274
## 4                                -0.9952369
## 5                                -0.9954648
## 6                                -0.9952387
```

```
complete_data2 <- aggregate(. ~ subjectID + activityID, complete_data, mean) ## here, we are aggreagati
head(complete_data2)
```

```
##   subjectID activityID timeBodyAccelerometer-mean()-X
## 1         1          1                      0.2773308
## 2         2          1                       0.2764266
## 3         3          1                       0.2755675
## 4         4          1                       0.2785820
## 5         5          1                       0.2778423
## 6         6          1                       0.2836589
##   timeBodyAccelerometer-mean()-Y timeBodyAccelerometer-mean()-Z
## 1                    -0.01738382                     -0.1111481
## 2                    -0.01859492                     -0.1055004
## 3                    -0.01717678                     -0.1126749
## 4                    -0.01483995                     -0.1114031
## 5                    -0.01728503                     -0.1077418
## 6                    -0.01689542                     -0.1103032
##   timeBodyAccelerometer-std()-X timeBodyAccelerometer-std()-Y
## 1                    -0.2837403                    0.11446134
## 2                    -0.4236428                   -0.07809125
## 3                    -0.3603567                   -0.06991407
## 4                    -0.4408300                   -0.07882674
## 5                    -0.2940985                    0.07674840
## 6                    -0.2965387                    0.16421388
##   timeBodyAccelerometer-std()-Z timeGravityAccelerometer-mean()-X
## 1                    -0.2600279                         0.9352232
## 2                    -0.4252575                         0.9130173
## 3                    -0.3874120                         0.9365067
## 4                    -0.5862528                         0.9639997
## 5                    -0.4570214                         0.9726250
## 6                    -0.5043242                         0.9580675
##   timeGravityAccelerometer-mean()-Y timeGravityAccelerometer-mean()-Z
## 1                       -0.28216502                      -0.068102864
## 2                       -0.34660709                       0.084727087
## 3                       -0.26198636                      -0.138107866
## 4                       -0.08585403                       0.127764113
## 5                       -0.10044029                       0.002476236
## 6                       -0.21469485                       0.033188883
##   timeGravityAccelerometer-std()-X timeGravityAccelerometer-std()-Y
## 1                       -0.9766096                       -0.9713060
## 2                       -0.9726932                       -0.9721169
## 3                       -0.9777716                       -0.9623556
## 4                       -0.9838265                       -0.9679632
## 5                       -0.9793484                       -0.9615855
## 6                       -0.9777799                       -0.9642486
##   timeGravityAccelerometer-std()-Z timeBodyAccelerometerJerk-mean()-X
## 1                       -0.9477172                         0.07404163
## 2                       -0.9720728                         0.06180807
## 3                       -0.9520918                         0.08147459
## 4                       -0.9629681                         0.07835291
## 5                       -0.9645808                         0.08458888
## 6                       -0.9572050                         0.06995859
##   timeBodyAccelerometerJerk-mean()-Y timeBodyAccelerometerJerk-mean()-Z
## 1                        0.028272110                      -4.168406e-03
## 2                        0.018249268                       7.895337e-03
## 3                        0.010059149                      -5.622646e-03
## 4                        0.002956024                      -7.676793e-04
## 5                       -0.016319410                       8.321594e-05
## 6                       -0.016483172                      -7.389312e-03
##   timeBodyAccelerometerJerk-std()-X timeBodyAccelerometerJerk-std()-Y
## 1                        -0.1136156                       0.067002501
## 2                        -0.2775305                      -0.016602236
## 3                        -0.2686796                      -0.044961959
## 4                        -0.2970426                      -0.221165132
## 5                        -0.3028910                      -0.091039743
## 6                        -0.1327848                       0.008088974
##   timeBodyAccelerometerJerk-std()-Z timeBodyGyroscope-mean()-X
## 1                        -0.5026998                -0.04183096
## 2                        -0.5860904                -0.05302582
## 3                        -0.5294861                -0.02564052
## 4                        -0.7513914                -0.03179826
## 5                        -0.6128953                -0.04889199
## 6                        -0.5757775                -0.02550962
##   timeBodyGyroscope-mean()-Y timeBodyGyroscope-mean()-Z
## 1                -0.06953005                 0.08494482
## 2                -0.04823823                 0.08283366
## 3                -0.07791509                 0.08134859
## 4                -0.07269053                 0.08056772
## 5                -0.06901352                 0.08154355
## 6                -0.07444625                 0.08388088
##   timeBodyGyroscope-std()-X timeBodyGyroscope-std()-Y timeBodyGyroscope-std()-Z
## 1                -0.4735355               -0.05460777                -0.3442666
## 2                -0.5615503               -0.53845367                -0.4810855
## 3                -0.5718696               -0.56379326                -0.4766964
## 4                -0.5009167               -0.66539409                -0.6626082
## 5                -0.4908775               -0.50462203                -0.3187006
## 6                -0.4460210               -0.33170227                -0.3831393
##   timeBodyGyroscopeJerk-mean()-X timeBodyGyroscopeJerk-mean()-Y
## 1                    -0.08999754                    -0.03984287
## 2                    -0.08188334                    -0.05382994
## 3                    -0.09523982                    -0.03878747
## 4                    -0.11532156                    -0.03934745
## 5                    -0.08884084                    -0.04495595
## 6                    -0.08788911                    -0.03623090
##   timeBodyGyroscopeJerk-mean()-Z timeBodyGyroscopeJerk-std()-X
## 1                    -0.04613093                    -0.2074219
## 2                    -0.05149392                    -0.3895498
## 3                    -0.05036161                    -0.3859230
## 4                    -0.05511669                    -0.4923411
## 5                    -0.04826796                    -0.3576814
## 6                    -0.05395973                    -0.1826009
##   timeBodyGyroscopeJerk-std()-Y timeBodyGyroscopeJerk-std()-Z
## 1                    -0.3044685                    -0.4042555
## 2                    -0.6341404                    -0.4354927
## 3                    -0.6390880                    -0.5366641
## 4                    -0.8074199                    -0.6404541
## 5                    -0.5714381                    -0.1576825
## 6                    -0.4163902                    -0.1666844
##   timeBodyAccelerometerMagnitude-mean() timeBodyAccelerometerMagnitude-std()
## 1                            -0.1369712                           -0.2196886
## 2                            -0.2904076                           -0.4225442
## 3                            -0.2546903                           -0.3284289
## 4                            -0.3120506                           -0.5276791
## 5                            -0.1583387                           -0.3771787
## 6                            -0.1668407                           -0.2667342
##   timeGravityAccelerometerMagnitude-mean()
## 1                               -0.1369712
## 2                               -0.2904076
## 3                               -0.2546903
## 4                               -0.3120506
## 5                               -0.1583387
## 6                               -0.1668407
##   timeGravityAccelerometerMagnitude-std()
## 1                              -0.2196886
## 2                              -0.4225442
## 3                              -0.3284289
## 4                              -0.5276791
## 5                              -0.3771787
## 6                              -0.2667342
##   timeBodyAccelerometerJerkMagnitude-mean()
## 1                                -0.1414288
## 2                                -0.2814242
## 3                                -0.2800093
## 4                                -0.3667009
## 5                                -0.2883330
## 6                                -0.1951170
##   timeBodyAccelerometerJerkMagnitude-std() timeBodyGyroscopeMagnitude-mean()
## 1                              -0.07447175                        -0.1609796
## 2                              -0.16415099                        -0.4465491
## 3                              -0.13991636                        -0.4664118
## 4                              -0.31691896                        -0.4977922
## 5                              -0.28224228                        -0.3559331
## 6                              -0.07060296                        -0.2812078
##   timeBodyGyroscopeMagnitude-std() timeBodyGyroscopeJerkMagnitude-mean()
## 1                       -0.1869784                            -0.2987037
## 2                       -0.5530199                            -0.5479120
## 3                       -0.5615107                            -0.5661352
## 4                       -0.5531161                            -0.6813040
## 5                       -0.4921768                            -0.4445325
## 6                       -0.3656029                            -0.3212905
##   timeBodyGyroscopeJerkMagnitude-std() frequencyBodyAccelerometer-mean()-X
## 1                           -0.3253249                          -0.2027943
## 2                           -0.5577982                          -0.3460482
## 3                           -0.5673716                          -0.3166140
## 4                           -0.7301464                          -0.4267194
## 5                           -0.4891997                          -0.2877826
## 6                           -0.3647083                          -0.1879343
##   frequencyBodyAccelerometer-mean()-Y frequencyBodyAccelerometer-mean()-Z
## 1                         0.089712726                          -0.3315601
## 2                        -0.021904810                          -0.4538064
## 3                        -0.081302435                          -0.4123741
## 4                        -0.149399633                          -0.6310055
## 5                         0.009460378                          -0.4902511
## 6                         0.140781622                          -0.4985202
##   frequencyBodyAccelerometer-std()-X frequencyBodyAccelerometer-std()-Y
## 1                         -0.3191347                         0.05604001
## 2                         -0.4576514                        -0.16921969
## 3                         -0.3792768                        -0.12403083
## 4                         -0.4472349                        -0.10179945
## 5                         -0.2975174                         0.04260268
## 6                         -0.3452277                         0.10169964
##   frequencyBodyAccelerometer-std()-Z frequencyBodyAccelerometerJerk-mean()-X
## 1                         -0.2796868                              -0.1705470
## 2                         -0.4552221                              -0.3046153
## 3                         -0.4229985                              -0.3046944
## 4                         -0.5941983                              -0.3588834
## 5                         -0.4830600                              -0.3449548
## 6                         -0.5504746                              -0.1509429
##   frequencyBodyAccelerometerJerk-mean()-Y
## 1                             -0.03522552
## 2                             -0.07876408
## 3                             -0.14050859
## 4                             -0.27955339
## 5                             -0.18105555
## 6                             -0.07537423
##   frequencyBodyAccelerometerJerk-mean()-Z
## 1                              -0.4689992
## 2                              -0.5549567
## 3                              -0.5141373
## 4                              -0.7289916
## 5                              -0.5904966
## 6                              -0.5414386
##   frequencyBodyAccelerometerJerk-std()-X frequencyBodyAccelerometerJerk-std()-Y
## 1                             -0.1335866                            0.106739857
## 2                             -0.3143131                           -0.015332952
## 3                             -0.2965966                           -0.005614988
## 4                             -0.2973261                           -0.209900006
## 5                             -0.3213903                           -0.054521360
## 6                             -0.1926947                            0.031445068
##   frequencyBodyAccelerometerJerk-std()-Z frequencyBodyGyroscope-mean()-X
## 1                             -0.5347134                      -0.3390322
## 2                             -0.6158982                      -0.4297135
## 3                             -0.5435291                      -0.4378458
## 4                             -0.7723591                      -0.3733845
## 5                             -0.6334300                      -0.3726687
## 6                             -0.6086244                      -0.2396507
##   frequencyBodyGyroscope-mean()-Y frequencyBodyGyroscope-mean()-Z
## 1                      -0.1030594                      -0.2559409
## 2                      -0.5547721                      -0.3966599
## 3                      -0.5615263                      -0.4181262
## 4                      -0.6884601                      -0.6013811
## 5                      -0.5139517                      -0.2131270
## 6                      -0.3413784                      -0.2035755
##   frequencyBodyGyroscope-std()-X frequencyBodyGyroscope-std()-Y
## 1                     -0.5166919                    -0.03350816
## 2                     -0.6040530                    -0.53304695
## 3                     -0.6151214                    -0.56888867
## 4                     -0.5426468                    -0.65465777
## 5                     -0.5293928                    -0.50268338
## 6                     -0.5153239                    -0.33200871
##   frequencyBodyGyroscope-std()-Z frequencyBodyAccelerometerMagnitude-mean()
## 1                     -0.4365622                                 -0.1286235
## 2                     -0.5598566                                 -0.3242894
## 3                     -0.5458964                                 -0.2900315
## 4                     -0.7164585                                 -0.4508046
## 5                     -0.4203671                                 -0.3049925
## 6                     -0.5122092                                 -0.2013866
##   frequencyBodyAccelerometerMagnitude-std()
## 1                                -0.3980326
## 2                                -0.5771052
## 3                                -0.4563731
## 4                                -0.6511726
## 5                                -0.5196369
## 6                                -0.4216831
##   frequencybodyAccelerometerJerkMagnitude-mean()
## 1                                    -0.05711940
## 2                                    -0.16906435
## 3                                    -0.18676452
## 4                                    -0.31858781
## 5                                    -0.26948166
## 6                                    -0.05540142
##   frequencybodyAccelerometerJerkMagnitude-std()
## 1                                   -0.10349240
## 2                                   -0.16409197
## 3                                   -0.08985199
## 4                                   -0.32045870
## 5                                   -0.30568538
## 6                                   -0.09649997
##   frequencybodyGyroscopeMagnitude-mean() frequencybodyGyroscopeMagnitude-std()
## 1                             -0.1992526                            -0.3210180
## 2                             -0.5307048                            -0.6517928
## 3                             -0.5697558                            -0.6326433
## 4                             -0.6092856                            -0.5939372
## 5                             -0.4842628                            -0.5897415
## 6                             -0.3296811                            -0.5106483
##   frequencybodyGyroscopeJerkMagnitude-mean()
## 1                                 -0.3193086
## 2                                 -0.5832493
## 3                                 -0.6077516
## 4                                 -0.7243274
## 5                                 -0.5480536
## 6                                 -0.3665005
##   frequencybodyGyroscopeJerkMagnitude-std()
## 1                                -0.3816019
## 2                                -0.5581046
## 3                                -0.5490870
## 4                                -0.7577681
## 5                                -0.4556653
## 6                                -0.4080789
```

```
write.table(complete_data2, file ="tidydata2", row.name=FALSE) ##writes a the file into the UCI HAR Dat
```

DATA examples and Resources.

http://data.un.org/ http://data.gov/ http://data.gov.uk http://www.data.gov/opendatasites http://www.gapminder.org/ http://www.asdfree.com/