Assignment_5

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```
library(readr)
Cereals <- read_csv("C:/Users/Dell/Desktop/Cereals.csv")
```

```
## Rows: 77 Columns: 16

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (3): name, mfr, type
## dbl (13): calories, protein, fat, sodium, fiber, carbo, sugars, potass, vita...

##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
View(Cereals)
```

Removing missing values

```
head(Cereals)
```

```
## # A tibble: 6 x 16
##   name       mfr   type  calories protein   fat sodium fiber carbo sugars potass
##   <chr>      <chr> <chr>    <dbl>   <dbl> <dbl>  <dbl> <dbl> <dbl>  <dbl>  <dbl>
## 1 100%_Bran  N     C           70       4     1    130  10     5        6    280
## 2 100%_Natu~ Q     C          120       3     5     15   2     8        8    135
## 3 All-Bran   K     C           70       4     1    260   9     7        5    320
## 4 All-Bran_~ K     C           50       4     0    140  14     8        0    330
## 5 Almond_De~ R     C          110       2     2    200   1    14        8     NA
## 6 Apple_Cin~ G     C          110       2     2    180   1.5  10.5     10     70
## # ... with 5 more variables: vitamins <dbl>, shelf <dbl>, weight <dbl>,
## #   cups <dbl>, rating <dbl>
```

```
null_model <- is.null(Cereals)
null_model
```

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

```
n_a <- is.na(Cereals)
n_a
```

```
##        name   mfr  type calories protein   fat sodium fiber carbo sugars potass
##  [1,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [2,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [3,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [4,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [5,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE   TRUE
##  [6,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [7,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [8,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##  [9,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [10,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [11,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [12,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [13,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [14,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [15,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [16,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [17,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [18,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [19,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [20,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [21,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE   TRUE
## [22,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [23,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [24,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [25,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [26,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [27,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [28,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [29,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [30,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [31,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [32,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [33,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [34,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [35,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [36,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [37,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [38,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [39,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [40,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [41,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [42,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [43,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [44,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [45,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [46,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [47,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [48,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [49,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
```

```
## [50,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [51,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [52,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [53,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [54,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [55,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [56,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [57,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [58,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE  TRUE   TRUE  FALSE
## [59,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [60,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [61,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [62,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [63,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [64,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [65,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [66,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [67,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [68,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [69,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [70,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [71,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [72,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [73,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [74,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [75,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [76,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
## [77,] FALSE FALSE FALSE    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE
##       vitamins shelf weight  cups rating
##  [1,]    FALSE FALSE  FALSE FALSE  FALSE
##  [2,]    FALSE FALSE  FALSE FALSE  FALSE
##  [3,]    FALSE FALSE  FALSE FALSE  FALSE
##  [4,]    FALSE FALSE  FALSE FALSE  FALSE
##  [5,]    FALSE FALSE  FALSE FALSE  FALSE
##  [6,]    FALSE FALSE  FALSE FALSE  FALSE
##  [7,]    FALSE FALSE  FALSE FALSE  FALSE
##  [8,]    FALSE FALSE  FALSE FALSE  FALSE
##  [9,]    FALSE FALSE  FALSE FALSE  FALSE
## [10,]    FALSE FALSE  FALSE FALSE  FALSE
## [11,]    FALSE FALSE  FALSE FALSE  FALSE
## [12,]    FALSE FALSE  FALSE FALSE  FALSE
## [13,]    FALSE FALSE  FALSE FALSE  FALSE
## [14,]    FALSE FALSE  FALSE FALSE  FALSE
## [15,]    FALSE FALSE  FALSE FALSE  FALSE
## [16,]    FALSE FALSE  FALSE FALSE  FALSE
## [17,]    FALSE FALSE  FALSE FALSE  FALSE
## [18,]    FALSE FALSE  FALSE FALSE  FALSE
## [19,]    FALSE FALSE  FALSE FALSE  FALSE
## [20,]    FALSE FALSE  FALSE FALSE  FALSE
## [21,]    FALSE FALSE  FALSE FALSE  FALSE
## [22,]    FALSE FALSE  FALSE FALSE  FALSE
## [23,]    FALSE FALSE  FALSE FALSE  FALSE
## [24,]    FALSE FALSE  FALSE FALSE  FALSE
## [25,]    FALSE FALSE  FALSE FALSE  FALSE
```

```
## [26,]    FALSE FALSE  FALSE FALSE  FALSE
## [27,]    FALSE FALSE  FALSE FALSE  FALSE
## [28,]    FALSE FALSE  FALSE FALSE  FALSE
## [29,]    FALSE FALSE  FALSE FALSE  FALSE
## [30,]    FALSE FALSE  FALSE FALSE  FALSE
## [31,]    FALSE FALSE  FALSE FALSE  FALSE
## [32,]    FALSE FALSE  FALSE FALSE  FALSE
## [33,]    FALSE FALSE  FALSE FALSE  FALSE
## [34,]    FALSE FALSE  FALSE FALSE  FALSE
## [35,]    FALSE FALSE  FALSE FALSE  FALSE
## [36,]    FALSE FALSE  FALSE FALSE  FALSE
## [37,]    FALSE FALSE  FALSE FALSE  FALSE
## [38,]    FALSE FALSE  FALSE FALSE  FALSE
## [39,]    FALSE FALSE  FALSE FALSE  FALSE
## [40,]    FALSE FALSE  FALSE FALSE  FALSE
## [41,]    FALSE FALSE  FALSE FALSE  FALSE
## [42,]    FALSE FALSE  FALSE FALSE  FALSE
## [43,]    FALSE FALSE  FALSE FALSE  FALSE
## [44,]    FALSE FALSE  FALSE FALSE  FALSE
## [45,]    FALSE FALSE  FALSE FALSE  FALSE
## [46,]    FALSE FALSE  FALSE FALSE  FALSE
## [47,]    FALSE FALSE  FALSE FALSE  FALSE
## [48,]    FALSE FALSE  FALSE FALSE  FALSE
## [49,]    FALSE FALSE  FALSE FALSE  FALSE
## [50,]    FALSE FALSE  FALSE FALSE  FALSE
## [51,]    FALSE FALSE  FALSE FALSE  FALSE
## [52,]    FALSE FALSE  FALSE FALSE  FALSE
## [53,]    FALSE FALSE  FALSE FALSE  FALSE
## [54,]    FALSE FALSE  FALSE FALSE  FALSE
## [55,]    FALSE FALSE  FALSE FALSE  FALSE
## [56,]    FALSE FALSE  FALSE FALSE  FALSE
## [57,]    FALSE FALSE  FALSE FALSE  FALSE
## [58,]    FALSE FALSE  FALSE FALSE  FALSE
## [59,]    FALSE FALSE  FALSE FALSE  FALSE
## [60,]    FALSE FALSE  FALSE FALSE  FALSE
## [61,]    FALSE FALSE  FALSE FALSE  FALSE
## [62,]    FALSE FALSE  FALSE FALSE  FALSE
## [63,]    FALSE FALSE  FALSE FALSE  FALSE
## [64,]    FALSE FALSE  FALSE FALSE  FALSE
## [65,]    FALSE FALSE  FALSE FALSE  FALSE
## [66,]    FALSE FALSE  FALSE FALSE  FALSE
## [67,]    FALSE FALSE  FALSE FALSE  FALSE
## [68,]    FALSE FALSE  FALSE FALSE  FALSE
## [69,]    FALSE FALSE  FALSE FALSE  FALSE
## [70,]    FALSE FALSE  FALSE FALSE  FALSE
## [71,]    FALSE FALSE  FALSE FALSE  FALSE
## [72,]    FALSE FALSE  FALSE FALSE  FALSE
## [73,]    FALSE FALSE  FALSE FALSE  FALSE
## [74,]    FALSE FALSE  FALSE FALSE  FALSE
## [75,]    FALSE FALSE  FALSE FALSE  FALSE
## [76,]    FALSE FALSE  FALSE FALSE  FALSE
## [77,]    FALSE FALSE  FALSE FALSE  FALSE
```

```r
Cereals_new <- data.frame(Cereals[,4:16])


Cereals_rmv<- na.omit(Cereals_new)
Cereals_rmv
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 1        70       4   1    130  10.0   5.0      6    280       25     3   1.00
## 2       120       3   5     15   2.0   8.0      8    135        0     3   1.00
## 3        70       4   1    260   9.0   7.0      5    320       25     3   1.00
## 4        50       4   0    140  14.0   8.0      0    330       25     3   1.00
## 6       110       2   2    180   1.5  10.5     10     70       25     1   1.00
## 7       110       2   0    125   1.0  11.0     14     30       25     2   1.00
## 8       130       3   2    210   2.0  18.0      8    100       25     3   1.33
## 9        90       2   1    200   4.0  15.0      6    125       25     1   1.00
## 10       90       3   0    210   5.0  13.0      5    190       25     3   1.00
## 11      120       1   2    220   0.0  12.0     12     35       25     2   1.00
## 12      110       6   2    290   2.0  17.0      1    105       25     1   1.00
## 13      120       1   3    210   0.0  13.0      9     45       25     2   1.00
## 14      110       3   2    140   2.0  13.0      7    105       25     3   1.00
## 15      110       1   1    180   0.0  12.0     13     55       25     2   1.00
## 16      110       2   0    280   0.0  22.0      3     25       25     1   1.00
## 17      100       2   0    290   1.0  21.0      2     35       25     1   1.00
## 18      110       1   0     90   1.0  13.0     12     20       25     2   1.00
## 19      110       1   1    180   0.0  12.0     13     65       25     2   1.00
## 20      110       3   3    140   4.0  10.0      7    160       25     3   1.00
## 22      110       2   0    220   1.0  21.0      3     30       25     3   1.00
## 23      100       2   1    140   2.0  11.0     10    120       25     3   1.00
## 24      100       2   0    190   1.0  18.0      5     80       25     3   1.00
## 25      110       2   1    125   1.0  11.0     13     30       25     2   1.00
## 26      110       1   0    200   1.0  14.0     11     25       25     1   1.00
## 27      100       3   0      0   3.0  14.0      7    100       25     2   1.00
## 28      120       3   2    160   5.0  12.0     10    200       25     3   1.25
## 29      120       3   0    240   5.0  14.0     12    190       25     3   1.33
## 30      110       1   1    135   0.0  13.0     12     25       25     2   1.00
## 31      100       2   0     45   0.0  11.0     15     40       25     1   1.00
## 32      110       1   1    280   0.0  15.0      9     45       25     2   1.00
## 33      100       3   1    140   3.0  15.0      5     85       25     3   1.00
## 34      110       3   0    170   3.0  17.0      3     90       25     3   1.00
## 35      120       3   3     75   3.0  13.0      4    100       25     3   1.00
## 36      120       1   2    220   1.0  12.0     11     45       25     2   1.00
## 37      110       3   1    250   1.5  11.5     10     90       25     1   1.00
## 38      110       1   0    180   0.0  14.0     11     35       25     1   1.00
## 39      110       2   1    170   1.0  17.0      6     60      100     3   1.00
## 40      140       3   1    170   2.0  20.0      9     95      100     3   1.30
## 41      110       2   1    260   0.0  21.0      3     40       25     2   1.00
## 42      100       4   2    150   2.0  12.0      6     95       25     2   1.00
## 43      110       2   1    180   0.0  12.0     12     55       25     2   1.00
## 44      100       4   1      0   0.0  16.0      3     95       25     2   1.00
## 45      150       4   3     95   3.0  16.0     11    170       25     3   1.00
## 46      150       4   3    150   3.0  16.0     11    170       25     3   1.00
## 47      160       3   2    150   3.0  17.0     13    160       25     3   1.50
## 48      100       2   1    220   2.0  15.0      6     90       25     1   1.00
```

```
## 49      120        2   1    190   0.0  15.0       9      40        25      2   1.00
## 50      140        3   2    220   3.0  21.0       7     130        25      3   1.33
## 51       90        3   0    170   3.0  18.0       2      90        25      3   1.00
## 52      130        3   2    170   1.5  13.5      10     120        25      3   1.25
## 53      120        3   1    200   6.0  11.0      14     260        25      3   1.33
## 54      100        3   0    320   1.0  20.0       3      45       100      3   1.00
## 55       50        1   0      0   0.0  13.0       0      15         0      3   0.50
## 56       50        2   0      0   1.0  10.0       0      50         0      3   0.50
## 57      100        4   1    135   2.0  14.0       6     110        25      3   1.00
## 59      120        3   1    210   5.0  14.0      12     240        25      2   1.33
## 60      100        3   2    140   2.5  10.5       8     140        25      3   1.00
## 61       90        2   0      0   2.0  15.0       6     110        25      3   1.00
## 62      110        1   0    240   0.0  23.0       2      30        25      1   1.00
## 63      110        2   0    290   0.0  22.0       3      35        25      1   1.00
## 64       80        2   0      0   3.0  16.0       0      95         0      1   0.83
## 65       90        3   0      0   4.0  19.0       0     140         0      1   1.00
## 66       90        3   0      0   3.0  20.0       0     120         0      1   1.00
## 67      110        2   1     70   1.0   9.0      15      40        25      2   1.00
## 68      110        6   0    230   1.0  16.0       3      55        25      1   1.00
## 69       90        2   0     15   3.0  15.0       5      90        25      2   1.00
## 70      110        2   1    200   0.0  21.0       3      35       100      3   1.00
## 71      140        3   1    190   4.0  15.0      14     230       100      3   1.50
## 72      100        3   1    200   3.0  16.0       3     110       100      3   1.00
## 73      110        2   1    250   0.0  21.0       3      60        25      3   1.00
## 74      110        1   1    140   0.0  13.0      12      25        25      2   1.00
## 75      100        3   1    230   3.0  17.0       3     115        25      1   1.00
## 76      100        3   1    200   3.0  17.0       3     110        25      1   1.00
## 77      110        2   1    200   1.0  16.0       8      60        25      1   1.00
##    cups   rating
## 1  0.33 68.40297
## 2  1.00 33.98368
## 3  0.33 59.42551
## 4  0.50 93.70491
## 6  0.75 29.50954
## 7  1.00 33.17409
## 8  0.75 37.03856
## 9  0.67 49.12025
## 10 0.67 53.31381
## 11 0.75 18.04285
## 12 1.25 50.76500
## 13 0.75 19.82357
## 14 0.50 40.40021
## 15 1.00 22.73645
## 16 1.00 41.44502
## 17 1.00 45.86332
## 18 1.00 35.78279
## 19 1.00 22.39651
## 20 0.50 40.44877
## 22 1.00 46.89564
## 23 0.75 36.17620
## 24 0.75 44.33086
## 25 1.00 32.20758
## 26 0.75 31.43597
## 27 0.80 58.34514
```

```
## 28 0.67 40.91705
## 29 0.67 41.01549
## 30 0.75 28.02576
## 31 0.88 35.25244
## 32 0.75 23.80404
## 33 0.88 52.07690
## 34 0.25 53.37101
## 35 0.33 45.81172
## 36 1.00 21.87129
## 37 0.75 31.07222
## 38 1.33 28.74241
## 39 1.00 36.52368
## 40 0.75 36.47151
## 41 1.50 39.24111
## 42 0.67 45.32807
## 43 1.00 26.73451
## 44 1.00 54.85092
## 45 1.00 37.13686
## 46 1.00 34.13976
## 47 0.67 30.31335
## 48 1.00 40.10596
## 49 0.67 29.92429
## 50 0.67 40.69232
## 51 1.00 59.64284
## 52 0.50 30.45084
## 53 0.67 37.84059
## 54 1.00 41.50354
## 55 1.00 60.75611
## 56 1.00 63.00565
## 57 0.50 49.51187
## 59 0.75 39.25920
## 60 0.50 39.70340
## 61 0.50 55.33314
## 62 1.13 41.99893
## 63 1.00 40.56016
## 64 1.00 68.23588
## 65 0.67 74.47295
## 66 0.67 72.80179
## 67 0.75 31.23005
## 68 1.00 53.13132
## 69 1.00 59.36399
## 70 1.00 38.83975
## 71 1.00 28.59278
## 72 1.00 46.65884
## 73 0.75 39.10617
## 74 1.00 27.75330
## 75 0.67 49.78744
## 76 1.00 51.59219
## 77 0.75 36.18756
```

```
z <- is.na(Cereals_rmv)
z
```

```
##    calories protein   fat sodium fiber carbo sugars potass vitamins shelf
```

```
## 1     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 2     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 3     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 4     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 6     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 7     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 8     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 9     FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 10    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 11    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 12    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 13    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 14    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 15    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 16    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 17    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 18    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 19    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 20    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 22    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 23    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 24    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 25    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 26    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 27    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 28    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 29    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 30    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 31    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 32    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 33    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 34    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 35    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 36    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 37    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 38    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 39    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 40    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 41    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 42    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 43    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 44    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 45    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 46    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 47    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 48    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 49    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 50    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 51    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 52    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 53    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 54    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 55    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 56    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
```

```
## 57    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 59    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 60    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 61    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 62    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 63    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 64    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 65    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 66    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 67    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 68    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 69    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 70    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 71    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 72    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 73    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 74    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 75    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 76    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
## 77    FALSE   FALSE FALSE  FALSE FALSE FALSE  FALSE  FALSE    FALSE FALSE
##    weight  cups rating
## 1   FALSE FALSE  FALSE
## 2   FALSE FALSE  FALSE
## 3   FALSE FALSE  FALSE
## 4   FALSE FALSE  FALSE
## 6   FALSE FALSE  FALSE
## 7   FALSE FALSE  FALSE
## 8   FALSE FALSE  FALSE
## 9   FALSE FALSE  FALSE
## 10  FALSE FALSE  FALSE
## 11  FALSE FALSE  FALSE
## 12  FALSE FALSE  FALSE
## 13  FALSE FALSE  FALSE
## 14  FALSE FALSE  FALSE
## 15  FALSE FALSE  FALSE
## 16  FALSE FALSE  FALSE
## 17  FALSE FALSE  FALSE
## 18  FALSE FALSE  FALSE
## 19  FALSE FALSE  FALSE
## 20  FALSE FALSE  FALSE
## 22  FALSE FALSE  FALSE
## 23  FALSE FALSE  FALSE
## 24  FALSE FALSE  FALSE
## 25  FALSE FALSE  FALSE
## 26  FALSE FALSE  FALSE
## 27  FALSE FALSE  FALSE
## 28  FALSE FALSE  FALSE
## 29  FALSE FALSE  FALSE
## 30  FALSE FALSE  FALSE
## 31  FALSE FALSE  FALSE
## 32  FALSE FALSE  FALSE
## 33  FALSE FALSE  FALSE
## 34  FALSE FALSE  FALSE
## 35  FALSE FALSE  FALSE
```

```
## 36  FALSE FALSE  FALSE
## 37  FALSE FALSE  FALSE
## 38  FALSE FALSE  FALSE
## 39  FALSE FALSE  FALSE
## 40  FALSE FALSE  FALSE
## 41  FALSE FALSE  FALSE
## 42  FALSE FALSE  FALSE
## 43  FALSE FALSE  FALSE
## 44  FALSE FALSE  FALSE
## 45  FALSE FALSE  FALSE
## 46  FALSE FALSE  FALSE
## 47  FALSE FALSE  FALSE
## 48  FALSE FALSE  FALSE
## 49  FALSE FALSE  FALSE
## 50  FALSE FALSE  FALSE
## 51  FALSE FALSE  FALSE
## 52  FALSE FALSE  FALSE
## 53  FALSE FALSE  FALSE
## 54  FALSE FALSE  FALSE
## 55  FALSE FALSE  FALSE
## 56  FALSE FALSE  FALSE
## 57  FALSE FALSE  FALSE
## 59  FALSE FALSE  FALSE
## 60  FALSE FALSE  FALSE
## 61  FALSE FALSE  FALSE
## 62  FALSE FALSE  FALSE
## 63  FALSE FALSE  FALSE
## 64  FALSE FALSE  FALSE
## 65  FALSE FALSE  FALSE
## 66  FALSE FALSE  FALSE
## 67  FALSE FALSE  FALSE
## 68  FALSE FALSE  FALSE
## 69  FALSE FALSE  FALSE
## 70  FALSE FALSE  FALSE
## 71  FALSE FALSE  FALSE
## 72  FALSE FALSE  FALSE
## 73  FALSE FALSE  FALSE
## 74  FALSE FALSE  FALSE
## 75  FALSE FALSE  FALSE
## 76  FALSE FALSE  FALSE
## 77  FALSE FALSE  FALSE
```

Nomalizing data

```
Cereals_norm <- scale(Cereals_rmv)
Cereals_norm
```

```
##      calories    protein        fat      sodium       fiber       carbo
## 1  -1.8659155  1.3817478  0.0000000 -0.39102269  3.22866747 -2.50013957
## 2   0.6537514  0.4522084  3.9728810 -1.78041856 -0.07249167 -1.72926320
## 3  -1.8659155  1.3817478  0.0000000  1.17959872  2.81602258 -1.98622199
```

```
## 4  -2.8737823  1.3817478 -0.9932203 -0.27020566  4.87924705 -1.72926320
## 6   0.1498180 -0.4773310  0.9932203  0.21306247 -0.27881412 -1.08686623
## 7   0.1498180 -0.4773310 -0.9932203 -0.45143121 -0.48513656 -0.95838683
## 8   1.1576848  0.4522084  0.9932203  0.57551356 -0.07249167  0.84032469
## 9  -0.8580487 -0.4773310  0.0000000  0.45469653  0.75279812  0.06944832
## 10 -0.8580487  0.4522084 -0.9932203  0.57551356  1.16544301 -0.44446926
## 11  0.6537514 -1.4068705  0.9932203  0.69633060 -0.89778146 -0.70142805
## 12  0.1498180  3.2408266  0.9932203  1.54204982 -0.07249167  0.58336590
## 13  0.6537514 -1.4068705  1.9864405  0.57551356 -0.89778146 -0.44446926
## 14  0.1498180  0.4522084  0.9932203 -0.27020566 -0.07249167 -0.44446926
## 15  0.1498180 -1.4068705  0.0000000  0.21306247 -0.89778146 -0.70142805
## 16  0.1498180 -0.4773310 -0.9932203  1.42123279 -0.89778146  1.86815984
## 17 -0.3541153 -0.4773310 -0.9932203  1.54204982 -0.48513656  1.61120105
## 18  0.1498180 -1.4068705 -0.9932203 -0.87429082 -0.48513656 -0.44446926
## 19  0.1498180 -1.4068705  0.0000000  0.21306247 -0.89778146 -0.70142805
## 20  0.1498180  0.4522084  1.9864405 -0.27020566  0.75279812 -1.21534562
## 22  0.1498180 -0.4773310 -0.9932203  0.69633060 -0.48513656  1.61120105
## 23 -0.3541153 -0.4773310  0.0000000 -0.27020566 -0.07249167 -0.95838683
## 24 -0.3541153 -0.4773310 -0.9932203  0.33387950 -0.48513656  0.84032469
## 25  0.1498180 -0.4773310  0.0000000 -0.45143121 -0.48513656 -0.95838683
## 26  0.1498180 -1.4068705 -0.9932203  0.45469653 -0.48513656 -0.18751047
## 27 -0.3541153  0.4522084 -0.9932203 -1.96164410  0.34015322 -0.18751047
## 28  0.6537514  0.4522084  0.9932203 -0.02857160  1.16544301 -0.70142805
## 29  0.6537514  0.4522084 -0.9932203  0.93796466  1.16544301 -0.18751047
## 30  0.1498180 -1.4068705  0.0000000 -0.33061417 -0.89778146 -0.44446926
## 31 -0.3541153 -0.4773310 -0.9932203 -1.41796746 -0.89778146 -0.95838683
## 32  0.1498180 -1.4068705  0.0000000  1.42123279 -0.89778146  0.06944832
## 33 -0.3541153  0.4522084  0.0000000 -0.27020566  0.34015322  0.06944832
## 34  0.1498180  0.4522084 -0.9932203  0.09224544  0.34015322  0.58336590
## 35  0.6537514  0.4522084  1.9864405 -1.05551637  0.34015322 -0.44446926
## 36  0.6537514 -1.4068705  0.9932203  0.69633060 -0.48513656 -0.70142805
## 37  0.1498180  0.4522084  0.0000000  1.05878169 -0.27881412 -0.82990744
## 38  0.1498180 -1.4068705 -0.9932203  0.21306247 -0.89778146 -0.18751047
## 39  0.1498180 -0.4773310  0.0000000  0.09224544 -0.48513656  0.58336590
## 40  1.6616182  0.4522084  0.0000000  0.09224544 -0.07249167  1.35424227
## 41  0.1498180 -0.4773310  0.0000000  1.17959872 -0.89778146  1.61120105
## 42 -0.3541153  1.3817478  0.9932203 -0.14938863 -0.07249167 -0.70142805
## 43  0.1498180 -0.4773310  0.0000000  0.21306247 -0.89778146 -0.70142805
## 44 -0.3541153  1.3817478  0.0000000 -1.96164410 -0.89778146  0.32640711
## 45  2.1655516  1.3817478  1.9864405 -0.81388230  0.34015322  0.32640711
## 46  2.1655516  1.3817478  1.9864405 -0.14938863  0.34015322  0.32640711
## 47  2.6694849  0.4522084  0.9932203 -0.14938863  0.34015322  0.58336590
## 48 -0.3541153 -0.4773310  0.0000000  0.69633060 -0.07249167  0.06944832
## 49  0.6537514 -0.4773310  0.0000000  0.33387950 -0.89778146  0.06944832
## 50  1.6616182  0.4522084  0.9932203  0.69633060  0.34015322  1.61120105
## 51 -0.8580487  0.4522084 -0.9932203  0.09224544  0.34015322  0.84032469
## 52  1.1576848  0.4522084  0.9932203  0.09224544 -0.27881412 -0.31598986
## 53  0.6537514  0.4522084  0.0000000  0.45469653  1.57808790 -0.95838683
## 54 -0.3541153  0.4522084 -0.9932203  1.90450091 -0.48513656  1.35424227
## 55 -2.8737823 -1.4068705 -0.9932203 -1.96164410 -0.89778146 -0.44446926
## 56 -2.8737823 -0.4773310 -0.9932203 -1.96164410 -0.48513656 -1.21534562
## 57 -0.3541153  1.3817478  0.0000000 -0.33061417 -0.07249167 -0.18751047
## 59  0.6537514  0.4522084  0.0000000  0.57551356  1.16544301 -0.18751047
## 60 -0.3541153  0.4522084  0.9932203 -0.27020566  0.13383078 -1.08686623
```

```
## 61 -0.8580487 -0.4773310 -0.9932203 -1.96164410 -0.07249167  0.06944832
## 62  0.1498180 -1.4068705 -0.9932203  0.93796466 -0.89778146  2.12511863
## 63  0.1498180 -0.4773310 -0.9932203  1.54204982 -0.89778146  1.86815984
## 64 -1.3619821 -0.4773310 -0.9932203 -1.96164410  0.34015322  0.32640711
## 65 -0.8580487  0.4522084 -0.9932203 -1.96164410  0.75279812  1.09728348
## 66 -0.8580487  0.4522084 -0.9932203 -1.96164410  0.34015322  1.35424227
## 67  0.1498180 -0.4773310  0.0000000 -1.11592488 -0.48513656 -1.47230441
## 68  0.1498180  3.2408266 -0.9932203  0.81714763 -0.48513656  0.32640711
## 69 -0.8580487 -0.4773310 -0.9932203 -1.78041856  0.34015322  0.06944832
## 70  0.1498180 -0.4773310  0.0000000  0.45469653 -0.89778146  1.61120105
## 71  1.6616182  0.4522084  0.0000000  0.33387950  0.75279812  0.06944832
## 72 -0.3541153  0.4522084  0.0000000  0.45469653  0.34015322  0.32640711
## 73  0.1498180 -0.4773310  0.0000000  1.05878169 -0.89778146  1.61120105
## 74  0.1498180 -1.4068705  0.0000000 -0.27020566 -0.89778146 -0.44446926
## 75 -0.3541153  0.4522084  0.0000000  0.81714763  0.34015322  0.58336590
## 76 -0.3541153  0.4522084  0.0000000  0.45469653  0.34015322  0.58336590
## 77  0.1498180 -0.4773310  0.0000000  0.45469653 -0.48513656  0.32640711
##         sugars      potass   vitamins      shelf     weight        cups
## 1  -0.25420505  2.56052289 -0.1818422  0.9419715 -0.2008324 -2.08565823
## 2   0.20460407  0.51477378 -1.3032024  0.9419715 -0.2008324  0.75675340
## 3  -0.48360961  3.12486748 -0.1818422  0.9419715 -0.2008324 -2.08565823
## 4  -1.63063240  3.26595362 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 6   0.66341318 -0.40228617 -0.1818422 -1.4616799 -0.2008324 -0.30384795
## 7   1.58103142 -0.96663076 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 8   0.20460407  0.02097226 -0.1818422  0.9419715  1.9501886 -0.30384795
## 9  -0.25420505  0.37368763 -0.1818422 -1.4616799 -0.2008324 -0.64324039
## 10 -0.48360961  1.29074758 -0.1818422  0.9419715 -0.2008324 -0.64324039
## 11  1.12222230 -0.89608768 -0.1818422 -0.2598542 -0.2008324 -0.30384795
## 12 -1.40122785  0.09151534 -0.1818422 -1.4616799 -0.2008324  1.81735475
## 13  0.43400862 -0.75500154 -0.1818422 -0.2598542 -0.2008324 -0.30384795
## 14 -0.02480049  0.09151534 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 15  1.35162686 -0.61391539 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 16 -0.94241873 -1.03717383 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 17 -1.17182329 -0.89608768 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 18  1.12222230 -1.10771690 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 19  1.35162686 -0.47282925 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 20 -0.02480049  0.86748914 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 22 -0.94241873 -0.96663076 -0.1818422  0.9419715 -0.2008324  0.75675340
## 23  0.66341318  0.30314456 -0.1818422  0.9419715 -0.2008324 -0.30384795
## 24 -0.48360961 -0.26120003 -0.1818422  0.9419715 -0.2008324 -0.30384795
## 25  1.35162686 -0.96663076 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 26  0.89281774 -1.03717383 -0.1818422 -1.4616799 -0.2008324 -0.30384795
## 27 -0.02480049  0.02097226 -0.1818422 -0.2598542 -0.2008324 -0.09172768
## 28  0.66341318  1.43183372 -0.1818422  0.9419715  1.4287290 -0.64324039
## 29  1.12222230  1.29074758 -0.1818422  0.9419715  1.9501886 -0.64324039
## 30  1.12222230 -1.03717383 -0.1818422 -0.2598542 -0.2008324 -0.30384795
## 31  1.81043598 -0.82554461 -0.1818422 -1.4616799 -0.2008324  0.24766475
## 32  0.43400862 -0.75500154 -0.1818422 -0.2598542 -0.2008324 -0.30384795
## 33 -0.48360961 -0.19065695 -0.1818422  0.9419715 -0.2008324  0.24766475
## 34 -0.94241873 -0.12011388 -0.1818422  0.9419715 -0.2008324 -2.42505066
## 35 -0.71301417  0.02097226 -0.1818422  0.9419715 -0.2008324 -2.08565823
## 36  0.89281774 -0.75500154 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 37  0.66341318 -0.12011388 -0.1818422 -1.4616799 -0.2008324 -0.30384795
## 38  0.89281774 -0.89608768 -0.1818422 -1.4616799 -0.2008324  2.15674718
```

```
## 39 -0.25420505 -0.54337232  3.1822385  0.9419715 -0.2008324  0.75675340
## 40  0.43400862 -0.04957081  3.1822385  0.9419715  1.7546413 -0.30384795
## 41 -0.94241873 -0.82554461 -0.1818422 -0.2598542 -0.2008324  2.87795610
## 42 -0.25420505 -0.04957081 -0.1818422 -0.2598542 -0.2008324 -0.64324039
## 43  1.12222230 -0.61391539 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 44 -0.94241873 -0.04957081 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 45  0.89281774  1.00857529 -0.1818422  0.9419715 -0.2008324  0.75675340
## 46  0.89281774  1.00857529 -0.1818422  0.9419715 -0.2008324  0.75675340
## 47  1.35162686  0.86748914 -0.1818422  0.9419715  3.0582904 -0.64324039
## 48 -0.25420505 -0.12011388 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 49  0.43400862 -0.82554461 -0.1818422 -0.2598542 -0.2008324 -0.64324039
## 50 -0.02480049  0.44423070 -0.1818422  0.9419715  1.9501886 -0.64324039
## 51 -1.17182329 -0.12011388 -0.1818422  0.9419715 -0.2008324  0.75675340
## 52  0.66341318  0.30314456 -0.1818422  0.9419715  1.4287290 -1.36444931
## 53  1.58103142  2.27835060 -0.1818422  0.9419715  1.9501886 -0.64324039
## 54 -0.94241873 -0.75500154  3.1822385  0.9419715 -0.2008324  0.75675340
## 55 -1.63063240 -1.17825998 -1.3032024  0.9419715 -3.4599552  0.75675340
## 56 -1.63063240 -0.68445846 -1.3032024  0.9419715 -3.4599552  0.75675340
## 57 -0.25420505  0.16205841 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 59  1.12222230  1.99617831 -0.1818422 -0.2598542  1.9501886 -0.30384795
## 60  0.20460407  0.58531685 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 61 -0.25420505  0.16205841 -0.1818422  0.9419715 -0.2008324 -1.36444931
## 62 -1.17182329 -0.96663076 -0.1818422 -1.4616799 -0.2008324  1.30826610
## 63 -0.94241873 -0.89608768 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 64 -1.63063240 -0.04957081 -1.3032024 -1.4616799 -1.3089342  0.75675340
## 65 -1.63063240  0.58531685 -1.3032024 -1.4616799 -0.2008324 -0.64324039
## 66 -1.63063240  0.30314456 -1.3032024 -1.4616799 -0.2008324 -0.64324039
## 67  1.81043598 -0.82554461 -0.1818422 -0.2598542 -0.2008324 -0.30384795
## 68 -0.94241873 -0.61391539 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 69 -0.48360961 -0.12011388 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 70 -0.94241873 -0.89608768  3.1822385  0.9419715 -0.2008324  0.75675340
## 71  1.58103142  1.85509216  3.1822385  0.9419715  3.0582904  0.75675340
## 72 -0.94241873  0.16205841  3.1822385  0.9419715 -0.2008324  0.75675340
## 73 -0.94241873 -0.54337232 -0.1818422  0.9419715 -0.2008324 -0.30384795
## 74  1.12222230 -1.03717383 -0.1818422 -0.2598542 -0.2008324  0.75675340
## 75 -0.94241873  0.23260148 -0.1818422 -1.4616799 -0.2008324 -0.64324039
## 76 -0.94241873  0.16205841 -0.1818422 -1.4616799 -0.2008324  0.75675340
## 77  0.20460407 -0.54337232 -0.1818422 -1.4616799 -0.2008324 -0.30384795
##         rating
## 1   1.85490376
## 2  -0.59771126
## 3   1.21519648
## 4   3.65784358
## 6  -0.91652483
## 7  -0.65539984
## 8  -0.38002951
## 9   0.48087533
## 10  0.77969576
## 11 -1.73360655
## 12  0.59807496
## 13 -1.60671768
## 14 -0.14048876
## 15 -1.39915514
## 16 -0.06603869
```

```
## 17  0.24879639
## 18 -0.46951197
## 19 -1.42337774
## 20 -0.13702824
## 22  0.32235640
## 23 -0.44147911
## 24  0.13959735
## 25 -0.72427057
## 26 -0.77925310
## 27  1.13821301
## 28 -0.10366038
## 29 -0.09664548
## 30 -1.02225423
## 31 -0.50730289
## 32 -1.32308140
## 33  0.69155685
## 34  0.78377123
## 35  0.24511896
## 36 -1.46080340
## 37 -0.80517325
## 38 -0.97118798
## 39 -0.41671824
## 40 -0.42043579
## 41 -0.22308231
## 42  0.21065609
## 43 -1.11426481
## 44  0.88922515
## 45 -0.37302488
## 46 -0.58658904
## 47 -0.85924775
## 48 -0.16145563
## 49 -0.88697142
## 50 -0.11967375
## 51  1.23068291
## 52 -0.84945049
## 53 -0.32287913
## 54 -0.06186866
## 55  1.31001152
## 56  1.47030646
## 57  0.50878106
## 59 -0.22179377
## 60 -0.19014120
## 61  0.92358705
## 62 -0.02656845
## 63 -0.12909114
## 64  1.84299757
## 65  2.28743193
## 66  2.16834997
## 67 -0.79392626
## 68  0.76669214
## 69  1.21081332
## 70 -0.25168258
## 71 -0.98185009
## 72  0.30548275
```

```
## 73 -0.23269772
## 74 -1.04166919
## 75  0.52841741
## 76  0.65701831
## 77 -0.44066942
## attr(,"scaled:center")
##    calories     protein         fat      sodium       fiber       carbo
## 107.0270270   2.5135135   1.0000000 162.3648649   2.1756757  14.7297297
##      sugars      potass    vitamins       shelf      weight        cups
##   7.1081081  98.5135135  29.0540541   2.2162162   1.0308108   0.8216216
##      rating
##  42.3717869
## attr(,"scaled:scale")
##   calories    protein        fat     sodium      fiber      carbo     sugars
## 19.8438928  1.0758016  1.0068260 82.7697871  2.4233912  3.8916746  4.3591113
##     potass   vitamins      shelf     weight       cups     rating
## 70.8786815 22.2943521  0.8320674  0.1534155  0.2357153 14.0337125
```

using euclidean distance measure to normalized data

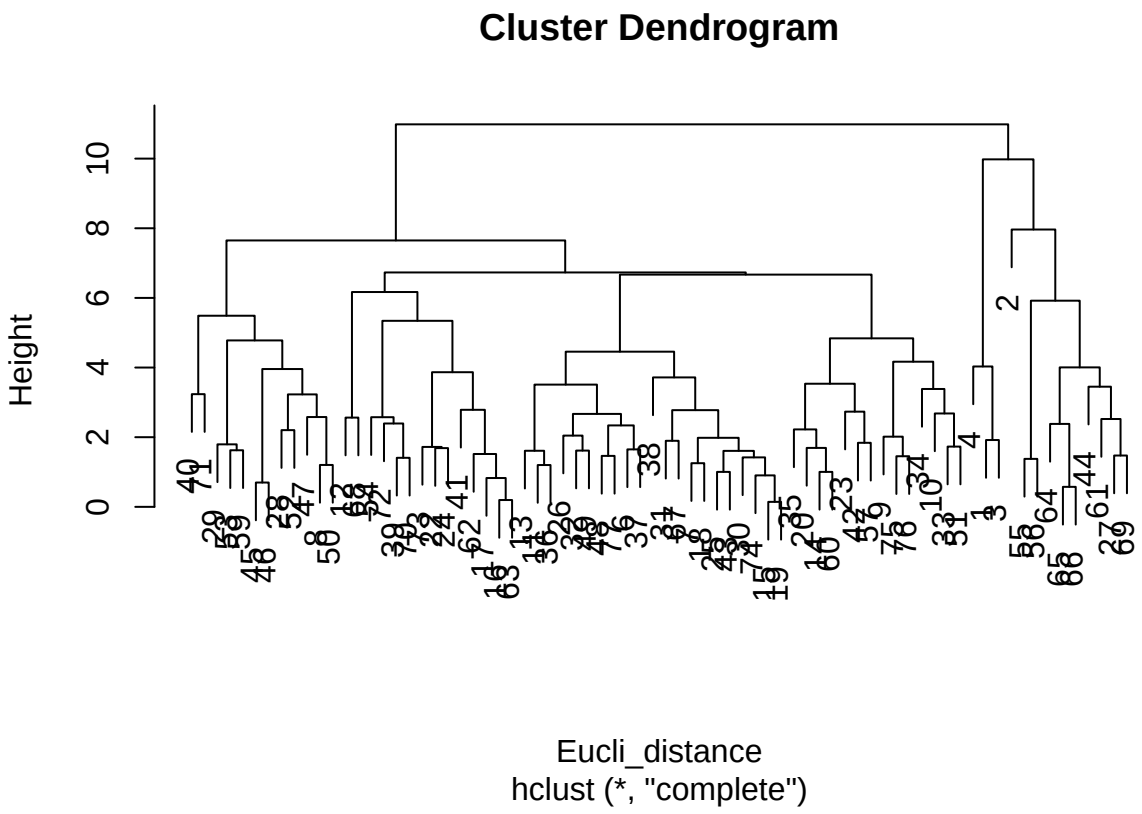
```
Eucli_distance <- dist(Cereals_norm, method = "euclidean")
```

checking number of cluster using complete linkage

```
hierarchical_complete <- hclust(Eucli_distance, method = "complete")
plot(hierarchical_complete )
round(hierarchical_complete$height, 3)
```

```
##  [1]  0.143  0.196  0.575  0.698  0.828  0.904  1.003  1.004  1.201  1.203
## [11]  1.254  1.378  1.408  1.421  1.454  1.463  1.474  1.517  1.608  1.611
## [21]  1.616  1.625  1.650  1.687  1.692  1.720  1.730  1.795  1.839  1.897
## [31]  1.919  1.982  2.015  2.046  2.203  2.224  2.339  2.381  2.394  2.522
## [41]  2.563  2.574  2.579  2.668  2.682  2.734  2.776  2.787  3.229  3.236
## [51]  3.385  3.451  3.510  3.535  3.717  3.866  3.957  4.005  4.031  4.168
## [61]  4.456  4.779  4.839  5.342  5.488  5.920  6.169  6.669  6.731  7.650
## [71]  7.964  9.979 10.984
```

```
plot(hierarchical_complete)
```



Using Agnes for single linkage, complete linkage, average linkage, and Ward.

```
library("cluster")
```

```
## Warning: package 'cluster' was built under R version 4.1.3
```

```
single_cluster <- agnes(Cereals_norm, method = "single")
complete_cluster <- agnes(Cereals_norm, method = "complete")
average_cluster <- agnes(Cereals_norm, method = "average")
ward_cluster <- agnes(Cereals_norm, method = "ward")
```

comparing agglomerative coefficients

```
print(single_cluster$ac)
```

```
## [1] 0.6067859
```

```
print(complete_cluster$ac)
```

```
## [1] 0.8353712
```

```
print(average_cluster$ac)
```

```
## [1] 0.7766075
```

```
print(ward_cluster$ac)
```

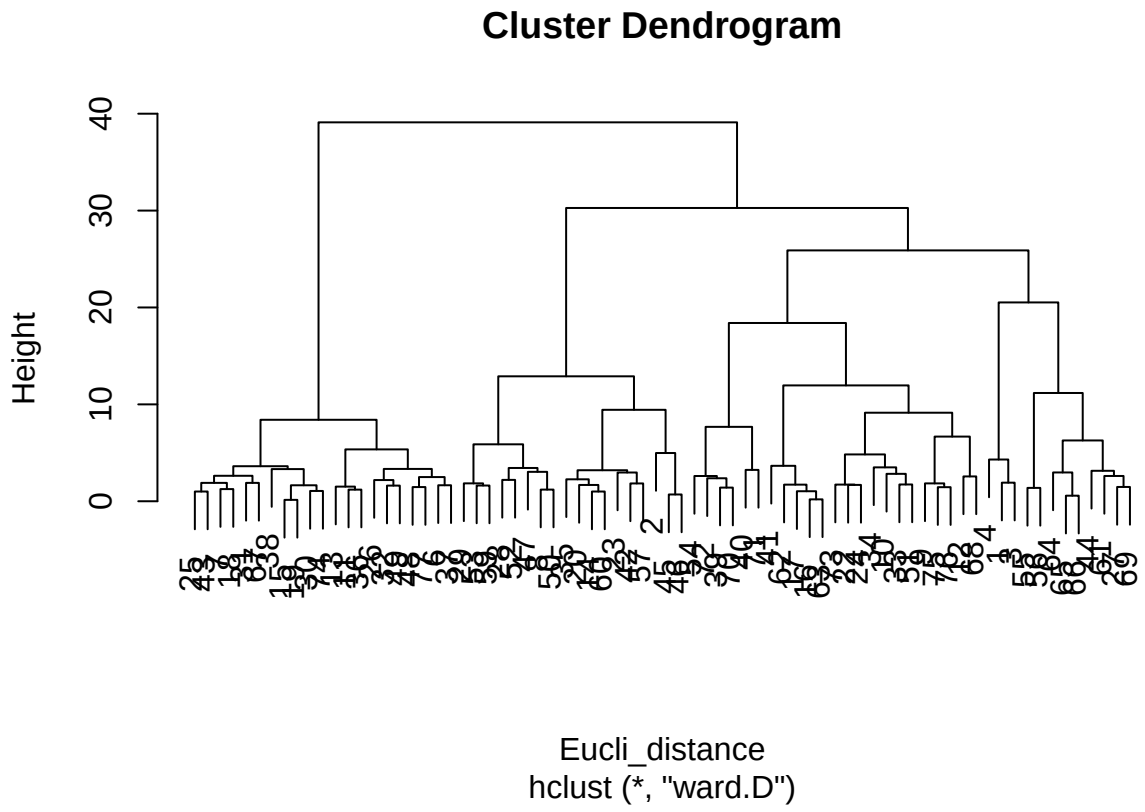
```
## [1] 0.9046042
```

Ward cluster has the highest agglomerative coefficient i.e 0.9046. plot using ward method

```
hierarchical_ward <- hclust(Eucli_distance, method = "ward")
```

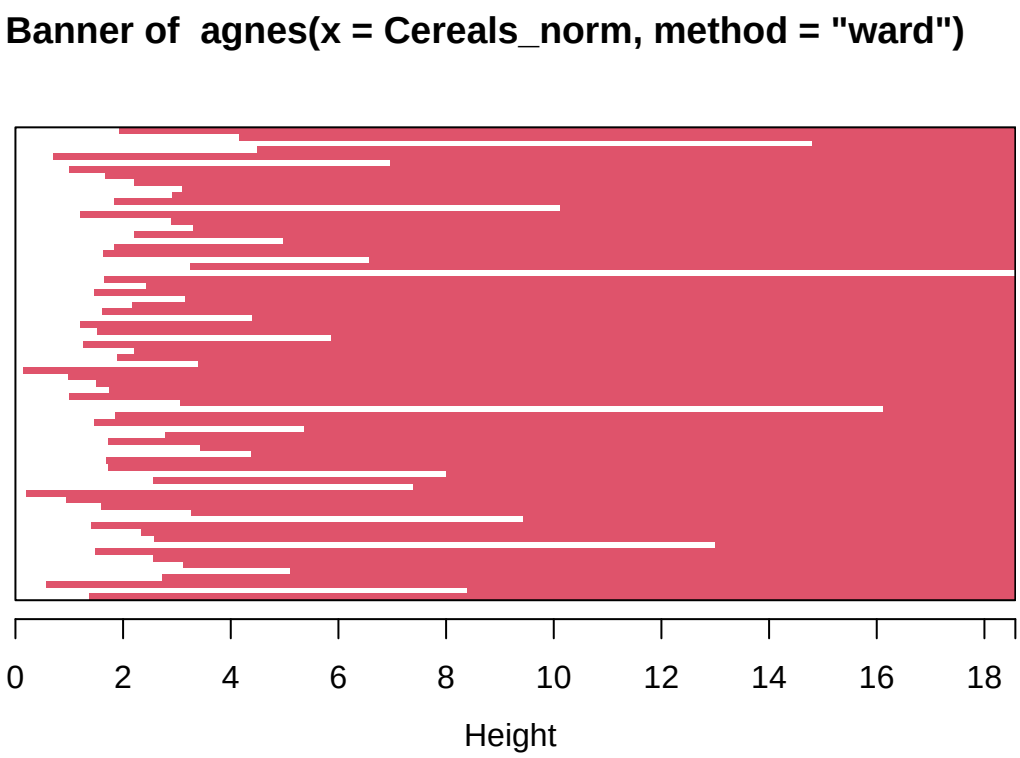
```
## The "ward" method has been renamed to "ward.D"; note new "ward.D2"
```

```
plot(hierarchical_ward)
```

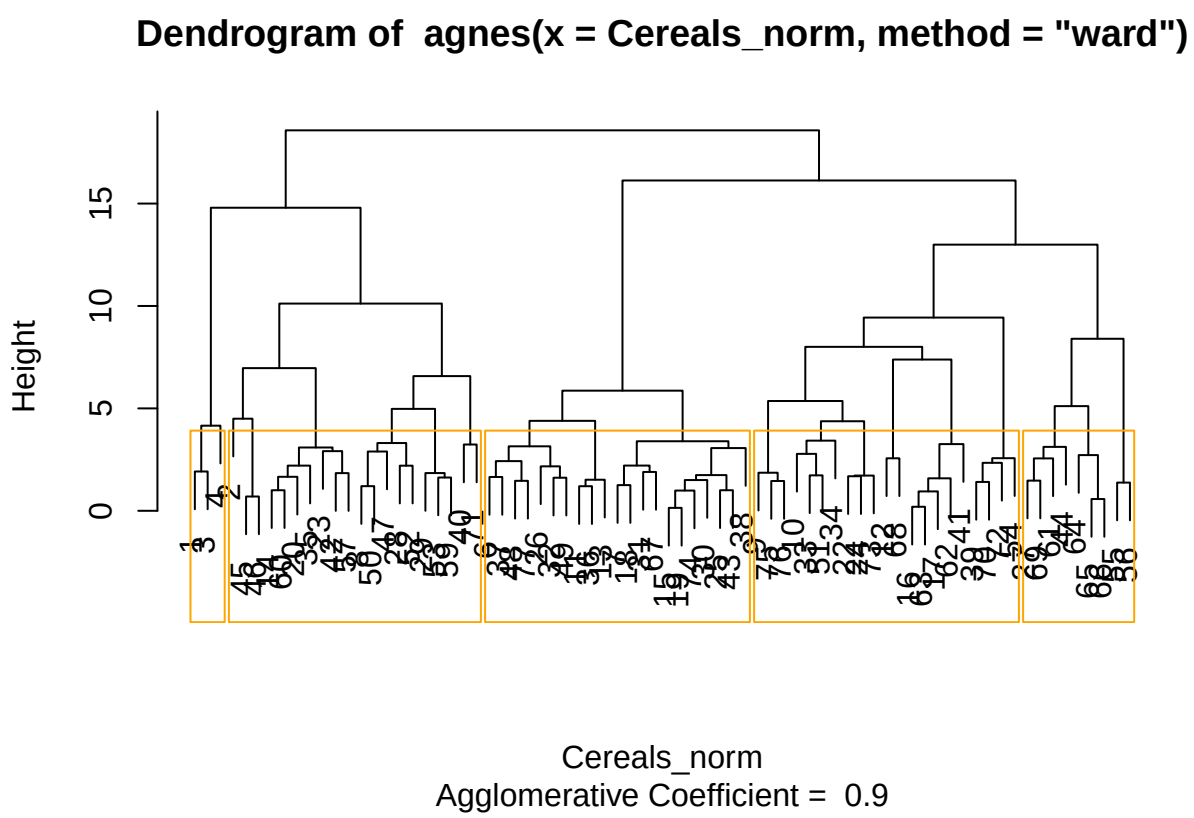


by observing ward cluster agglomerative coefficient and dendogram we can choose k=5 cluster

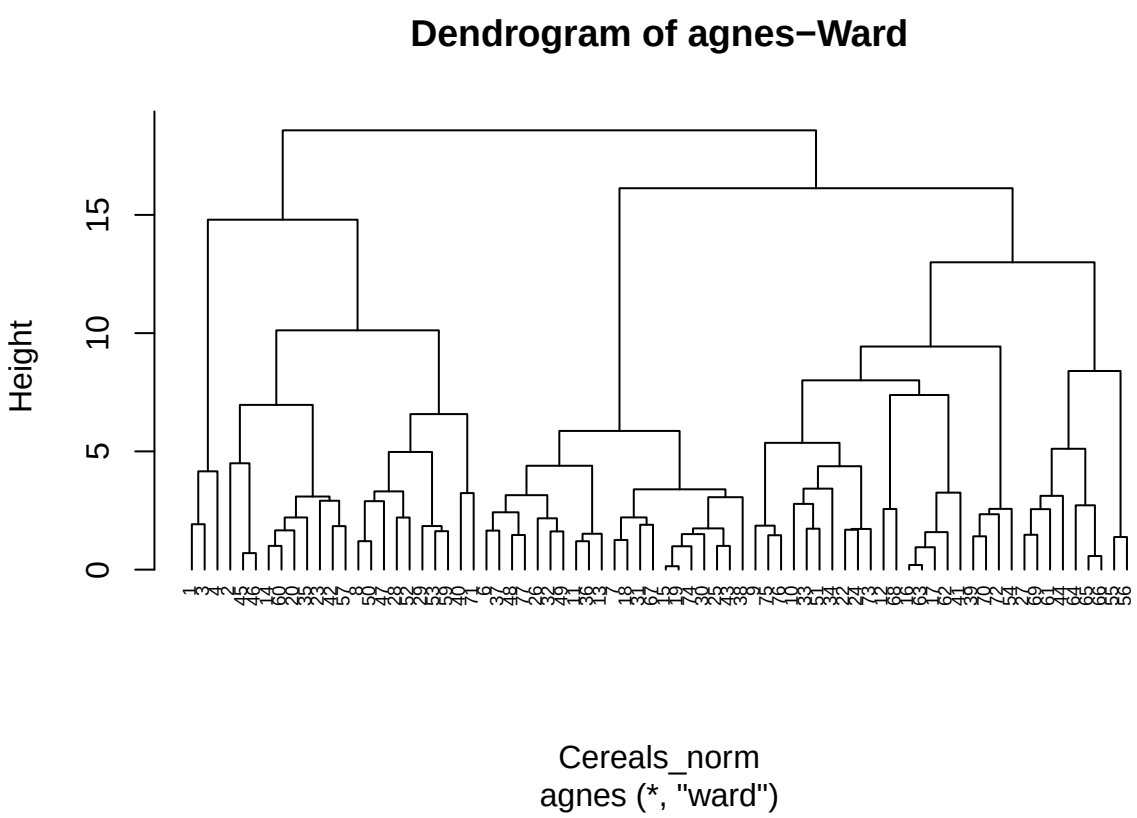
```
plot(ward_cluster)
```




```
rect.hclust(ward_cluster,k = 5, border = "Orange")
```




```
pltree(ward_cluster, cex = 0.6, hang = -1, main = "Dendrogram of agnes-Ward")
```



finding the group of healthy cereals

```
clus_ward <- hclust(Eucli_distance, method = "ward.D2" )
group <- cutree(clus_ward, k = 5)
table(group)
```

```
## group
##  1  2  3  4  5
##  3 20 21 21  9
```

```
library("factoextra")
```

```
## Warning: package 'factoextra' was built under R version 4.1.3
```

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

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
fviz_cluster(list(data= Cereals_norm,cluster = group))
```

diving groups for finding healthy cereals

```
healthy_cluster <- cbind(Cereals_rmv,group)
healthy_cluster
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 1        70       4   1    130  10.0   5.0      6    280       25     3   1.00
## 2       120       3   5     15   2.0   8.0      8    135        0     3   1.00
## 3        70       4   1    260   9.0   7.0      5    320       25     3   1.00
## 4        50       4   0    140  14.0   8.0      0    330       25     3   1.00
## 6       110       2   2    180   1.5  10.5     10     70       25     1   1.00
## 7       110       2   0    125   1.0  11.0     14     30       25     2   1.00
## 8       130       3   2    210   2.0  18.0      8    100       25     3   1.33
## 9        90       2   1    200   4.0  15.0      6    125       25     1   1.00
## 10       90       3   0    210   5.0  13.0      5    190       25     3   1.00
## 11      120       1   2    220   0.0  12.0     12     35       25     2   1.00
## 12      110       6   2    290   2.0  17.0      1    105       25     1   1.00
## 13      120       1   3    210   0.0  13.0      9     45       25     2   1.00
## 14      110       3   2    140   2.0  13.0      7    105       25     3   1.00
## 15      110       1   1    180   0.0  12.0     13     55       25     2   1.00
## 16      110       2   0    280   0.0  22.0      3     25       25     1   1.00
## 17      100       2   0    290   1.0  21.0      2     35       25     1   1.00
## 18      110       1   0     90   1.0  13.0     12     20       25     2   1.00
```

```
## 19      110       1   1   180   0.0  12.0     13     65       25     2   1.00
## 20      110       3   3   140   4.0  10.0      7    160       25     3   1.00
## 22      110       2   0   220   1.0  21.0      3     30       25     3   1.00
## 23      100       2   1   140   2.0  11.0     10    120       25     3   1.00
## 24      100       2   0   190   1.0  18.0      5     80       25     3   1.00
## 25      110       2   1   125   1.0  11.0     13     30       25     2   1.00
## 26      110       1   0   200   1.0  14.0     11     25       25     1   1.00
## 27      100       3   0     0   3.0  14.0      7    100       25     2   1.00
## 28      120       3   2   160   5.0  12.0     10    200       25     3   1.25
## 29      120       3   0   240   5.0  14.0     12    190       25     3   1.33
## 30      110       1   1   135   0.0  13.0     12     25       25     2   1.00
## 31      100       2   0    45   0.0  11.0     15     40       25     1   1.00
## 32      110       1   1   280   0.0  15.0      9     45       25     2   1.00
## 33      100       3   1   140   3.0  15.0      5     85       25     3   1.00
## 34      110       3   0   170   3.0  17.0      3     90       25     3   1.00
## 35      120       3   3    75   3.0  13.0      4    100       25     3   1.00
## 36      120       1   2   220   1.0  12.0     11     45       25     2   1.00
## 37      110       3   1   250   1.5  11.5     10     90       25     1   1.00
## 38      110       1   0   180   0.0  14.0     11     35       25     1   1.00
## 39      110       2   1   170   1.0  17.0      6     60      100     3   1.00
## 40      140       3   1   170   2.0  20.0      9     95      100     3   1.30
## 41      110       2   1   260   0.0  21.0      3     40       25     2   1.00
## 42      100       4   2   150   2.0  12.0      6     95       25     2   1.00
## 43      110       2   1   180   0.0  12.0     12     55       25     2   1.00
## 44      100       4   1     0   0.0  16.0      3     95       25     2   1.00
## 45      150       4   3    95   3.0  16.0     11    170       25     3   1.00
## 46      150       4   3   150   3.0  16.0     11    170       25     3   1.00
## 47      160       3   2   150   3.0  17.0     13    160       25     3   1.50
## 48      100       2   1   220   2.0  15.0      6     90       25     1   1.00
## 49      120       2   1   190   0.0  15.0      9     40       25     2   1.00
## 50      140       3   2   220   3.0  21.0      7    130       25     3   1.33
## 51       90       3   0   170   3.0  18.0      2     90       25     3   1.00
## 52      130       3   2   170   1.5  13.5     10    120       25     3   1.25
## 53      120       3   1   200   6.0  11.0     14    260       25     3   1.33
## 54      100       3   0   320   1.0  20.0      3     45      100     3   1.00
## 55       50       1   0     0   0.0  13.0      0     15        0     3   0.50
## 56       50       2   0     0   1.0  10.0      0     50        0     3   0.50
## 57      100       4   1   135   2.0  14.0      6    110       25     3   1.00
## 59      120       3   1   210   5.0  14.0     12    240       25     2   1.33
## 60      100       3   2   140   2.5  10.5      8    140       25     3   1.00
## 61       90       2   0     0   2.0  15.0      6    110       25     3   1.00
## 62      110       1   0   240   0.0  23.0      2     30       25     1   1.00
## 63      110       2   0   290   0.0  22.0      3     35       25     1   1.00
## 64       80       2   0     0   3.0  16.0      0     95        0     1   0.83
## 65       90       3   0     0   4.0  19.0      0    140        0     1   1.00
## 66       90       3   0     0   3.0  20.0      0    120        0     1   1.00
## 67      110       2   1    70   1.0   9.0     15     40       25     2   1.00
## 68      110       6   0   230   1.0  16.0      3     55       25     1   1.00
## 69       90       2   0    15   3.0  15.0      5     90       25     2   1.00
## 70      110       2   1   200   0.0  21.0      3     35      100     3   1.00
## 71      140       3   1   190   4.0  15.0     14    230      100     3   1.50
## 72      100       3   1   200   3.0  16.0      3    110      100     3   1.00
## 73      110       2   1   250   0.0  21.0      3     60       25     3   1.00
## 74      110       1   1   140   0.0  13.0     12     25       25     2   1.00
```

```
## 75      100       3   1    230   3.0  17.0      3    115       25     1   1.00
## 76      100       3   1    200   3.0  17.0      3    110       25     1   1.00
## 77      110       2   1    200   1.0  16.0      8     60       25     1   1.00
##    cups   rating group
## 1  0.33 68.40297     1
## 2  1.00 33.98368     2
## 3  0.33 59.42551     1
## 4  0.50 93.70491     1
## 6  0.75 29.50954     3
## 7  1.00 33.17409     3
## 8  0.75 37.03856     2
## 9  0.67 49.12025     4
## 10 0.67 53.31381     4
## 11 0.75 18.04285     3
## 12 1.25 50.76500     4
## 13 0.75 19.82357     3
## 14 0.50 40.40021     2
## 15 1.00 22.73645     3
## 16 1.00 41.44502     4
## 17 1.00 45.86332     4
## 18 1.00 35.78279     3
## 19 1.00 22.39651     3
## 20 0.50 40.44877     2
## 22 1.00 46.89564     4
## 23 0.75 36.17620     2
## 24 0.75 44.33086     4
## 25 1.00 32.20758     3
## 26 0.75 31.43597     3
## 27 0.80 58.34514     5
## 28 0.67 40.91705     2
## 29 0.67 41.01549     2
## 30 0.75 28.02576     3
## 31 0.88 35.25244     3
## 32 0.75 23.80404     3
## 33 0.88 52.07690     4
## 34 0.25 53.37101     4
## 35 0.33 45.81172     2
## 36 1.00 21.87129     3
## 37 0.75 31.07222     3
## 38 1.33 28.74241     3
## 39 1.00 36.52368     4
## 40 0.75 36.47151     2
## 41 1.50 39.24111     4
## 42 0.67 45.32807     2
## 43 1.00 26.73451     3
## 44 1.00 54.85092     5
## 45 1.00 37.13686     2
## 46 1.00 34.13976     2
## 47 0.67 30.31335     2
## 48 1.00 40.10596     3
## 49 0.67 29.92429     3
## 50 0.67 40.69232     2
## 51 1.00 59.64284     4
## 52 0.50 30.45084     2
```

```
## 53 0.67 37.84059     2
## 54 1.00 41.50354     4
## 55 1.00 60.75611     5
## 56 1.00 63.00565     5
## 57 0.50 49.51187     2
## 59 0.75 39.25920     2
## 60 0.50 39.70340     2
## 61 0.50 55.33314     5
## 62 1.13 41.99893     4
## 63 1.00 40.56016     4
## 64 1.00 68.23588     5
## 65 0.67 74.47295     5
## 66 0.67 72.80179     5
## 67 0.75 31.23005     3
## 68 1.00 53.13132     4
## 69 1.00 59.36399     5
## 70 1.00 38.83975     4
## 71 1.00 28.59278     2
## 72 1.00 46.65884     4
## 73 0.75 39.10617     4
## 74 1.00 27.75330     3
## 75 0.67 49.78744     4
## 76 1.00 51.59219     4
## 77 0.75 36.18756     3
```

```
healthy_cluster[healthy_cluster$group==1,]
```

```
##   calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 1       70       4   1    130    10     5      6    280       25     3      1
## 3       70       4   1    260     9     7      5    320       25     3      1
## 4       50       4   0    140    14     8      0    330       25     3      1
##   cups   rating group
## 1 0.33 68.40297     1
## 3 0.33 59.42551     1
## 4 0.50 93.70491     1
```

```
healthy_cluster[healthy_cluster$group==2,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 2       120       3   5     15   2.0   8.0      8    135        0     3   1.00
## 8       130       3   2    210   2.0  18.0      8    100       25     3   1.33
## 14      110       3   2    140   2.0  13.0      7    105       25     3   1.00
## 20      110       3   3    140   4.0  10.0      7    160       25     3   1.00
## 23      100       2   1    140   2.0  11.0     10    120       25     3   1.00
## 28      120       3   2    160   5.0  12.0     10    200       25     3   1.25
## 29      120       3   0    240   5.0  14.0     12    190       25     3   1.33
## 35      120       3   3     75   3.0  13.0      4    100       25     3   1.00
## 40      140       3   1    170   2.0  20.0      9     95      100     3   1.30
## 42      100       4   2    150   2.0  12.0      6     95       25     2   1.00
## 45      150       4   3     95   3.0  16.0     11    170       25     3   1.00
## 46      150       4   3    150   3.0  16.0     11    170       25     3   1.00
## 47      160       3   2    150   3.0  17.0     13    160       25     3   1.50
## 50      140       3   2    220   3.0  21.0      7    130       25     3   1.33
```

```
## 52      130       3   2    170   1.5  13.5     10    120       25     3   1.25
## 53      120       3   1    200   6.0  11.0     14    260       25     3   1.33
## 57      100       4   1    135   2.0  14.0      6    110       25     3   1.00
## 59      120       3   1    210   5.0  14.0     12    240       25     2   1.33
## 60      100       3   2    140   2.5  10.5      8    140       25     3   1.00
## 71      140       3   1    190   4.0  15.0     14    230      100     3   1.50
##    cups   rating group
## 2  1.00 33.98368     2
## 8  0.75 37.03856     2
## 14 0.50 40.40021     2
## 20 0.50 40.44877     2
## 23 0.75 36.17620     2
## 28 0.67 40.91705     2
## 29 0.67 41.01549     2
## 35 0.33 45.81172     2
## 40 0.75 36.47151     2
## 42 0.67 45.32807     2
## 45 1.00 37.13686     2
## 46 1.00 34.13976     2
## 47 0.67 30.31335     2
## 50 0.67 40.69232     2
## 52 0.50 30.45084     2
## 53 0.67 37.84059     2
## 57 0.50 49.51187     2
## 59 0.75 39.25920     2
## 60 0.50 39.70340     2
## 71 1.00 28.59278     2
```

```
healthy_cluster[healthy_cluster$group==3,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 6       110       2   2    180   1.5  10.5     10     70       25     1      1
## 7       110       2   0    125   1.0  11.0     14     30       25     2      1
## 11      120       1   2    220   0.0  12.0     12     35       25     2      1
## 13      120       1   3    210   0.0  13.0      9     45       25     2      1
## 15      110       1   1    180   0.0  12.0     13     55       25     2      1
## 18      110       1   0     90   1.0  13.0     12     20       25     2      1
## 19      110       1   1    180   0.0  12.0     13     65       25     2      1
## 25      110       2   1    125   1.0  11.0     13     30       25     2      1
## 26      110       1   0    200   1.0  14.0     11     25       25     1      1
## 30      110       1   1    135   0.0  13.0     12     25       25     2      1
## 31      100       2   0     45   0.0  11.0     15     40       25     1      1
## 32      110       1   1    280   0.0  15.0      9     45       25     2      1
## 36      120       1   2    220   1.0  12.0     11     45       25     2      1
## 37      110       3   1    250   1.5  11.5     10     90       25     1      1
## 38      110       1   0    180   0.0  14.0     11     35       25     1      1
## 43      110       2   1    180   0.0  12.0     12     55       25     2      1
## 48      100       2   1    220   2.0  15.0      6     90       25     1      1
## 49      120       2   1    190   0.0  15.0      9     40       25     2      1
## 67      110       2   1     70   1.0   9.0     15     40       25     2      1
## 74      110       1   1    140   0.0  13.0     12     25       25     2      1
## 77      110       2   1    200   1.0  16.0      8     60       25     1      1
##    cups   rating group
## 6  0.75 29.50954     3
```

```
## 7  1.00 33.17409     3
## 11 0.75 18.04285     3
## 13 0.75 19.82357     3
## 15 1.00 22.73645     3
## 18 1.00 35.78279     3
## 19 1.00 22.39651     3
## 25 1.00 32.20758     3
## 26 0.75 31.43597     3
## 30 0.75 28.02576     3
## 31 0.88 35.25244     3
## 32 0.75 23.80404     3
## 36 1.00 21.87129     3
## 37 0.75 31.07222     3
## 38 1.33 28.74241     3
## 43 1.00 26.73451     3
## 48 1.00 40.10596     3
## 49 0.67 29.92429     3
## 67 0.75 31.23005     3
## 74 1.00 27.75330     3
## 77 0.75 36.18756     3
```

```
healthy_cluster[healthy_cluster$group==4,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 9        90       2   1    200     4    15       6    125       25     1       1
## 10       90       3   0    210     5    13       5    190       25     3       1
## 12      110       6   2    290     2    17       1    105       25     1       1
## 16      110       2   0    280     0    22       3     25       25     1       1
## 17      100       2   0    290     1    21       2     35       25     1       1
## 22      110       2   0    220     1    21       3     30       25     3       1
## 24      100       2   0    190     1    18       5     80       25     3       1
## 33      100       3   1    140     3    15       5     85       25     3       1
## 34      110       3   0    170     3    17       3     90       25     3       1
## 39      110       2   1    170     1    17       6     60      100     3       1
## 41      110       2   1    260     0    21       3     40       25     2       1
## 51       90       3   0    170     3    18       2     90       25     3       1
## 54      100       3   0    320     1    20       3     45      100     3       1
## 62      110       1   0    240     0    23       2     30       25     1       1
## 63      110       2   0    290     0    22       3     35       25     1       1
## 68      110       6   0    230     1    16       3     55       25     1       1
## 70      110       2   1    200     0    21       3     35      100     3       1
## 72      100       3   1    200     3    16       3    110      100     3       1
## 73      110       2   1    250     0    21       3     60       25     3       1
## 75      100       3   1    230     3    17       3    115       25     1       1
## 76      100       3   1    200     3    17       3    110       25     1       1
##    cups   rating group
## 9  0.67 49.12025     4
## 10 0.67 53.31381     4
## 12 1.25 50.76500     4
## 16 1.00 41.44502     4
## 17 1.00 45.86332     4
## 22 1.00 46.89564     4
## 24 0.75 44.33086     4
## 33 0.88 52.07690     4
```

```
## 34 0.25 53.37101     4
## 39 1.00 36.52368     4
## 41 1.50 39.24111     4
## 51 1.00 59.64284     4
## 54 1.00 41.50354     4
## 62 1.13 41.99893     4
## 63 1.00 40.56016     4
## 68 1.00 53.13132     4
## 70 1.00 38.83975     4
## 72 1.00 46.65884     4
## 73 0.75 39.10617     4
## 75 0.67 49.78744     4
## 76 1.00 51.59219     4
```

```
healthy_cluster[healthy_cluster$group==5,]
```

```
##    calories protein fat sodium fiber carbo sugars potass vitamins shelf weight
## 27      100       3   0      0     3    14      7    100       25     2   1.00
## 44      100       4   1      0     0    16      3     95       25     2   1.00
## 55       50       1   0      0     0    13      0     15        0     3   0.50
## 56       50       2   0      0     1    10      0     50        0     3   0.50
## 61       90       2   0      0     2    15      6    110       25     3   1.00
## 64       80       2   0      0     3    16      0     95        0     1   0.83
## 65       90       3   0      0     4    19      0    140        0     1   1.00
## 66       90       3   0      0     3    20      0    120        0     1   1.00
## 69       90       2   0     15     3    15      5     90       25     2   1.00
##    cups   rating group
## 27 0.80 58.34514     5
## 44 1.00 54.85092     5
## 55 1.00 60.75611     5
## 56 1.00 63.00565     5
## 61 0.50 55.33314     5
## 64 1.00 68.23588     5
## 65 0.67 74.47295     5
## 66 0.67 72.80179     5
## 69 1.00 59.36399     5
```

finding the cluster with healthy cereals

```
mean(healthy_cluster[healthy_cluster$group==1,"rating"])
```

```
## [1] 73.84446
```

```
mean(healthy_cluster[healthy_cluster$group==2,"rating"])
```

```
## [1] 38.26161
```

```r
mean(healthy_cluster[healthy_cluster$group==3,"rating"])
```

```
## [1] 28.84825
```

```r
mean(healthy_cluster[healthy_cluster$group==4,"rating"])
```

```
## [1] 46.46513
```

```r
mean(healthy_cluster[healthy_cluster$group==5,"rating"])
```

```
## [1] 63.0184
```

group 1 has the highest mean which means cluster 1 has healthy diet