MV_teamprj1_EDA

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data importing & analysis

```
library(tidyverse)
```

```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.
0.0 ──
## ✔ dplyr     1.1.4     ✔ readr     2.1.5
## ✔ forcats   1.0.0     ✔ stringr   1.5.1
## ✔ ggplot2   3.5.1     ✔ tibble    3.2.1
## ✔ lubridate 1.9.3     ✔ tidyr     1.3.1
## ✔ purrr     1.0.2
## ── Conflicts ────────────────────────────────────────── tidyverse_conflict
s() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all
 conflicts to become errors
```

```
library(ggplot2)
library(ggmosaic)
library(GGally)
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
##
## Attaching package: 'GGally'
##
## The following object is masked from 'package:ggmosaic':
##
##     happy
```

```
hotel = read.csv("./source/hotel_bookings.csv")
head(hotel)
```

```
##          hotel is_canceled lead_time arrival_date_year arrival_date_month
## 1 Resort Hotel           0       342              2015               July
## 2 Resort Hotel           0       737              2015               July
## 3 Resort Hotel           0         7              2015               July
## 4 Resort Hotel           0        13              2015               July
## 5 Resort Hotel           0       14              2015               July
## 6 Resort Hotel           0       14              2015               July
##   arrival_date_week_number arrival_date_day_of_month stays_in_weekend_nigh
ts
## 1                       27                         1                        
 0
## 2                       27                         1                        
 0
## 3                       27                         1                        
 0
## 4                       27                         1                        
 0
## 5                       27                         1                        
 0
## 6                       27                         1                        
 0
##   stays_in_week_nights adults children babies meal country market_segment
## 1                    0      2        0      0   BB     PRT         Direct
## 2                    0      2        0      0   BB     PRT         Direct
## 3                    1      1        0      0   BB     GBR         Direct
## 4                    1      1        0      0   BB     GBR      Corporate
## 5                    2      2        0      0   BB     GBR      Online TA
## 6                    2      2        0      0   BB     GBR      Online TA
##   distribution_channel is_repeated_guest previous_cancellations
## 1               Direct                 0                      0
## 2               Direct                 0                      0
## 3               Direct                 0                      0
## 4            Corporate                 0                      0
## 5                TA/TO                 0                      0
## 6                TA/TO                 0                      0
##   previous_bookings_not_canceled reserved_room_type assigned_room_type
## 1                              0                  C                  C
## 2                              0                  C                  C
## 3                              0                  A                  C
## 4                              0                  A                  A
## 5                              0                  A                  A
## 6                              0                  A                  A
##   booking_changes deposit_type agent company days_in_waiting_list customer
_type
## 1               3   No Deposit  NULL    NULL                    0     Tran
sient
## 2               4   No Deposit  NULL    NULL                    0     Tran
sient
## 3               0   No Deposit  NULL    NULL                    0     Tran
sient
## 4               0   No Deposit   304    NULL                    0     Tran
sient
## 5               0   No Deposit   240    NULL                    0     Tran
sient
```

```
## 6               0   No Deposit   240    NULL                    0     Tran
sient
##   adr required_car_parking_spaces total_of_special_requests reservation_st
atus
## 1   0                           0                         0          Check
-Out
## 2   0                           0                         0          Check
-Out
## 3  75                           0                         0          Check
-Out
## 4  75                           0                         0          Check
-Out
## 5  98                           0                         1          Check
-Out
## 6  98                           0                         1          Check
-Out
##   reservation_status_date
## 1              2015-07-01
## 2              2015-07-01
## 3              2015-07-02
## 4              2015-07-02
## 5              2015-07-03
## 6              2015-07-03
```

```
dim(hotel)
```

```
## [1] 119390     32
```

```
summary(hotel)
```

```
##      hotel            is_canceled       lead_time   arrival_date_year
##  Length:119390     Min.   :0.0000   Min.   :  0   Min.   :2015
##  Class :character  1st Qu.:0.0000   1st Qu.: 18   1st Qu.:2016
##  Mode  :character  Median :0.0000   Median : 69   Median :2016
##                     Mean   :0.3704   Mean   :104   Mean   :2016
##                     3rd Qu.:1.0000   3rd Qu.:160   3rd Qu.:2017
##                     Max.   :1.0000   Max.   :737   Max.   :2017
##
##  arrival_date_month arrival_date_week_number arrival_date_day_of_month
##  Length:119390      Min.   : 1.00            Min.   : 1.0
##  Class :character   1st Qu.:16.00            1st Qu.: 8.0
##  Mode  :character   Median :28.00            Median :16.0
##                     Mean   :27.17            Mean   :15.8
##                     3rd Qu.:38.00            3rd Qu.:23.0
##                     Max.   :53.00            Max.   :31.0
##
##  stays_in_weekend_nights stays_in_week_nights     adults
##  Min.   : 0.0000         Min.   : 0.0         Min.   : 0.000
##  1st Qu.: 0.0000         1st Qu.: 1.0         1st Qu.: 2.000
##  Median : 1.0000         Median : 2.0         Median : 2.000
##  Mean   : 0.9276         Mean   : 2.5         Mean   : 1.856
##  3rd Qu.: 2.0000         3rd Qu.: 3.0         3rd Qu.: 2.000
##  Max.   :19.0000         Max.   :50.0         Max.   :55.000
##
##     children           babies              meal             country

##  Min.   : 0.0000   Min.   : 0.000000   Length:119390      Length:119390

##  1st Qu.: 0.0000   1st Qu.: 0.000000   Class :character   Class :character

##  Median : 0.0000   Median : 0.000000   Mode  :character   Mode  :character

##  Mean   : 0.1039   Mean   : 0.007949

##  3rd Qu.: 0.0000   3rd Qu.: 0.000000

##  Max.   :10.0000   Max.   :10.000000

##  NA's   :4

##  market_segment     distribution_channel is_repeated_guest
##  Length:119390      Length:119390        Min.   :0.00000
##  Class :character   Class :character     1st Qu.:0.00000
##  Mode  :character   Mode  :character     Median :0.00000
##                                          Mean   :0.03191
##                                          3rd Qu.:0.00000
##                                          Max.   :1.00000
##
##  previous_cancellations previous_bookings_not_canceled reserved_room_type
##  Min.   : 0.00000       Min.   : 0.0000                Length:119390
##  1st Qu.: 0.00000       1st Qu.: 0.0000                Class :character
##  Median : 0.00000       Median : 0.0000                Mode  :character
##  Mean   : 0.08712       Mean   : 0.1371
##  3rd Qu.: 0.00000       3rd Qu.: 0.0000
##  Max.   :26.00000       Max.   :72.0000
##
##  assigned_room_type booking_changes   deposit_type          agent

##  Length:119390      Min.   : 0.0000   Length:119390      Length:119390

##  Class :character   1st Qu.: 0.0000   Class :character   Class :character

##  Mode  :character   Median : 0.0000   Mode  :character   Mode  :character

##                     Mean   : 0.2211

##                     3rd Qu.: 0.0000
##                      Max.   :21.0000
##
##    company           days_in_waiting_list customer_type           adr
##  Length:119390      Min.   :  0.000      Length:119390      Min.   :  -6.3
8
##  Class :character   1st Qu.:  0.000      Class :character   1st Qu.:  69.2
9
##  Mode  :character   Median :  0.000      Mode  :character   Median :  94.5
8
##                      Mean   :  2.321                         Mean   : 101.8
3
##                      3rd Qu.:  0.000                         3rd Qu.: 126.0
0
##                      Max.   :391.000                         Max.   :5400.0
0
##
##  required_car_parking_spaces total_of_special_requests reservation_status
##  Min.   :0.00000             Min.   :0.0000             Length:119390
##  1st Qu.:0.00000             1st Qu.:0.0000             Class :character
##  Median :0.00000             Median :0.0000             Mode  :character
##  Mean   :0.06252             Mean   :0.5714
##  3rd Qu.:0.00000             3rd Qu.:1.0000
##  Max.   :8.00000             Max.   :5.0000
##
##  reservation_status_date
##  Length:119390
##  Class :character
##  Mode  :character
##
##
##
##
```

```r
str(hotel)
```

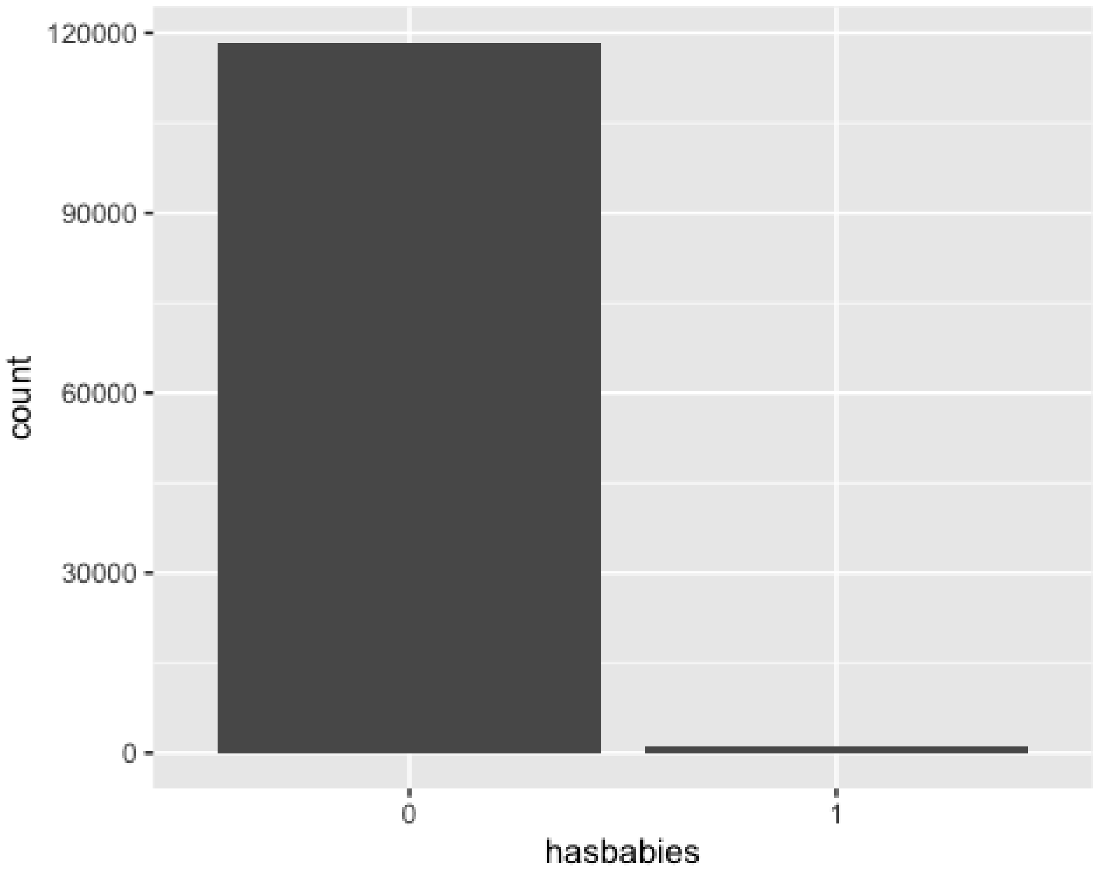
```
## 'data.frame':    119390 obs. of  32 variables:
##  $ hotel                         : chr  "Resort Hotel" "Resort Hotel" "Res
ort Hotel" "Resort Hotel" ...
##  $ is_canceled                   : int  0 0 0 0 0 0 0 0 1 1 ...
##  $ lead_time                     : int  342 737 7 13 14 14 0 9 85 75 ...
##  $ arrival_date_year             : int  2015 2015 2015 2015 2015 2015 2015
 2015 2015 2015 ...
##  $ arrival_date_month            : chr  "July" "July" "July" "July" ...
##  $ arrival_date_week_number      : int  27 27 27 27 27 27 27 27 27 27 ...
##  $ arrival_date_day_of_month     : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ stays_in_weekend_nights       : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ stays_in_week_nights          : int  0 0 1 1 2 2 2 2 3 3 ...
##  $ adults                        : int  2 2 1 1 2 2 2 2 2 2 ...
##  $ children                      : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ babies                        : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ meal                          : chr  "BB" "BB" "BB" "BB" ...
##  $ country                       : chr  "PRT" "PRT" "GBR" "GBR" ...
##  $ market_segment                : chr  "Direct" "Direct" "Direct" "Corpor
ate" ...
##  $ distribution_channel          : chr  "Direct" "Direct" "Direct" "Corpor
ate" ...
##  $ is_repeated_guest             : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ previous_cancellations        : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ previous_bookings_not_canceled: int  0 0 0 0 0 0 0 0 0 0 ...
##  $ reserved_room_type            : chr  "C" "C" "A" "A" ...
##  $ assigned_room_type            : chr  "C" "C" "C" "A" ...
##  $ booking_changes               : int  3 4 0 0 0 0 0 0 0 0 ...
##  $ deposit_type                  : chr  "No Deposit" "No Deposit" "No Depo
sit" "No Deposit" ...
##  $ agent                         : chr  "NULL" "NULL" "NULL" "304" ...
##  $ company                       : chr  "NULL" "NULL" "NULL" "NULL" ...
##  $ days_in_waiting_list          : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ customer_type                 : chr  "Transient" "Transient" "Transient
" "Transient" ...
##  $ adr                           : num  0 0 75 75 98 ...
##  $ required_car_parking_spaces   : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ total_of_special_requests     : int  0 0 0 0 1 1 0 1 1 0 ...
##  $ reservation_status            : chr  "Check-Out" "Check-Out" "Check-Out
" "Check-Out" ...
##  $ reservation_status_date       : chr  "2015-07-01" "2015-07-01" "2015-07
-02" "2015-07-02" ...
```

소주제 1 : baby 의 수/children 의 수와 연관된 변수 파악

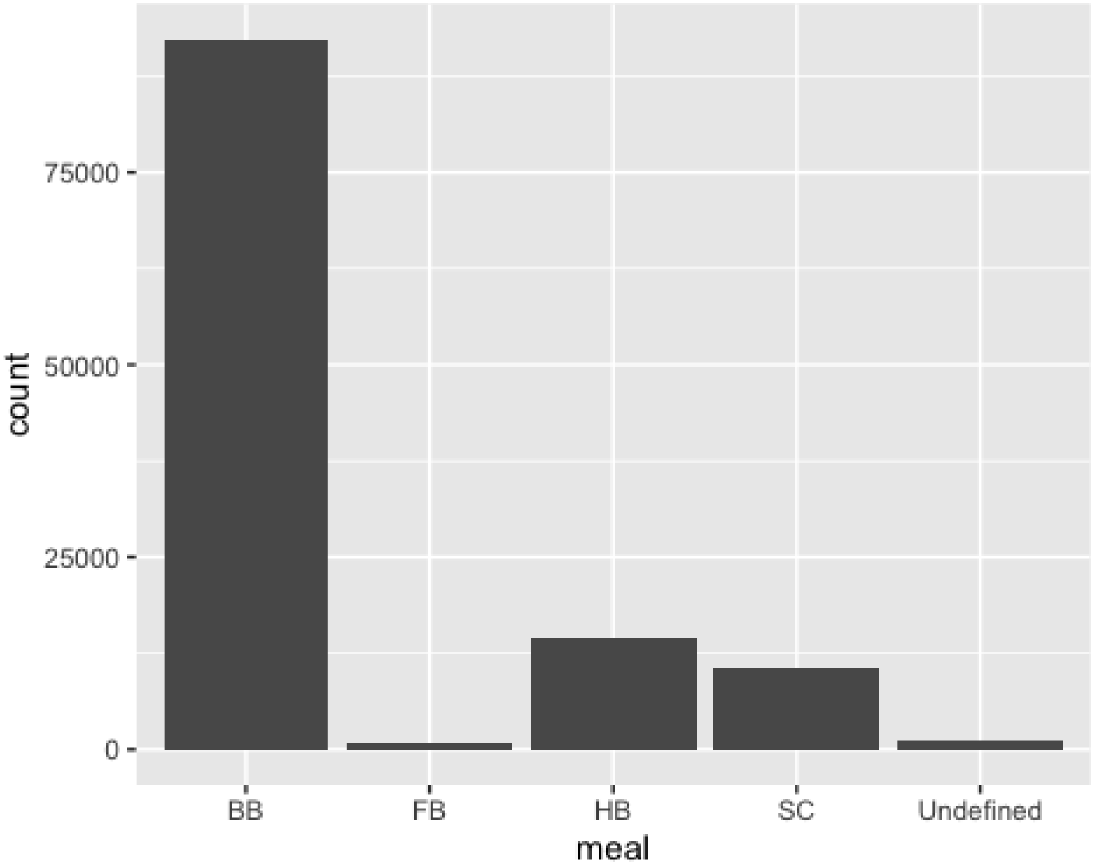
- meal type (식사타입)
- total_of_special_requests (특별 요청 수)
- 가설 1 : baby 의 유무가 meal type 에 영향을 미칠 것이다.
- 가설 2 : baby 의 유무가 total_of_special_requests(특별 요청 수)에 영향을 미칠 것이다.

- 가설 3: baby 의 유무가 meal type 과 total_of_special_requests(특별 요청 수)에 영향을 미칠 것이다. (one-way manova)

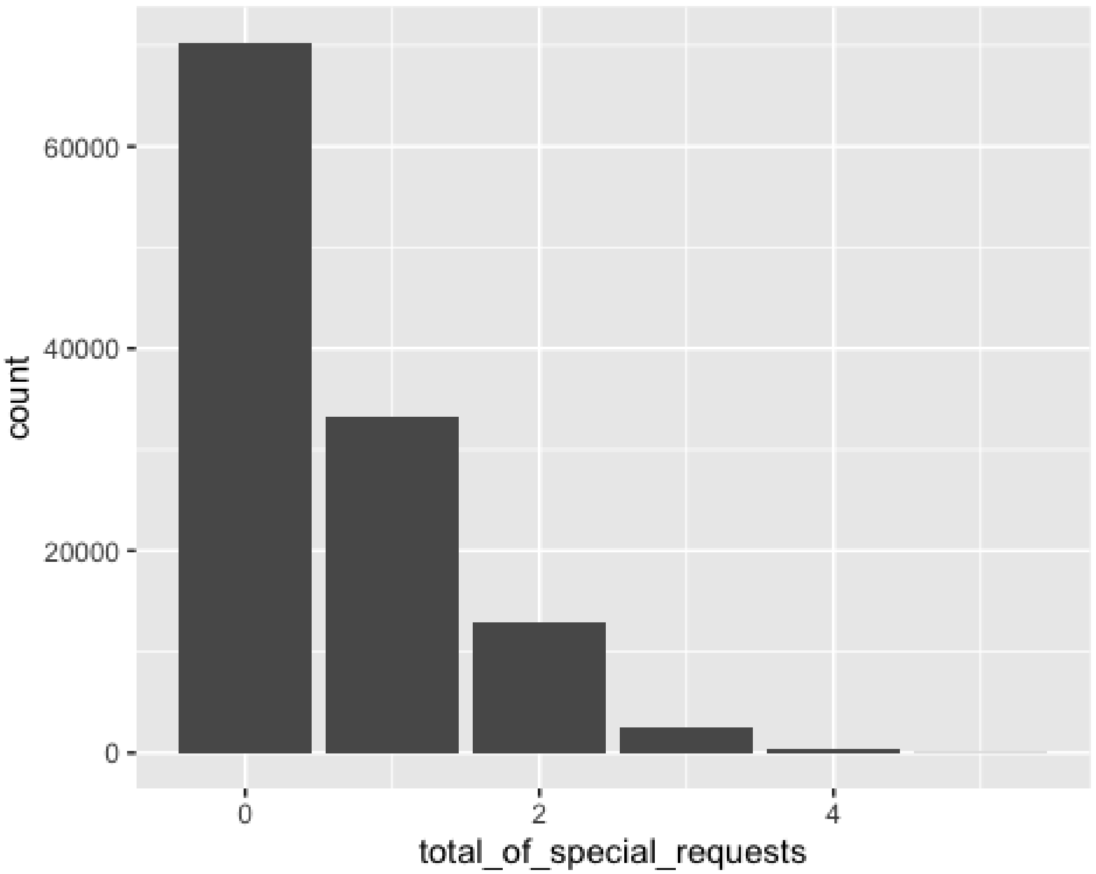
```
#babies
summary(hotel$babies)

##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max. 
##  0.000000  0.000000  0.000000  0.007949  0.000000 10.000000

sum(is.na(hotel$babies))

## [1] 0

sum(ifelse(hotel$babies != 0, 1, 0))

## [1] 917

table(hotel$babies)

## 
##      0      1      2      9     10 
## 118473    900     15      1      1

#baby 유무로 전처리
hotel$hasbabies = ifelse(hotel$babies != "0", 1, 0)
hotel$hasbabies = factor(hotel$hasbabies, levels = c(0, 1), labels = c("0", "
1"))
ggplot(hotel, aes(hasbabies)) + geom_bar()
```



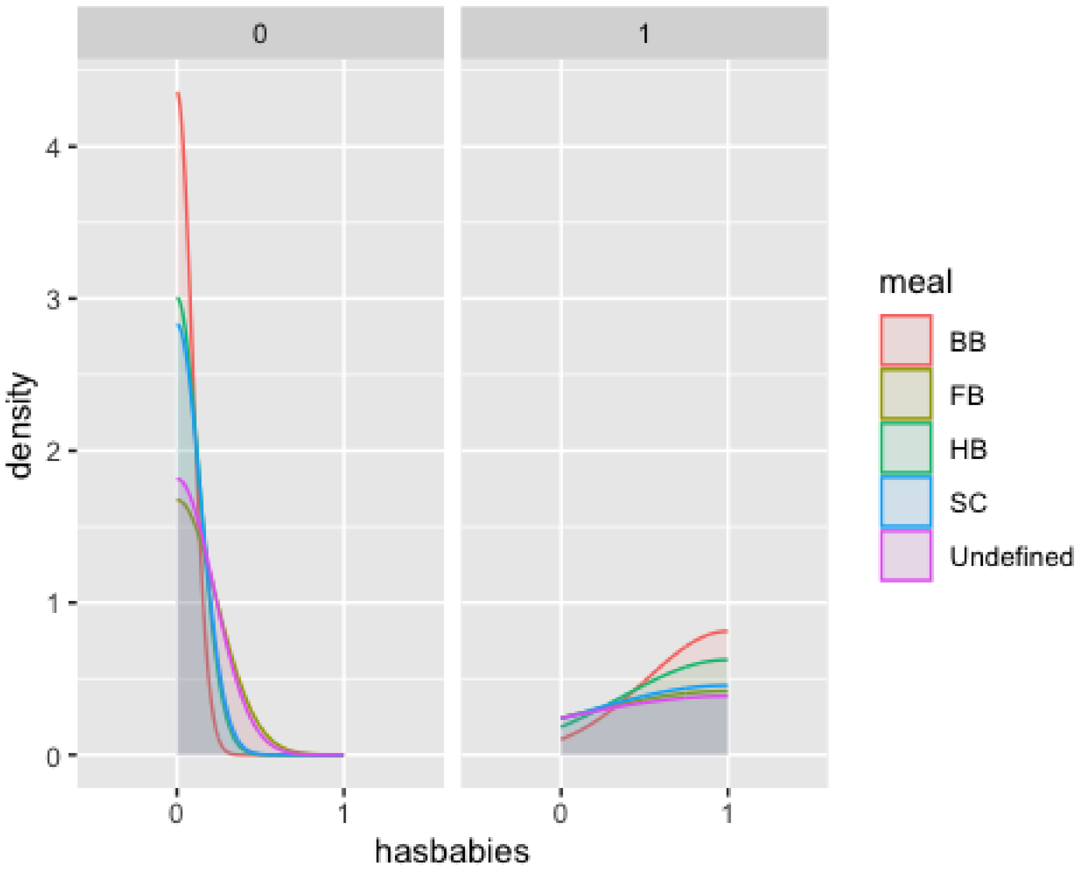
```
#meal type
sum(is.na(hotel$meal))

## [1] 0

table(hotel$meal) #BB : breakfast&Bed / FB : full-board(breakfast, lunch & di
nner) / HB : Half Board (Breakfast and Dinner normally) / SC : self-catering
/ undefined = sc 로 통합하거나 삭제

## 
##        BB        FB        HB        SC Undefined 
##     92310       798     14463     10650      1169

ggplot(hotel, aes(meal)) + geom_bar()
```



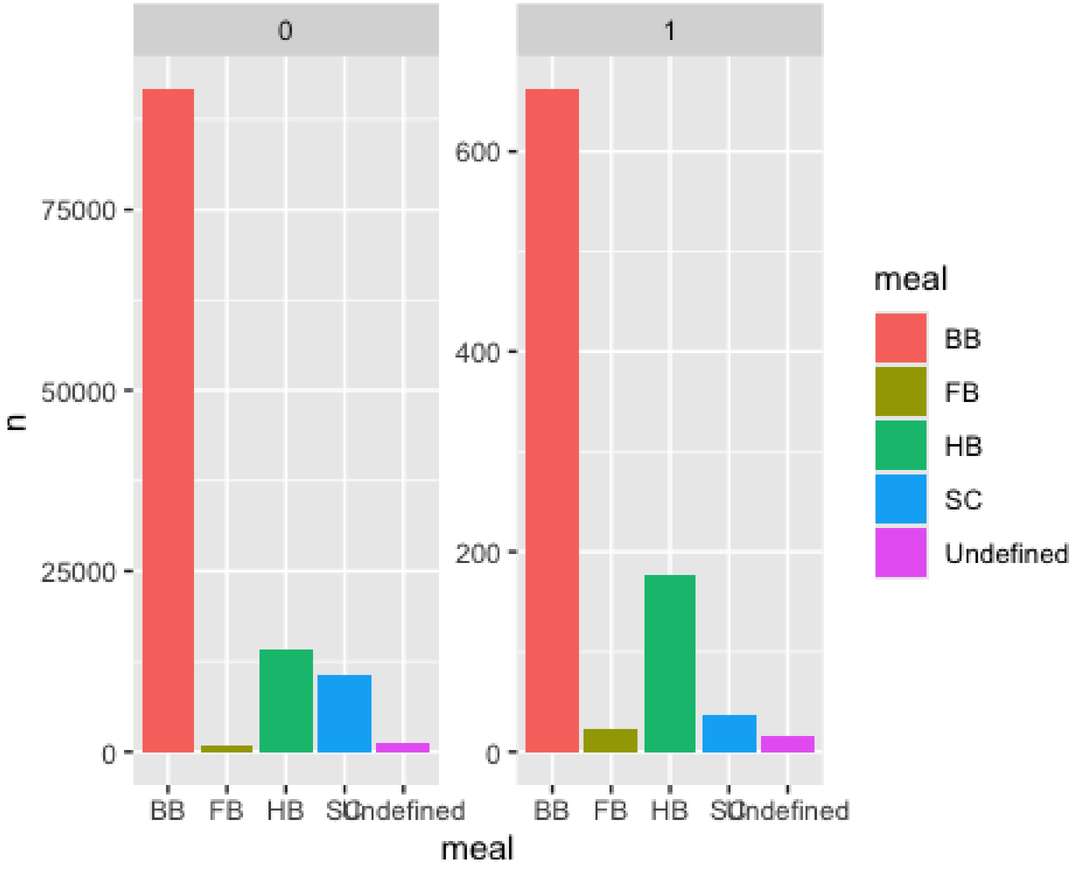
```
#total_of_special_requests
summary(hotel$total_of_special_requests)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##  0.0000  0.0000  0.0000  0.5714  1.0000  5.0000

sum(is.na(hotel$total_of_special_requests))

## [1] 0

table(hotel$total_of_special_requests)

## 
##     0     1     2     3     4     5 
## 70318 33226 12969  2497   340    40

ggplot(hotel, aes(total_of_special_requests)) + geom_bar()
```



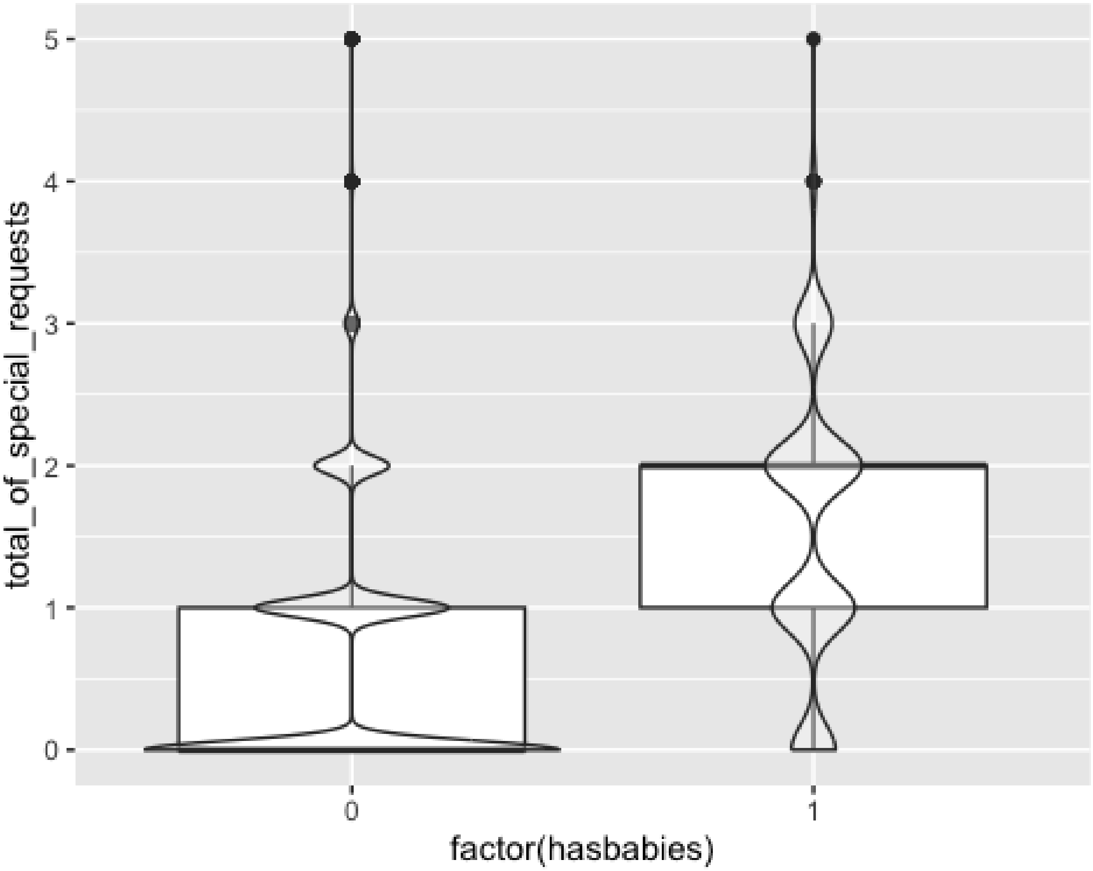
```
#hyp 1 : babies - meal type
ggplot(hotel, aes(x = hasbabies, colour = meal, fill = meal)) + geom_density(
alpha = 0.1) + facet_wrap(~hasbabies)
```



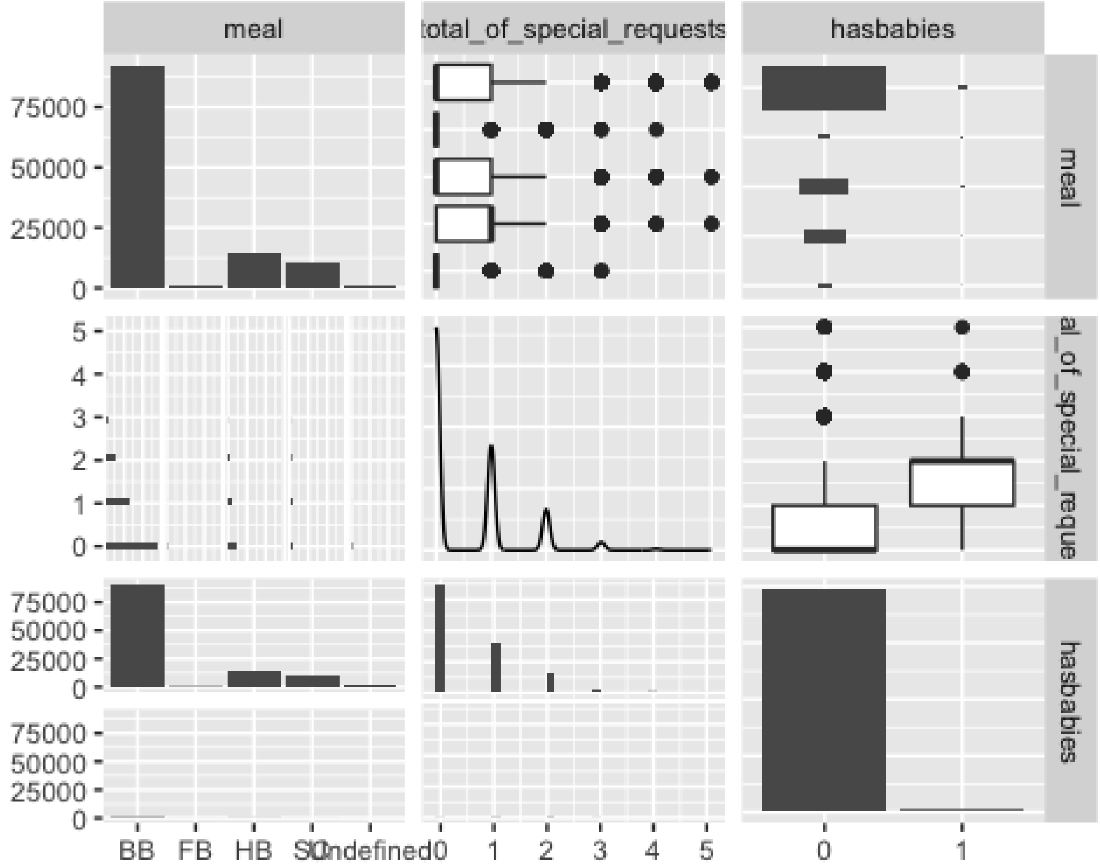
```
hotel %>% group_by(meal, hasbabies) %>% summarise(n=n()) %>% ggplot(aes(meal,
n,fill=meal)) + geom_bar(stat = 'identity', position='dodge') + facet_wrap(~h
asbabies, scales = "free_y")

## `summarise()` has grouped output by 'meal'. You can override using the
## `.groups` argument.
```



```
#hyp 2 : babies - total_of_special_requests
ggplot(hotel, aes(x = factor(hasbabies), y = total_of_special_requests)) + ge
om_boxplot() + geom_violin(alpha = 0.3)
```



```
#hyp 3 : babies - meal type & total_of_special_requests

ggpairs(hotel[,c(13,30,33)])

## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```


meal
total_of_special_requests
hasbabies
meal
al_of_special_reque
hasbabies
75000
50000
25000
0
5
4
3
2
1
0
75000
50000
25000
0
75000
50000
25000
0
BB
FB
HB
SC
Undefined
0
1
2
3
4
5
0
1