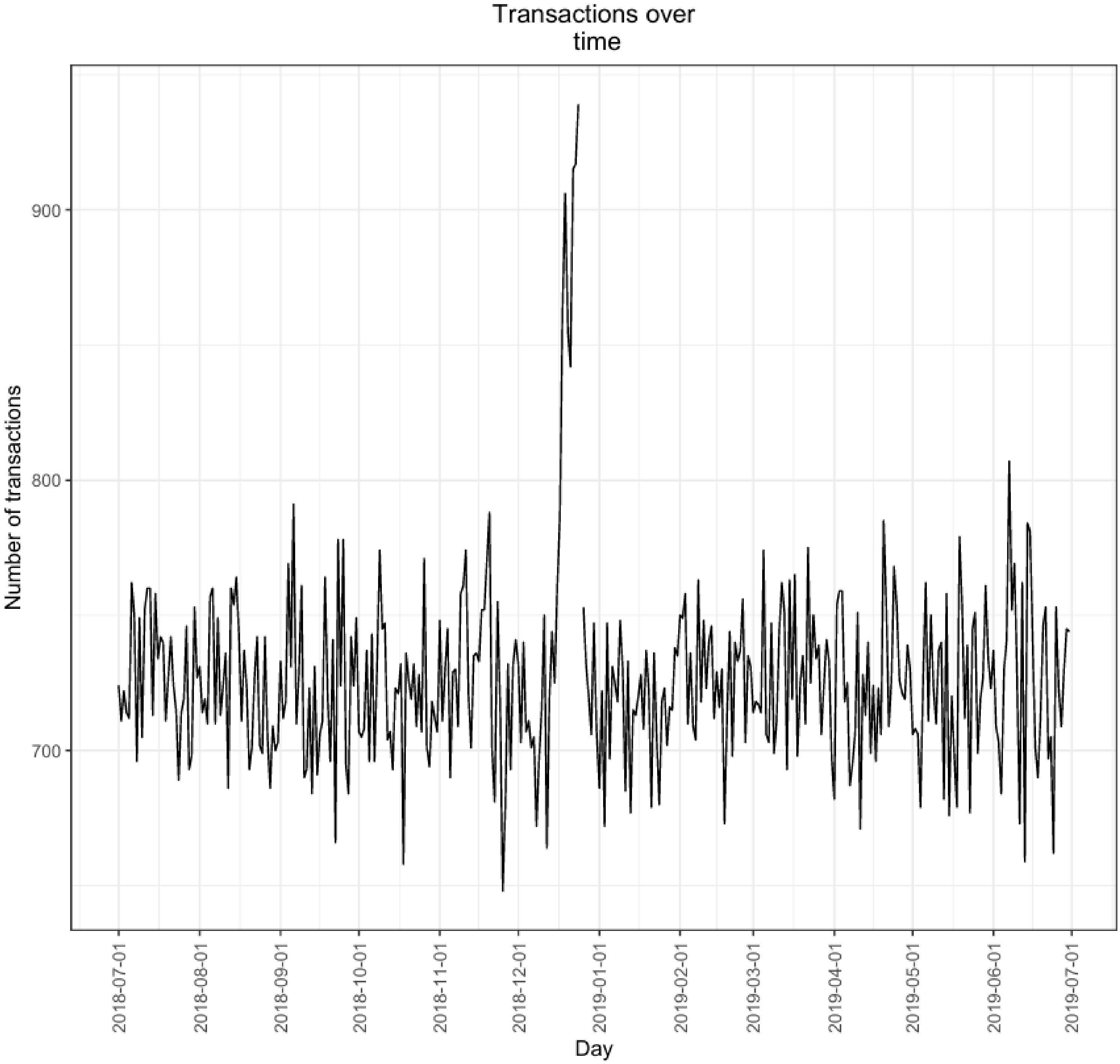
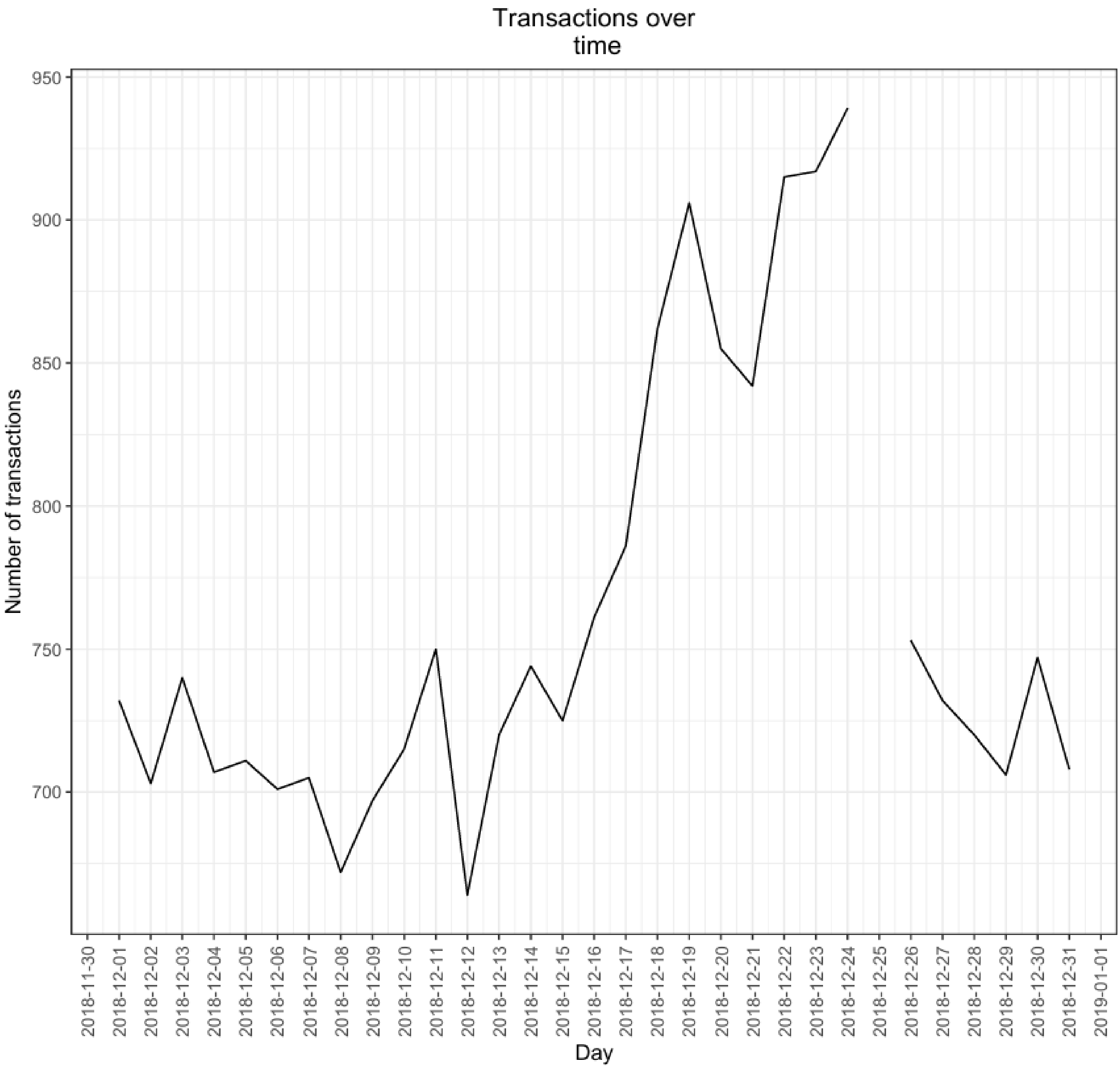
```
>  #### Load required libraries
>  library(data.table)
data.table 1.17.0 using 2 threads (see ?getDTthreads).  Latest news: r-datatable.com
>  library(ggplot2)
>  library(ggmosaic)
Error in library(ggmosaic) : there is no package called ‘ggmosaic’
>  library(readr)
> getwd()
[1] "C:/Users/PC/OneDrive/Documents"
> setwd("C:/Users/PC/Downloads")
>  filePath <-"C:/Users/PC/Downloads"
> transactionData <- fread(paste0("C:/Users/PC/Downloads/QVI_transaction_data.csv")
+ )
>  customerData <- fread(paste0("C:/Users/PC/Downloads/QVI_purchase_behaviour.csv") + )
>  #### Examine transaction data
>  str(transactionData)
Classes ‘data.table’ and 'data.frame':  264836 obs. of  8 variables:
 $ DATE          : int  43390 43599 43605 43329 43330 43604 43601 43601 43332 43330 ...
 $ STORE_NBR     : int  1 1 1 2 2 4 4 4 5 7 ...
 $ LYLTY_CARD_NBR: int  1000 1307 1343 2373 2426 4074 4149 4196 5026 7150 ...
 $ TXN_ID        : int  1 348 383 974 1038 2982 3333 3539 4525 6900 ...
 $ PROD_NBR      : int  5 66 61 69 108 57 16 24 42 52 ...
 $ PROD_NAME     : chr  "Natural Chip        Compny SeaSalt175g" "CCs Nacho Cheese    175g" "Smit hs Crinkle Cut  Chips Chicken 170g"
"Smiths Chip Thinly  S/Cream&Onion 175g" ...
 $ PROD_QTY      : int  2 3 2 5 3 1 1 1 1 2 ...
 $ TOT_SALES     : num  6 6.3 2.9 15 13.8 5.1 5.7 3.6 3.9 7.2 ...
 - attr(*, ".internal.selfref")=<externalptr>
> #### Convert DATE column to a date format
>  transactionData$DATE <- as.Date(transactionData$DATE, origin = "1899-12-30")
>  #### Examine PROD_NAME
>  transactionData[, .N, PROD_NAME]
                                   PROD_NAME     N
                                      <char> <int>
  1:   Natural Chip        Compny SeaSalt175g  1468
  2:                 CCs Nacho Cheese    175g  1498
  3:   Smiths Crinkle Cut  Chips Chicken 170g  1484
  4:   Smiths Chip Thinly  S/Cream&Onion 175g  1473
  5: Kettle Tortilla ChpsHny&Jlpno Chili 150g  3296
 ---
110:    Red Rock Deli Chikn&Garlic Aioli 150g  1434
111:      RRD SR Slow Rst     Pork Belly 150g  1526
112:                 RRD Pc Sea Salt     165g  1431
113:       Smith Crinkle Cut   Bolognese 150g  1451
114:                 Doritos Salsa Mild  300g  1472
>  #### Examine the words in PROD_NAME to see if there are any incorrect entries
>  #### such as products that are not chips
>  productWords <- data.table(unlist(strsplit(unique(transactionData[, PROD_NAME]), " ")))
> setnames(productWords, 'words')
> setnames(productWords, 'words')
>  #### Removing digits
>  productWords <- productWords[grepl("\\d", words) == FALSE,]
> ### Removing special characters
> productWords <- productWords[grepl("[:alpha:]", words),]
>  #### sorting them by this frequency in order of highest to lowest frequency
>  productWords[, .N, words][order(N, decreasing = TRUE)]             words     N
<char> <int>
  1:       Chips    21
  2:      Smiths    16
  3:      Crinkle    14
  4:       Kettle    13
  5:       Cheese    12
 ---
127: Chikn&Garlic     1
128:        Aioli     1
129:         Slow     1
130:        Belly     1
131:    Bolognese     1
>  #### Note that sorting by negative N gives us the same result
>  #productWords[, .N, words][order(-N)]
>  #### Remove salsa products
>  #transactionData[, SALSA := grepl("salsa", tolower(PROD_NAME))]
>  #transactionData <- transactionData[SALSA == FALSE, ][, SALSA := NULL]
>  #### Summarise the data to check for nulls and possible outliers
>  summary(transactionData)
      DATE              STORE_NBR     LYLTY_CARD_NBR        TXN_ID       
 Min.   :2018-07-01   Min.   :  1.0   Min.   :   1000   Min.   :      1  
 1st Qu.:2018-09-30   1st Qu.: 70.0   1st Qu.:  70021   1st Qu.:  67602  
 Median :2018-12-30   Median :130.0   Median : 130358   Median : 135138  
 Mean   :2018-12-30   Mean   :135.1   Mean   : 135550   Mean   : 135158  
 3rd Qu.:2019-03-31   3rd Qu.:203.0   3rd Qu.: 203094   3rd Qu.: 202701  
 Max.   :2019-06-30   Max.   :272.0   Max.   :2373711   Max.   :2415841  
    PROD_NBR       PROD_NAME            PROD_QTY         TOT_SALES      
 Min.   :  1.00   Length:264836      Min.   :  1.000   Min.   :  1.500  
 1st Qu.: 28.00   Class :character   1st Qu.:  2.000   1st Qu.:  5.400  
 Median : 56.00   Mode  :character   Median :  2.000   Median :  7.400  
 Mean   : 56.58                      Mean   :  1.907   Mean   :  7.304  
 3rd Qu.: 85.00                      3rd Qu.:  2.000   3rd Qu.:  9.200  
 Max.   :114.00                      Max.   :200.000   Max.   :650.000  
>  #### Filter the dataset to find the outlier
>  transactionData[PROD_QTY == 200, ]
         DATE STORE_NBR LYLTY_CARD_NBR TXN_ID PROD_NBR
       <Date>     <int>          <int>  <int>    <int>
1: 2018-08-19       226         226000 226201        4
2: 2019-05-20       226         226000 226210        4
                          PROD_NAME PROD_QTY TOT_SALES
                             <char>    <int>     <num>
1: Dorito Corn Chp     Supreme 380g      200       650
2: Dorito Corn Chp     Supreme 380g      200       650
>  transactionData[LYLTY_CARD_NBR == 226000, ]
         DATE STORE_NBR LYLTY_CARD_NBR TXN_ID PROD_NBR
       <Date>     <int>          <int>  <int>    <int>
1: 2018-08-19       226         226000 226201        4
2: 2019-05-20       226         226000 226210        4
                          PROD_NAME PROD_QTY TOT_SALES
                             <char>    <int>     <num>
1: Dorito Corn Chp     Supreme 380g      200       650
2: Dorito Corn Chp     Supreme 380g      200       650
>  #### Filter out the customer based on the loyalty card number
>  transactionData <- transactionData[LYLTY_CARD_NBR !=226000,]
> #### Re↪examine transaction data
>  summary(transactionData)
      DATE              STORE_NBR     LYLTY_CARD_NBR        TXN_ID       
 Min.   :2018-07-01   Min.   :  1.0   Min.   :   1000   Min.   :      1  
 1st Qu.:2018-09-30   1st Qu.: 70.0   1st Qu.:  70021   1st Qu.:  67601  
 Median :2018-12-30   Median :130.0   Median : 130357   Median : 135137  
 Mean   :2018-12-30   Mean   :135.1   Mean   : 135549   Mean   : 135158  
 3rd Qu.:2019-03-31   3rd Qu.:203.0   3rd Qu.: 203094   3rd Qu.: 202700  
 Max.   :2019-06-30   Max.   :272.0   Max.   :2373711   Max.   :2415841  
    PROD_NBR       PROD_NAME            PROD_QTY       TOT_SALES      
 Min.   :  1.00   Length:264834      Min.   :1.000   Min.   : 1.500  
 1st Qu.: 28.00   Class :character   1st Qu.:2.000   1st Qu.: 5.400  
 Median : 56.00   Mode  :character   Median :2.000   Median : 7.400  
 Mean   : 56.58                      Mean   :1.906   Mean   : 7.299  
 3rd Qu.: 85.00                      3rd Qu.:2.000   3rd Qu.: 9.200  
 Max.   :114.00                      Max.   :5.000   Max.   :29.500  
>  #### Count the number of transactions by date
>  transactionData[, .N, by = DATE]
           DATE     N
         <Date> <int>
  1: 2018-10-17   732
  2: 2019-05-14   758
  3: 2019-05-20   754
  4: 2018-08-17   711
  5: 2018-08-18   737
 ---                 
360: 2018-11-21   700
361: 2019-05-10   710
362: 2018-12-08   672
363: 2019-01-30   738
364: 2019-02-09   718
>  allDates <↪ data.table(seq(as.Date("2018/07/01"), as.Date("2019/06/30"), by =
Error: unexpected invalid token in " allDates <↪"
>  "day")
Error: unexpected ')' in "  "day")" >   allDates <- data.table(seq(as.Date("2018/07/01"), as.Date("2019/06/30"), by ="day")) > setnames(allDates, "DATE")
>  transactions_by_day <- merge(allDates, transactionData[, .N, by = DATE], all.x = TRUE) >  theme_set(theme_bw())
>  theme_update(plot.title = element_text(hjust = 0.5))
>  ggplot(transactions_by_day, aes(x = DATE, y = N)) +
+  geom_line() +
+  labs(x = "Day", y = "Number of transactions", title = "Transactions over +  time") +
+  scale_x_date(breaks = "1 month") +
+  theme(axis.text.x = element_text(angle = 90, vjust = 0.5))
```

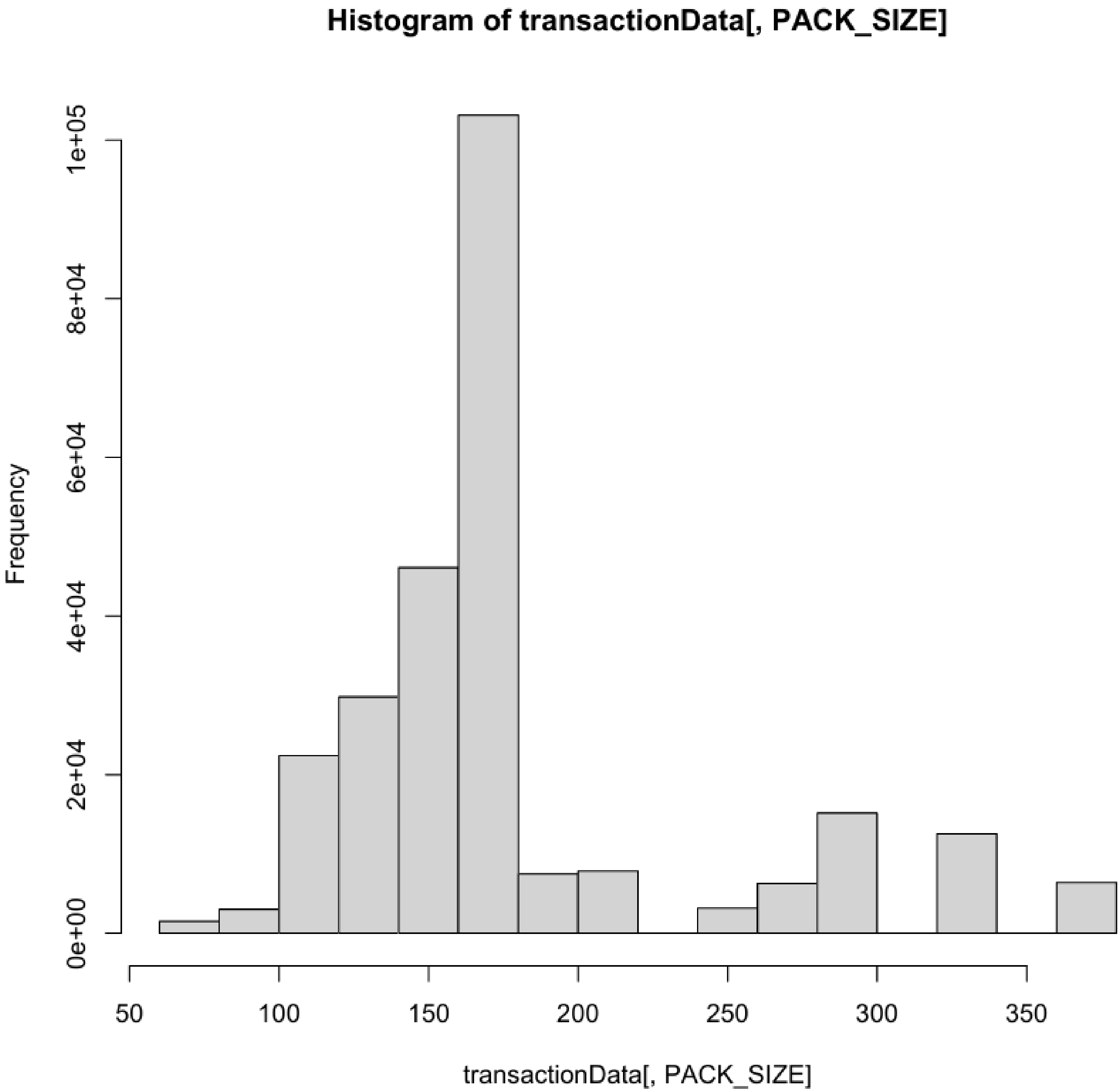


```
>  #### Filter to December and look at individual days
>  ggplot(transactions_by_day[month(DATE) == 12, ], aes(x = DATE, y = N)) +
+  geom_line() +
+  labs(x = "Day", y = "Number of transactions", title = "Transactions over +  time") +
+  scale_x_date(breaks = "1 day") +
+  theme(axis.text.x = element_text(angle = 90, vjust = 0.5))
+  labs(x = "Day", y = "Number of transactions", title = "Transactions over +  time") +
+  scale_x_date(breaks = "1 month") +
+  theme(axis.text.x = element_text(angle = 90, vjust = 0.5))
```



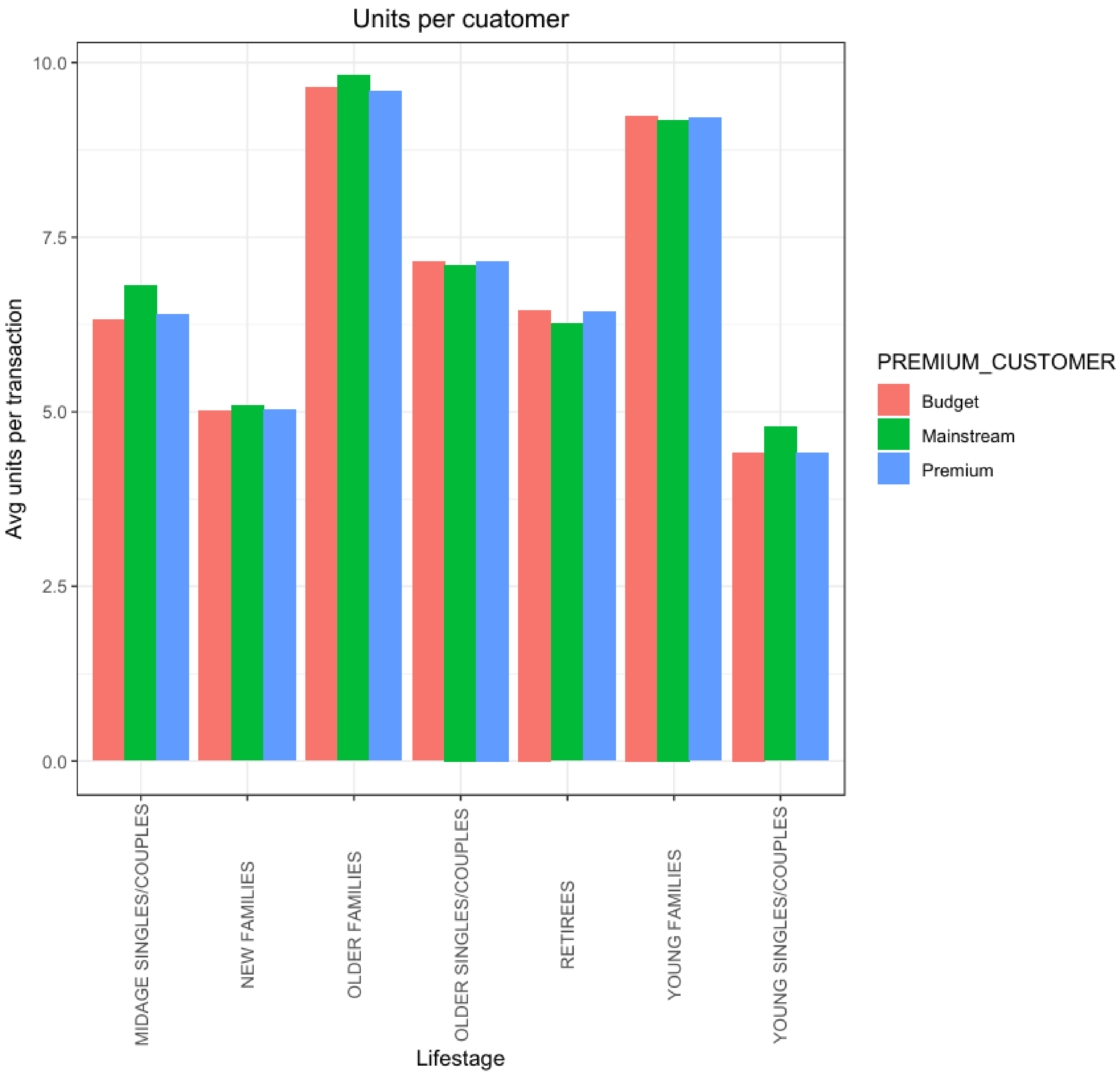
```
>  transactionData[,.N,PACK_SIZE][order(PACK_SIZE)]
    PACK_SIZE     N
        <num> <int>
 1:        70  1507
 2:        90  3008
 3:       110 22387
 4:       125  1454
 5:       134 25102
 6:       135  3257
 7:       150 43131
 8:       160  2970
 9:       165 15297
10:       170 19983
```

```
11:       175 66390
12:       180  1468
13:       190  2995
14:       200  4473
15:       210  6272
16:       220  1564
17:       250  3169
18:       270  6285
19:       300 15166
20:       330 12540
21:       380  6416
    PACK_SIZE     N
>  ####Let'scheck the outputofthefirstfewrowstoseeifwehaveindeed
>  pickedout packsize. ↪
Error: unexpected symbol in " pickedout packsize."
>  transactionData
              DATE STORE_NBR LYLTY_CARD_NBR TXN_ID PROD_NBR
            <Date>     <int>          <int>  <int>    <int>
     1: 2018-10-17         1           1000      1        5
     2: 2019-05-14         1           1307    348       66
     3: 2019-05-20         1           1343    383       61
     4: 2018-08-17         2           2373    974       69
     5: 2018-08-18         2           2426   1038      108
    ---
264830: 2019-03-09       272         272319 270088       89
264831: 2018-08-13       272         272358 270154       74
264832: 2018-11-06       272         272379 270187       51
264833: 2018-12-27       272         272379 270188       42
264834: 2018-09-22       272         272380 270189       74
                                       PROD_NAME PROD_QTY TOT_SALES PACK_SIZE
                                          <char>    <int>     <num>     <num>
     1:   Natural Chip        Compny SeaSalt175g        2       6.0       175
     2:                 CCs Nacho Cheese    175g        3       6.3       175
     3:   Smiths Crinkle Cut  Chips Chicken 170g        2       2.9       170
     4:   Smiths Chip Thinly  S/Cream&Onion 175g        5      15.0       175
     5: Kettle Tortilla ChpsHny&Jlpno Chili 150g        3      13.8       150
    ---
264830:  Kettle Sweet Chilli And Sour Cream 175g        2      10.8       175
264831:            Tostitos Splash Of  Lime 175g        1       4.4       175
264832:                 Doritos Mexicana    170g        2       8.8       170
264833:  Doritos Corn Chip Mexican Jalapeno 150g        2       7.8       150
264834:            Tostitos Splash Of  Lime 175g        2       8.8       175
>  hist(transactionData[,PACK_SIZE])
```

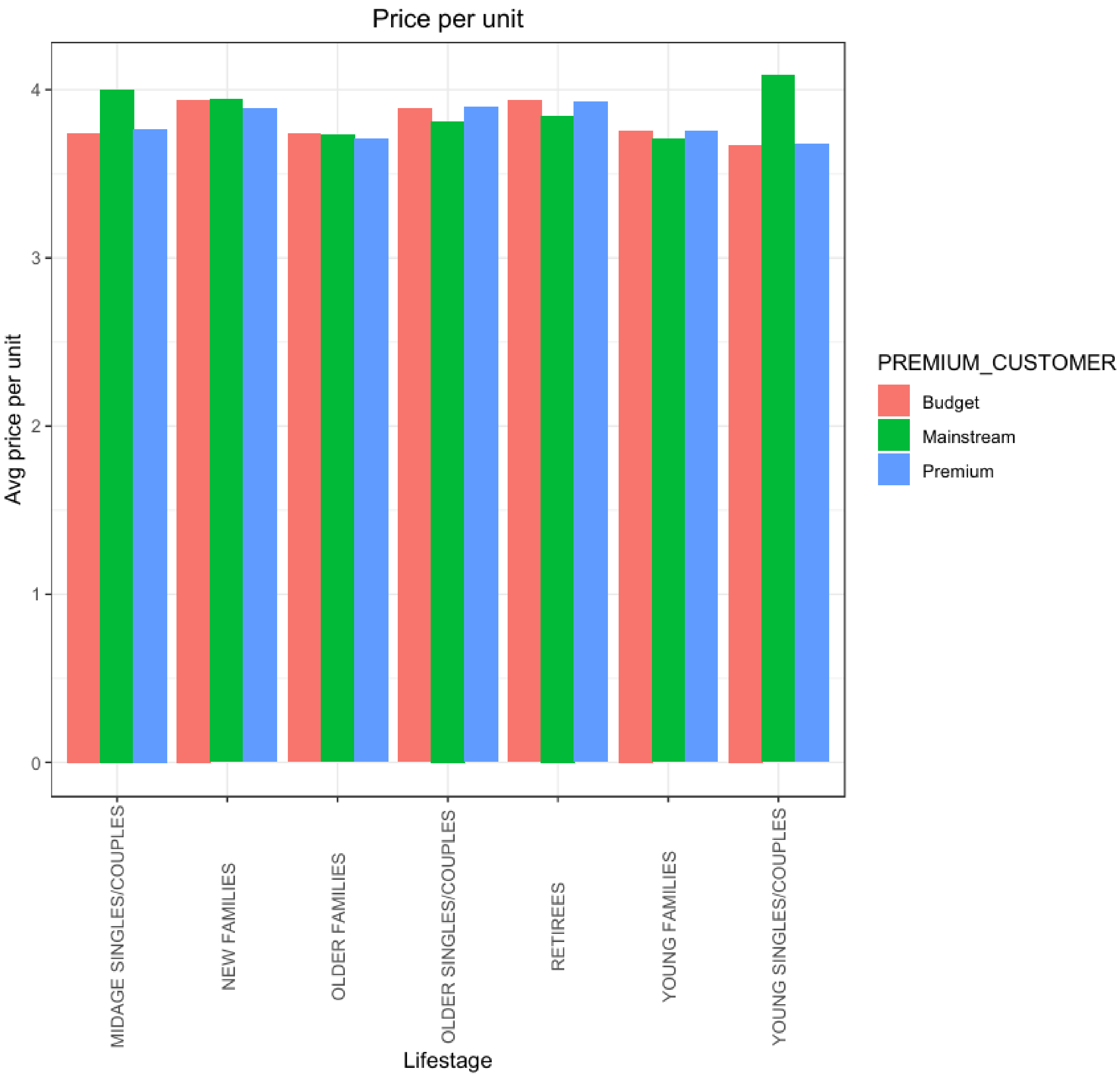


```
> ####Brands
> transactionData[,BRAND:= toupper(substr(PROD_NAME,1, regexpr(pattern='',PROD_NAME)-1))] > ####Checkingbrands
> transactionData[,.N,by=BRAND][order(-N)]
   BRAND      N
  <char>  <int>
1:        264834
> transactionData[,.N,by=BRAND][order(-N)]
   BRAND      N
  <char>  <int>
1:        264834
> #### Clean brand names
>  transactionData[BRAND == "RED", BRAND := "RRD"]
>  transactionData[BRAND == "SNBTS", BRAND := "SUNBITES"]
>  transactionData[BRAND == "INFZNS", BRAND := "INFUZIONS"]
>  transactionData[BRAND == "WW", BRAND := "WOOLWORTHS"]
>  transactionData[BRAND == "SMITH", BRAND := "SMITHS"]
>  transactionData[BRAND == "NCC", BRAND := "NATURAL"]
>  transactionData[BRAND == "DORITO", BRAND := "DORITOS"]
>  transactionData[BRAND == "GRAIN", BRAND := "GRNWVES"]
>  transactionData[, .N, by = BRAND][order(BRAND)]
    BRAND      N
   <char>  <int>
1:        264834
>  transactionData[,BRAND:= toupper(substr(PROD_NAME,1, regexpr(pattern=",PROD_NAME) -1))]
>  transactionData[,.N,by=BRAND][order(-N)]
    BRAND      N
   <char>  <int>
1:        264834
>  #### Examining customer data
>  str(customerData)
Classes ‘data.table’ and 'data.frame':  72637 obs. of  3 variables:
 $ LYLTY_CARD_NBR  : int  1000 1002 1003 1004 1005 1007 1009 1010 1011 1012 ...
 $ LIFESTAGE       : chr  "YOUNG SINGLES/COUPLES" "YOUNG SINGLES/COUPLES" "YOUNG FAMILIES" "OLDER
 SINGLES/COUPLES" ...
 $ PREMIUM_CUSTOMER: chr  "Premium" "Mainstream" "Budget" "Mainstream" ...
 - attr(*, ".internal.selfref")=<externalptr>
>  summary(customerData)
 LYLTY_CARD_NBR     LIFESTAGE         PREMIUM_CUSTOMER
 Min.   :    1000   Length:72637       Length:72637
 1st Qu.:  66202   Class :character   Class :character
 Median : 134040   Mode  :character   Mode  :character
 Mean   : 136186
 3rd Qu.: 203375
 Max.   :2373711
>  customerData[, .N, by = LIFESTAGE][order(-N)]
               LIFESTAGE     N
                  <char> <int>
1:              RETIREES 14805
2:  OLDER SINGLES/COUPLES 14609
3:  YOUNG SINGLES/COUPLES 14441
4:         OLDER FAMILIES  9780
5:         YOUNG FAMILIES  9178
6: MIDAGE SINGLES/COUPLES  7275
7:           NEW FAMILIES  2549
> customerData[, .N, by = PREMIUM_CUSTOMER][order(-N)]
   PREMIUM_CUSTOMER     N
            <char> <int>
1:       Mainstream 29245
2:           Budget 24470
3:          Premium 18922
>  #### Merge transaction data to customer data
>  data <- merge(transactionData, customerData, all.x = TRUE)
>  data[is.null(LIFESTAGE), .N]
[1] 0
>  data[is.null(PREMIUM_CUSTOMER), .N]
[1] 0
>  ####Number ofcustomersbyLIFESTAGEandPREMIUM_CUSTOMER
>  customers<-data[,.(CUSTOMERS= uniqueN(LYLTY_CARD_NBR)),.(LIFESTAGE, PREMIUM_CUSTOMER)][order(-
CUSTOMERS)]
```

```
>  ####Average number ofunitspercustomerbyLIFESTAGEandPREMIUM_CUSTOMER
>  avg_units<-data[,.(AVG= sum(PROD_QTY)/uniqueN(LYLTY_CARD_NBR)),
+  .(LIFESTAGE,PREMIUM_CUSTOMER)][order(-AVG)]
> ggplot(data=avg_units, aes(weight=AVG,x= LIFESTAGE,fill=
+  PREMIUM_CUSTOMER))+
+ geom_bar(position= position_dodge()) +
+  labs(x= "Lifestage",y= "Avg units per transaction",title="Units per cuatomer")+
+  theme(axis.text.x= element_text(angle=90,vjust=0.5))
```



```
>  #### Average price per unit by LIFESTAGE and PREMIUM_CUSTOMER
> avg_price <- data[, .(AVG = sum(TOT_SALES)/sum(PROD_QTY)), .(LIFESTAGE, PREMIUM_CUSTOMER)][ord er(-AVG)]
> #### Create plot
> ggplot(data = avg_price, aes(weight = AVG, x = LIFESTAGE, fill = PREMIUM_CUSTOMER)) +geom_bar( position = position_dodge()) +
+ labs(x = "Lifestage", y = "Avg price per unit", title = "Price per unit") +
+ theme(axis.text.x = element_text(angle = 90, vjust = 0.5))
```



```
> segment1 <- data[LIFESTAGE == "YOUNG SINGLES/COUPLES" & PREMIUM_CUSTOMER ==
+ "Mainstream",]
> other <- data[!(LIFESTAGE == "YOUNG SINGLES/COUPLES" & PREMIUM_CUSTOMER == +
"Mainstream"),]
> #### Preferred pack size compared to the rest of the population
>  quantity_segment1_by_pack <- segment1[, .(targetSegment =
+  sum(PROD_QTY)/quantity_segment1), by = PACK_SIZE]
>  quantity_other_by_pack <- other[, .(other = sum(PROD_QTY)/quantity_other), by = +  PACK_SIZE]
>  pack_proportions <- merge(quantity_segment1_by_pack, quantity_other_by_pack)[,
+  affinityToPack := targetSegment/other]
>  pack_proportions[order(-affinityToPack)]
    PACK_SIZE targetSegment       other affinityToPack
        <num>         <num>       <num>          <num>
 1:       270   0.029845724 0.023377359      1.2766936
 2:       380   0.030156347 0.023832205      1.2653612
 3:       330   0.057465314 0.046726826      1.2298142
 4:       134   0.111979706 0.093743295      1.1945356
 5:       110   0.099658314 0.083642285      1.1914824
 6:       210   0.027308967 0.023400959      1.1670020
 7:       135   0.013848623 0.012179999      1.1369971
 8:       250   0.013460344 0.011905375      1.1306107
 9:       170   0.075740319 0.075440042      1.0039803
10:       300   0.054954442 0.057263373      0.9596787
11:       175   0.239102299 0.251516868      0.9506412
12:       150   0.155130462 0.163446272      0.9491221
13:       165   0.052184717 0.058003570      0.8996811
14:       190   0.007014910 0.011589987      0.6052561
15:       180   0.003365086 0.005651245      0.5954592
16:       160   0.006005384 0.011525622      0.5210464
17:        90   0.005953614 0.011718716      0.5080431
18:       125   0.002821495 0.005623353      0.5017460
19:       200   0.008412715 0.017378543      0.4840863
20:        70   0.002847380 0.005889395      0.4834759
21:       220   0.002743839 0.006144710      0.4465369
    PACK_SIZE targetSegment       other affinityToPack
>  data[PACK_SIZE == 270, unique(PROD_NAME)]
[1] "Twisties Cheese     270g" "Twisties Chicken270g"    >
```