

Sinhuja's CIND820 Code

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R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
library(dplyr)
```

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

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

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

```
#install.packages("polycor")  
library(polycor)  
EvaluationRaw <- read.csv('ApartmentBuildingEvaluation.csv', header= TRUE)  
summary(EvaluationRaw)
```

```
##      X_id      BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS  
## Min.   :260124 Min.   :1      Min.   : 0.000 Min.   :  0.00  
## 1st Qu.:260992 1st Qu.:3      1st Qu.: 3.000 1st Qu.: 24.00  
## Median :261861 Median :4      Median : 5.000 Median : 52.00  
## Mean   :261861 Mean   :4      Mean   : 7.713 Mean   : 90.83  
## 3rd Qu.:262730 3rd Qu.:5      3rd Qu.:10.000 3rd Qu.:124.00  
## Max.   :263598 Max.   :5      Max.   :51.000 Max.   :4111.00  
##      NA's :1314  
##      ELEVATORS ENTRANCE_DOORS WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON  
## Min.   :2.000 Min.   :1.000      Min.   :2.000      : 348  
## 1st Qu.:4.000 1st Qu.:4.000      1st Qu.:3.000 10/30/2019: 85
```

```

## Median :4.000 Median :4.000 Median :4.000 11/27/2019: 80
## Mean :4.107 Mean :3.924 Mean :3.973 11/28/2019: 76
## 3rd Qu.:5.000 3rd Qu.:4.000 3rd Qu.:4.000 10/28/2019: 71
## Max. :5.000 Max. :5.000 Max. :5.000 11/18/2019: 71
## NA's :1551 NA's :353 NA's :353 (Other) :2744
## EXTERIOR_CLADDING EXTERIOR_GROUNDS EXTERIOR_WALKWAYS GARBAGE_BIN_STORAGE_AREA
## Min. :1.00 Min. :1.000 Min. :1.000 Min. :1.000
## 1st Qu.:3.00 1st Qu.:3.000 1st Qu.:3.000 1st Qu.:3.000
## Median :4.00 Median :4.000 Median :4.000 Median :4.000
## Mean :3.74 Mean :3.876 Mean :3.856 Mean :3.821
## 3rd Qu.:4.00 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000
## Max. :5.00 Max. :5.000 Max. :5.000 Max. :5.000
## NA's :354 NA's :355 NA's :354 NA's :354
## GARBAGE_CHUTE_ROOMS GRAFFITI INTERIOR_LIGHTING_LEVELS
## Min. :1.000 Min. :1.000 Min. :1.000
## 1st Qu.:3.000 1st Qu.:5.000 1st Qu.:3.000
## Median :4.000 Median :5.000 Median :4.000
## Mean :3.816 Mean :4.743 Mean :3.936
## 3rd Qu.:4.000 3rd Qu.:5.000 3rd Qu.:4.000
## Max. :5.000 Max. :5.000 Max. :5.000
## NA's :2064 NA's :354 NA's :354
## INTERIOR_WALL_CEILING_FLOOR INTERNAL_GUARDS_HANDRAILS LAUNDRY_ROOMS
## Min. :1.00 Min. :2.000 Min. :1.000
## 1st Qu.:3.00 1st Qu.:3.000 1st Qu.:3.000
## Median :4.00 Median :4.000 Median :4.000
## Mean :3.74 Mean :3.866 Mean :3.803
## 3rd Qu.:4.00 3rd Qu.:4.000 3rd Qu.:4.000
## Max. :5.00 Max. :5.000 Max. :5.000
## NA's :354 NA's :354 NA's :465
## NO_OF_AREAS_EVALUATED OTHER_FACILITIES PARKING_AREA PROPERTY_TYPE
## Min. : 0.00 Min. :2.000 Min. :1.000 PRIVATE :2909
## 1st Qu.:15.00 1st Qu.:4.000 1st Qu.:3.000 SOCIAL HOUSING: 238
## Median :17.00 Median :4.000 Median :4.000 TCHC : 328
## Mean :15.57 Mean :4.322 Mean :3.572
## 3rd Qu.:19.00 3rd Qu.:5.000 3rd Qu.:4.000
## Max. :20.00 Max. :5.000 Max. :5.000
## NA's :2838 NA's :635
## RESULTS_OF_SCORE RSN
## : 22 Min. :4152554
## Building Audit : 19 1st Qu.:4153688
## Evaluation needs to be conducted in 1 year : 313 Median :4154609
## Evaluation needs to be conducted in 2 years:1847 Mean :4172264
## Evaluation needs to be conducted in 3 years:1274 3rd Qu.:4155556
## Max. :4902355
##
## SCORE SECURITY SITE_ADDRESS
## Min. : 37.00 Min. :1.00 1625-1641 KINGSTON RD : 3
## 1st Qu.: 72.00 1st Qu.:4.00 40-50 ALEXANDER ST : 3
## Median : 78.00 Median :5.00 2085-2101 ISLINGTON AVE : 2
## Mean : 77.41 Mean :4.47 740 MIDLAND AVE : 2

```

```
## 3rd Qu.: 83.00    3rd Qu.:5.00    75-85 SILVER SPRINGS BLVD :    2
## Max.    :100.00   Max.    :5.00    85-95 THORNCLIFFE PARK DR :    2
## NA's    :22      NA's    :355    (Other)                      :3461
## STAIRWELLS STORAGE_AREAS_LOCKERS WARD
## Min.    :1.000   Min.    :1.000   Min.    : 1.00
## 1st Qu.:3.000   1st Qu.:3.000   1st Qu.: 5.00
## Median :4.000   Median :4.000   Median :12.00
## Mean    :3.724   Mean    :3.789   Mean    :11.08
## 3rd Qu.:4.000   3rd Qu.:4.000   3rd Qu.:16.00
## Max.    :5.000   Max.    :5.000   Max.    :25.00
## NA's    :353     NA's    :1934
## WATER_PEN_EXT_BLDG_ELEMENTS YEAR_BUILT YEAR_REGISTERED
## Min.    :1.00           Min.    :1805   Min.    :2017
## 1st Qu.:4.00           1st Qu.:1955   1st Qu.:2017
## Median :4.00           Median :1962   Median :2017
## Mean    :3.94           Mean    :1962   Mean    :2017
## 3rd Qu.:4.00           3rd Qu.:1970   3rd Qu.:2017
## Max.    :5.00           Max.    :2019   Max.    :2021
## NA's    :354           NA's    :29     NA's    :100
```

```
head(EvaluationRaw)
```

```
##      X_id BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS ELEVATORS
## 1 260124           NA           4           29           3
## 2 260125           NA           3           11          NA
## 3 260126           NA           4           23          NA
## 4 260127           4          12           96           4
## 5 260128           NA           4           30           4
## 6 260129           NA           8           88           4
## ENTRANCE_DOORS_WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON
## 1           4           3          11/05/2020
## 2           NA          NA
## 3           4           4          12/08/2020
## 4           4           4          11/10/2020
## 5           5           5          12/03/2019
## 6           3           4          12/16/2020
## EXTERIOR_CLADDING EXTERIOR_GROUNDS EXTERIOR_WALKWAYS GARBAGE_BIN_STORAGE_AREA
## 1           3           3           3           4
## 2           NA          NA          NA          NA
## 3           4           3           3           3
## 4           4           4           4           3
## 5           4           4           4           5
## 6           4           3           3           4
## GARBAGE_CHUTE_ROOMS GRAFFITI INTERIOR_LIGHTING_LEVELS
## 1           NA          4           4
## 2           NA          NA          NA
## 3           NA          4           4
## 4           3           3           4
## 5           4           4           5
```

## 6	NA	4	4
##	INTERIOR_WALL_CEILING_FLOOR	INTERNAL_GUARDS_HANDRAILS	LAUNDRY_ROOMS
## 1	3	4	4
## 2	NA	NA	NA
## 3	3	3	4
## 4	3	4	3
## 5	4	4	5
## 6	4	4	4
##	NO_OF_AREAS_EVALUATED	OTHER_FACILITIES	PARKING_AREA
## 1	15	NA	NA
## 2	0	NA	NA
## 3	14	NA	NA
## 4	19	NA	3
## 5	16	NA	NA
## 6	16	NA	3
##		RESULTS_OF_SCORE	RSN SCORE SECURITY
## 1	Evaluation needs to be conducted in 2 years		4153010 69 4
## 2	Evaluation needs to be conducted in 1 year		4153027 60 NA
## 3	Evaluation needs to be conducted in 2 years		4153035 73 5
## 4	Evaluation needs to be conducted in 2 years		4153486 74 5
## 5	Evaluation needs to be conducted in 3 years		4153496 86 4
## 6	Evaluation needs to be conducted in 2 years		4153497 75 4
##	SITE_ADDRESS	STAIRWELLS	STORAGE_AREAS_LOCKERS WARD
## 1	194 DOWLING AVE	3	NA 4
## 2	1479 QUEEN ST W	NA	NA 4
## 3	1387 QUEEN ST W	3	NA 4
## 4	100 ALEXANDER ST	3	4 13
## 5	77 WELLESLEY ST E	4	NA 13
## 6	85 WELLESLEY ST E	4	NA 13
##	WATER_PEN_EXT_BLDG_ELEMENTS	YEAR_BUILT	YEAR_REGISTERED
## 1	3	2010	2017
## 2	NA	1917	2017
## 3	4	1910	2017
## 4	4	1968	2017
## 5	4	1926	2017
## 6	4	1965	2018

```
Evaluation1 <- na.omit(EvaluationRaw)
```

#Removed the blanks from the data set as it was incomplete data.The N/A were removed to ensure that all data was filled accurately missing data was removed as there was no score or certain attributes were not taken into consideration.

```
summary(Evaluation1)
```

##	x_id	BALCONY_GUARDS	CONFIRMED_STOREYS	CONFIRMED_UNITS
##	Min. :260132	Min. :2.000	Min. : 3.0	Min. : 21
##	1st Qu.:261110	1st Qu.:4.000	1st Qu.:10.0	1st Qu.:121
##	Median :261989	Median :4.000	Median :16.0	Median :175
##	Mean :261942	Mean :4.235	Mean :15.5	Mean :194
##	3rd Qu.:262832	3rd Qu.:5.000	3rd Qu.:19.0	3rd Qu.:235

```

## Max. :263562 Max. :5.000 Max. :37.0 Max. :575
##
## ELEVATORS ENTRANCE_DOORS WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON
## Min. :2.00 Min. :3.000 Min. :3.00 10/29/2019: 17
## 1st Qu.:4.00 1st Qu.:4.000 1st Qu.:4.00 11/07/2019: 15
## Median :4.00 Median :4.000 Median :5.00 11/27/2019: 14
## Mean :4.28 Mean :4.263 Mean :4.49 11/06/2019: 13
## 3rd Qu.:5.00 3rd Qu.:5.000 3rd Qu.:5.00 10/28/2019: 12
## Max. :5.00 Max. :5.000 Max. :5.00 11/28/2019: 10
## (Other) :162
## EXTERIOR_CLADDING EXTERIOR_GROUNDS EXTERIOR_WALKWAYS GARBAGE_BIN_STORAGE_AREA
## Min. :2.000 Min. :3.000 Min. :2.000 Min. :2.00
## 1st Qu.:4.000 1st Qu.:4.000 1st Qu.:4.000 1st Qu.:4.00
## Median :4.000 Median :4.000 Median :4.000 Median :4.00
## Mean :3.979 Mean :4.148 Mean :4.049 Mean :4.14
## 3rd Qu.:4.000 3rd Qu.:5.000 3rd Qu.:5.000 3rd Qu.:5.00
## Max. :5.000 Max. :5.000 Max. :5.000 Max. :5.00
##
## GARBAGE_CHUTE_ROOMS GRAFFITI INTERIOR_LIGHTING_LEVELS
## Min. :2.00 Min. :2.000 Min. :2.000
## 1st Qu.:4.00 1st Qu.:5.000 1st Qu.:4.000
## Median :4.00 Median :5.000 Median :4.000
## Mean :4.07 Mean :4.844 Mean :4.309
## 3rd Qu.:5.00 3rd Qu.:5.000 3rd Qu.:5.000
## Max. :5.00 Max. :5.000 Max. :5.000
##
## INTERIOR_WALL_CEILING_FLOOR INTERNAL_GUARDS_HANDRAILS LAUNDRY_ROOMS
## Min. :2.000 Min. :3.000 Min. :3.00
## 1st Qu.:4.000 1st Qu.:4.000 1st Qu.:4.00
## Median :4.000 Median :4.000 Median :4.00
## Mean :3.992 Mean :4.148 Mean :4.21
## 3rd Qu.:4.000 3rd Qu.:5.000 3rd Qu.:5.00
## Max. :5.000 Max. :5.000 Max. :5.00
##
## NO_OF_AREAS_EVALUATED OTHER_FACILITIES PARKING_AREA PROPERTY_TYPE
## Min. :20 Min. :3.000 Min. :1.000 PRIVATE :200
## 1st Qu.:20 1st Qu.:4.000 1st Qu.:3.000 SOCIAL HOUSING: 25
## Median :20 Median :5.000 Median :4.000 TCHC : 18
## Mean :20 Mean :4.428 Mean :3.667
## 3rd Qu.:20 3rd Qu.:5.000 3rd Qu.:4.000
## Max. :20 Max. :5.000 Max. :5.000
##
## RESULTS_OF_SCORE RSN
## : 0 Min. :4152570
## Building Audit : 0 1st Qu.:4153814
## Evaluation needs to be conducted in 1 year : 3 Median :4154773
## Evaluation needs to be conducted in 2 years: 69 Mean :4166086
## Evaluation needs to be conducted in 3 years:171 3rd Qu.:4155798
## Max. :4626360
##

```

```

##          SCORE          SECURITY          SITE_ADDRESS  STAIRWELLS
##  Min.      :59.00    Min.      :3.00    40-50 ALEXANDER ST      : 3    Min.      :2.000
##  1st Qu.:79.50    1st Qu.:5.00    2085-2101 ISLINGTON AVE : 2    1st Qu.:4.000
##  Median :85.00    Median :5.00    1 RICHVIEW RD          : 1    Median :4.000
##  Mean   :84.12    Mean   :4.72    1 ROSEMOUNT DR         : 1    Mean   :3.979
##  3rd Qu.:90.00    3rd Qu.:5.00    10 BOULTBEE AVE        : 1    3rd Qu.:4.500
##  Max.   :99.00    Max.   :5.00    10 CHICHESTER PL       : 1    Max.   :5.000
##                                     (Other)                :234
##  STORAGE_AREAS_LOCKERS      WARD      WATER_PEN_EXT_BLDG_ELEMENTS
##  Min.      :2.000          Min.      : 1.00    Min.      :2.000
##  1st Qu.:4.000          1st Qu.: 6.00    1st Qu.:4.000
##  Median :4.000          Median :12.00    Median :4.000
##  Mean   :3.988          Mean   :12.21    Mean   :4.177
##  3rd Qu.:4.000          3rd Qu.:17.00    3rd Qu.:5.000
##  Max.   :5.000          Max.   :25.00    Max.   :5.000
##
##  YEAR_BUILT  YEAR_REGISTERED
##  Min.      :1955    Min.      :2017
##  1st Qu.:1965    1st Qu.:2017
##  Median :1969    Median :2017
##  Mean   :1973    Mean   :2017
##  3rd Qu.:1974    3rd Qu.:2017
##  Max.   :2019    Max.   :2019
##

```

```

Evaluation1$PROPERTY_TYPE <- as.character(Evaluation1$PROPERTY_TYPE)
#Changed the property type from factor to character.
str(Evaluation1)

```

```
## 'data.frame':    243 obs. of  33 variables:
## $ X_id          : int   260132 260137 260156 260162 260186 260234 260
246 260263 260264 260293 ...
## $ BALCONY_GUARDS      : num   4 4 4 4 5 5 5 4 4 4 ...
## $ CONFIRMED_STOREYS    : num   33 19 15 6 25 19 17 9 7 12 ...
## $ CONFIRMED_UNITS      : num   319 225 203 75 547 224 146 130 150 83 ...
## $ ELEVATORS           : num    5 4 3 4 4 3 5 3 4 4 ...
## $ ENTRANCE_DOORS_WINDOWS : num    4 4 4 5 4 5 5 4 4 4 ...
## $ ENTRANCE_LOBBY      : num    5 5 3 5 5 3 5 4 4 5 ...
## $ EVALUATION_COMPLETED_ON : Factor w/ 203 levels "", "01/02/2018",...: 67 133 14
5 111 150 91 191 117 100 177 ...
## $ EXTERIOR_CLADDING    : num    3 4 4 4 4 5 5 3 4 4 ...
## $ EXTERIOR_GROUNDS     : num    4 4 4 4 4 4 5 4 4 4 ...
## $ EXTERIOR_WALKWAYS    : num    5 3 4 4 4 4 5 4 4 4 ...
## $ GARBAGE_BIN_STORAGE_AREA : num    4 4 4 5 4 4 5 4 5 4 ...
## $ GARBAGE_CHUTE_ROOMS  : num    4 4 4 5 5 3 3 4 4 4 ...
## $ GRAFFITI            : num    5 5 5 5 5 4 5 5 5 4 ...
## $ INTERIOR_LIGHTING_LEVELS : num    5 3 4 5 4 4 5 3 3 5 ...
## $ INTERIOR_WALL_CEILING_FLOOR: num    5 4 4 4 4 3 4 3 3 4 ...
## $ INTERNAL_GUARDS_HANDRAILS : num    4 4 4 4 3 4 5 4 4 4 ...
## $ LAUNDRY_ROOMS       : num    5 4 4 4 4 4 3 4 4 5 ...
## $ NO_OF_AREAS_EVALUATED : int   20 20 20 20 20 20 20 20 20 20 ...
## $ OTHER_FACILITIES     : num    4 4 5 5 4 4 5 4 3 4 ...
## $ PARKING_AREA        : num    4 3 3 4 4 3 5 3 2 4 ...
## $ PROPERTY_TYPE       : chr   "PRIVATE" "PRIVATE" "TCHC" "SOCIAL HOUSING" .
..
## $ RESULTS_OF_SCORE     : Factor w/ 5 levels "", "Building Audit",...: 5 4 4 5
5 4 5 4 4 5 ...
## $ RSN                 : num   4154010 4154519 4156390 4153054 4154930 ...
## $ SCORE               : num    87 80 79 87 85 78 92 76 76 83 ...
## $ SECURITY            : num    5 5 4 5 5 5 4 5 5 5 ...
## $ SITE_ADDRESS        : Factor w/ 3467 levels "1 ANTRIM CRES ",...: 2654 2
171 1707 2686 2328 2303 2312 2412 3063 2712 ...
## $ STAIRWELLS          : num    4 4 4 4 4 3 4 4 3 4 ...
## $ STORAGE_AREAS_LOCKERS : num    4 4 4 4 5 4 4 4 3 3 ...
## $ WARD                : int    8 8 22 4 12 5 24 6 6 6 ...
## $ WATER_PEN_EXT_BLDG_ELEMENTS: num    4 4 4 3 4 4 5 3 4 4 ...
## $ YEAR_BUILT           : num   1974 1974 1971 1990 1964 ...
## $ YEAR_REGISTERED      : num   2017 2017 2017 2017 2017 ...
## - attr(*, "na.action")= 'omit' Named int   1 2 3 4 5 6 7 8 10 11 ...
## ..- attr(*, "names")= chr  "1" "2" "3" "4" ...
```

```
#Ensure that the property type was changed.
head(Evaluation1)
```

```
##           X_id BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS ELEVATORS
## 9      260132              4              33              319              5
## 14     260137              4              19              225              4
```

## 33	260156	4	15	203	3
## 39	260162	4	6	75	4
## 63	260186	5	25	547	4
## 111	260234	5	19	224	3
##	ENTRANCE_DOORS_WINDOWS	ENTRANCE_LOBBY	EVALUATION_COMPLETED_ON		
## 9	4	5	03/15/2019		
## 14	4	5	11/20/2019		
## 33	4	3	11/26/2020		
## 39	5	5	11/04/2019		
## 63	4	5	11/28/2019		
## 111	5	3	10/21/2020		
##	EXTERIOR_CLADDING	EXTERIOR_GROUNDS	EXTERIOR_WALKWAYS		
## 9	3	4	5		
## 14	4	4	3		
## 33	4	4	4		
## 39	4	4	4		
## 63	4	4	4		
## 111	5	4	4		
##	GARBAGE_BIN_STORAGE_AREA	GARBAGE_CHUTE_ROOMS	GRAFFITI		
## 9	4	4	5		
## 14	4	4	5		
## 33	4	4	5		
## 39	5	5	5		
## 63	4	5	5		
## 111	4	3	4		
##	INTERIOR_LIGHTING_LEVELS	INTERIOR_WALL_CEILING_FLOOR			
## 9	5	5			
## 14	3	4			
## 33	4	4			
## 39	5	4			
## 63	4	4			
## 111	4	3			
##	INTERNAL_GUARDS_HANDRAILS	LAUNDRY_ROOMS	NO_OF_AREAS_EVALUATED		
## 9	4	5	20		
## 14	4	4	20		
## 33	4	4	20		
## 39	4	4	20		
## 63	3	4	20		
## 111	4	4	20		
##	OTHER_FACILITIES	PARKING_AREA	PROPERTY_TYPE		
## 9	4	4	PRIVATE		
## 14	4	3	PRIVATE		
## 33	5	3	TCHC		
## 39	5	4	SOCIAL HOUSING		
## 63	4	4	PRIVATE		
## 111	4	3	TCHC		
##		RESULTS_OF_SCORE	RSN SCORE SECURITY		
## 9	Evaluation needs to be conducted in 3 years	4154010	87	5	
## 14	Evaluation needs to be conducted in 2 years	4154519	80	5	
## 33	Evaluation needs to be conducted in 2 years	4156390	79	4	


```
## 39 Evaluation needs to be conducted in 3 years 4153054      87      5
## 63 Evaluation needs to be conducted in 3 years 4154930      85      5
## 111 Evaluation needs to be conducted in 2 years 4155913      78      5
##
##          SITE_ADDRESS STAIRWELLS STORAGE_AREAS_LOCKERS WARD
## 9          500  DUPLEX AVE          4          4      8
## 14         3636  BATHURST ST          4          4      8
## 33  2739  VICTORIA PARK AVE          4          4     22
## 39          515  PARKSIDE DR          4          4      4
## 63          400  WALMER RD          4          5     12
## 111         40  FALSTAFF AVE          3          4      5
##
##          WATER_PEN_EXT_BLDG_ELEMENTS YEAR_BUILT YEAR_REGISTERED
## 9                                4      1974      2017
## 14                               4      1974      2017
## 33                               4      1971      2017
## 39                               3      1990      2017
## 63                               4      1964      2017
## 111                              4      1970      2017
```

```
Evaluation1 %>% count(Evaluation1$PROPERTY_TYPE)
```

```
## Evaluation1$PROPERTY_TYPE  n
## 1          PRIVATE 200
## 2      SOCIAL HOUSING  25
## 3          TCHC   18
```

```
#To count how many apartments evaluated were Private, Social Housing, and TCHC
EvalPrivate <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "PRIVATE")
head(EvalPrivate)
```

```
##          X_id BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS ELEVATORS
## 1  260132          4          33          319      5
## 2  260137          4          19          225      4
## 3  260186          5          25          547      4
## 4  260246          5          17          146      5
## 5  260264          4           7          150      4
## 6  260293          4          12           83      4
##
##          ENTRANCE_DOORS_WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON
## 1                                4           5      03/15/2019
## 2                                4           5      11/20/2019
## 3                                4           5      11/28/2019
## 4                                5           5      12/18/2020
## 5                                4           4      10/28/2020
## 6                                4           5      12/11/2020
##
##          EXTERIOR_CLADDING EXTERIOR_GROUNDS EXTERIOR_WALKWAYS GARBAGE_BIN_STORAGE_AREA
## 1              3              4              5              4
## 2              4              4              3              4
## 3              4              4              4              4
## 4              5              5              5              5
```

## 5	4	4	4	5
## 6	4	4	4	4
##	GARBAGE_CHUTE_ROOMS	GRAFFITI	INTERIOR_LIGHTING_LEVELS	
## 1	4	5	5	
## 2	4	5	3	
## 3	5	5	4	
## 4	3	5	5	
## 5	4	5	3	
## 6	4	4	5	
##	INTERIOR_WALL_CEILING_FLOOR	INTERNAL_GUARDS_HANDRAILS	LAUNDRY_ROOMS	
## 1		5	4	5
## 2		4	4	4
## 3		4	3	4
## 4		4	5	3
## 5		3	4	4
## 6		4	4	5
##	NO_OF_AREAS_EVALUATED	OTHER_FACILITIES	PARKING_AREA	PROPERTY_TYPE
## 1	20	4	4	PRIVATE
## 2	20	4	3	PRIVATE
## 3	20	4	4	PRIVATE
## 4	20	5	5	PRIVATE
## 5	20	3	2	PRIVATE
## 6	20	4	4	PRIVATE
##		RESULTS_OF_SCORE	RSN	SCORE SECURITY
## 1	Evaluation needs to be conducted in 3 years	4154010	87	5
## 2	Evaluation needs to be conducted in 2 years	4154519	80	5
## 3	Evaluation needs to be conducted in 3 years	4154930	85	5
## 4	Evaluation needs to be conducted in 3 years	4594874	92	4
## 5	Evaluation needs to be conducted in 2 years	4154619	76	5
## 6	Evaluation needs to be conducted in 3 years	4154696	83	5
##	SITE_ADDRESS	STAIRWELLS	STORAGE_AREAS_LOCKERS	WARD
## 1	500 DUPLEX AVE	4	4	8
## 2	3636 BATHURST ST	4	4	8
## 3	400 WALMER RD	4	5	12
## 4	40 MEADOWGLEN PL	4	4	24
## 5	707-711 FINCH AVE W	3	3	6
## 6	535 SHEPPARD AVE W	4	3	6
##	WATER_PEN_EXT_BLDG_ELEMENTS	YEAR_BUILT	YEAR_REGISTERED	
## 1		4	1974	2017
## 2		4	1974	2017
## 3		4	1964	2017
## 4		5	2019	2019
## 5		4	1964	2017
## 6		4	1965	2017

```

EvalPrivate1 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "PRIVATE" & RESULTS_OF_SCORE == "Evaluation needs to be conducted in 1 year")
count(EvalPrivate1)

```

```
##      n
## 1 1
```

```
EvalPrivate2 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "PRIVATE" & RESULTS_OF_SCORE == "Evaluation needs to be conducted in 2 years")
count(EvalPrivate2)
```

```
##      n
## 1 52
```

```
EvalPrivate3 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "PRIVATE" & RESULTS_OF_SCORE == "Evaluation needs to be conducted in 3 years")
count(EvalPrivate3)
```

```
##      n
## 1 147
```

```
EvalPrivateFull <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "PRIVATE" & RESULTS_OF_SCORE == "Building Audit")
count(EvalPrivateFull)
```

```
##      n
## 1 0
```

```
EvalSocial <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "SOCIAL HOUSING")
head(EvalSocial)
```

```
##      X_id BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS ELEVATORS
## 1 260162      4           6              75             4
## 2 260263      4           9             130             3
## 3 260593      4           5             177             3
## 4 260645      5           4              53             5
## 5 260742      5           4              70             3
## 6 261029      4           3              63             4
##      ENTRANCE_DOORS_WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON
## 1      5           5           11/04/2019
## 2      4           4           11/07/2019
## 3      4           3           12/04/2019
## 4      5           5           11/06/2019
## 5      4           5           11/05/2019
## 6      5           5           10/29/2019
##      EXTERIOR_CLADDING EXTERIOR_GROUNDS EXTERIOR_WALKWAYS GARBAGE_BIN_STORAGE_AREA
## 1      4           4           4           5
## 2      3           4           4           4
```

## 3	4	4	3	4
## 4	5	4	5	4
## 5	4	4	4	4
## 6	4	4	3	5
##	GARBAGE_CHUTE_ROOMS	GRAFFITI	INTERIOR_LIGHTING_LEVELS	
## 1	5	5	5	
## 2	4	5	3	
## 3	3	5	4	
## 4	4	5	5	
## 5	5	5	4	
## 6	5	5	4	
##	INTERIOR_WALL_CEILING_FLOOR	INTERNAL_GUARDS_HANDRAILS	LAUNDRY_ROOMS	
## 1		4	4	4
## 2		3	4	4
## 3		3	4	3
## 4		4	5	5
## 5		4	5	5
## 6		3	4	5
##	NO_OF_AREAS_EVALUATED	OTHER_FACILITIES	PARKING_AREA	PROPERTY_TYPE
## 1	20	5	4	SOCIAL HOUSING
## 2	20	4	3	SOCIAL HOUSING
## 3	20	4	4	SOCIAL HOUSING
## 4	20	5	4	SOCIAL HOUSING
## 5	20	5	4	SOCIAL HOUSING
## 6	20	5	4	SOCIAL HOUSING
##		RESULTS_OF_SCORE	RSN	SCORE SECURITY
## 1	Evaluation needs to be conducted in 3 years		4153054	87 5
## 2	Evaluation needs to be conducted in 2 years		4154607	76 5
## 3	Evaluation needs to be conducted in 2 years		4153633	74 5
## 4	Evaluation needs to be conducted in 3 years		4156140	95 5
## 5	Evaluation needs to be conducted in 3 years		4154772	88 5
## 6	Evaluation needs to be conducted in 3 years		4155222	87 5
##	SITE_ADDRESS	STAIRWELLS	STORAGE_AREAS_LOCKERS	WARD
## 1	515 PARKSIDE DR	4	4	4
## 2	4266 BATHURST ST	4	4	6
## 3	1070 QUEEN ST E	3	3	14
## 4	45 CUMMER AVE	5	5	18
## 5	7 THE DONWAY E	3	5	16
## 6	773 THE QUEENSWAY	4	4	3
##	WATER_PEN_EXT_BLDG_ELEMENTS	YEAR_BUILT	YEAR_REGISTERED	
## 1		3 1990	2017	
## 2		3 1983	2017	
## 3		4 1993	2017	
## 4		5 1996	2017	
## 5		5 1989	2017	
## 6		5 1993	2017	

```
EvalSocial1 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "SOCIAL HOUSING" & RESULTS_
OF_SCORE == "Evaluation needs to be conducted in 1 year")
count(EvalSocial1)
```

```
##      n
## 1 1
```

```
EvalSocial2 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "SOCIAL HOUSING" & RESULTS_
OF_SCORE == "Evaluation needs to be conducted in 2 years")
count(EvalSocial2)
```

```
##      n
## 1 9
```

```
EvalSocial3 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "SOCIAL HOUSING" & RESULTS_
OF_SCORE == "Evaluation needs to be conducted in 3 years")
count(EvalSocial3)
```

```
##      n
## 1 15
```

```
EvalSocialFull <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "SOCIAL HOUSING" & RESUL
TS_OF_SCORE == "Building Audit")
count(EvalSocialFull)
```

```
##      n
## 1 0
```

```
EvalTCHC <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "TCHC")
head(EvalTCHC)
```

```
##      X_id BALCONY_GUARDS CONFIRMED_STOREYS CONFIRMED_UNITS ELEVATORS
## 1 260156          4          15          203          3
## 2 260234          5          19          224          3
## 3 260303          2          24          447          3
## 4 260430          3          12          162          4
## 5 260619          3          18          176          3
## 6 260794          4          15          201          4
##      ENTRANCE_DOORS_WINDOWS ENTRANCE_LOBBY EVALUATION_COMPLETED_ON
## 1          4          3          11/26/2020
## 2          5          3          10/21/2020
## 3          3          4          12/05/2019
## 4          4          3          10/28/2019
```

## 5	3	3	10/15/2020	
## 6	4	4	11/26/2020	
##	EXTERIOR_CLADDING	EXTERIOR_GROUNDS	EXTERIOR_WALKWAYS	GARBAGE_BIN_STORAGE_AREA
## 1	4	4	4	4
## 2	5	4	4	4
## 3	3	4	4	3
## 4	4	3	4	3
## 5	3	4	3	3
## 6	4	4	4	4
##	GARBAGE_CHUTE_ROOMS	GRAFFITI	INTERIOR_LIGHTING_LEVELS	
## 1	4	5	4	
## 2	3	4	4	
## 3	3	5	3	
## 4	2	5	4	
## 5	3	5	4	
## 6	4	5	4	
##	INTERIOR_WALL_CEILING_FLOOR	INTERNAL_GUARDS_HANDRAILS	LAUNDRY_ROOMS	
## 1		4	4	4
## 2		3	4	4
## 3		2	4	4
## 4		2	4	3
## 5		4	3	4
## 6		4	4	4
##	NO_OF_AREAS_EVALUATED	OTHER_FACILITIES	PARKING_AREA	PROPERTY_TYPE
## 1	20	5	3	TCHC
## 2	20	4	3	TCHC
## 3	20	3	3	TCHC
## 4	20	4	4	TCHC
## 5	20	3	4	TCHC
## 6	20	5	4	TCHC
##		RESULTS_OF_SCORE	RSN	SCORE SECURITY
## 1	Evaluation needs to be conducted in 2 years	4156390	79	4
## 2	Evaluation needs to be conducted in 2 years	4155913	78	5
## 3	Evaluation needs to be conducted in 2 years	4155587	68	5
## 4	Evaluation needs to be conducted in 2 years	4155705	68	4
## 5	Evaluation needs to be conducted in 2 years	4154259	70	4
## 6	Evaluation needs to be conducted in 3 years	4155942	82	4
##	SITE_ADDRESS	STAIRWELLS	STORAGE_AREAS_LOCKERS	WARD
## 1	2739 VICTORIA PARK AVE	4	4	22
## 2	40 FALSTAFF AVE	3	4	5
## 3	100 HIGH PARK AVE	3	3	4
## 4	2067 ISLINGTON AVE	2	2	1
## 5	3101 WESTON RD	3	3	7
## 6	2743 VICTORIA PARK AVE	4	4	22
##	WATER_PEN_EXT_BLDG_ELEMENTS	YEAR_BUILT	YEAR_REGISTERED	
## 1		4	1971	2017
## 2		4	1970	2017
## 3		4	1969	2017
## 4		4	1973	2017
## 5		5	1984	2017

```
## 6
```

```
4
```

```
1971
```

```
2017
```

```
EvalTCHC1 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "TCHC" & RESULTS_OF_SCORE ==  
"Evaluation needs to be conducted in 1 year")  
count(EvalTCHC1)
```

```
##      n  
## 1 1
```

```
EvalTCHC2 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "TCHC" & RESULTS_OF_SCORE ==  
"Evaluation needs to be conducted in 2 years")  
count(EvalTCHC2)
```

```
##      n  
## 1 8
```

```
EvalTCHC3 <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "TCHC" & RESULTS_OF_SCORE ==  
"Evaluation needs to be conducted in 3 years")  
count(EvalTCHC3)
```

```
##      n  
## 1 9
```

```
EvalTCHCFull <- dplyr::filter(Evaluation1,PROPERTY_TYPE == "TCHC" & RESULTS_OF_SCORE  
== "Building Audit")  
count(EvalTCHCFull)
```

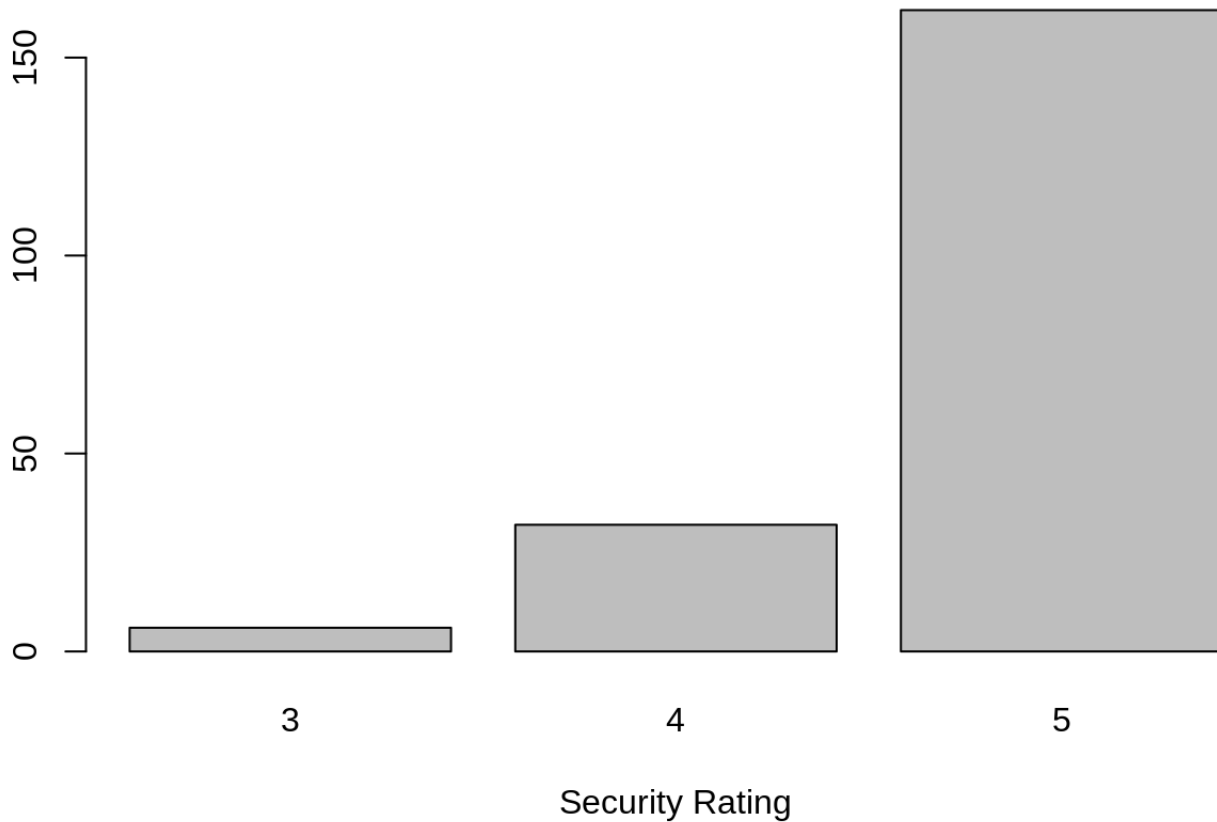
```
##      n  
## 1 0
```

```
# Counts how many out of each property type has a result of Evaluation needed in 1 ye  
ar, Evaluation needed in 2 years, and Full audit needed.  
countPrivate <- table(EvalPrivate$SECURITY)  
EvalPrivate %>% count(EvalPrivate$SECURITY)
```

```
##      EvalPrivate$SECURITY      n  
## 1                3      6  
## 2                4     32  
## 3                5    162
```

```
barplot(countPrivate, main="Private Apartments' Security Rating", xlab="Security Rati  
ng")
```

Private Apartments' Security Rating

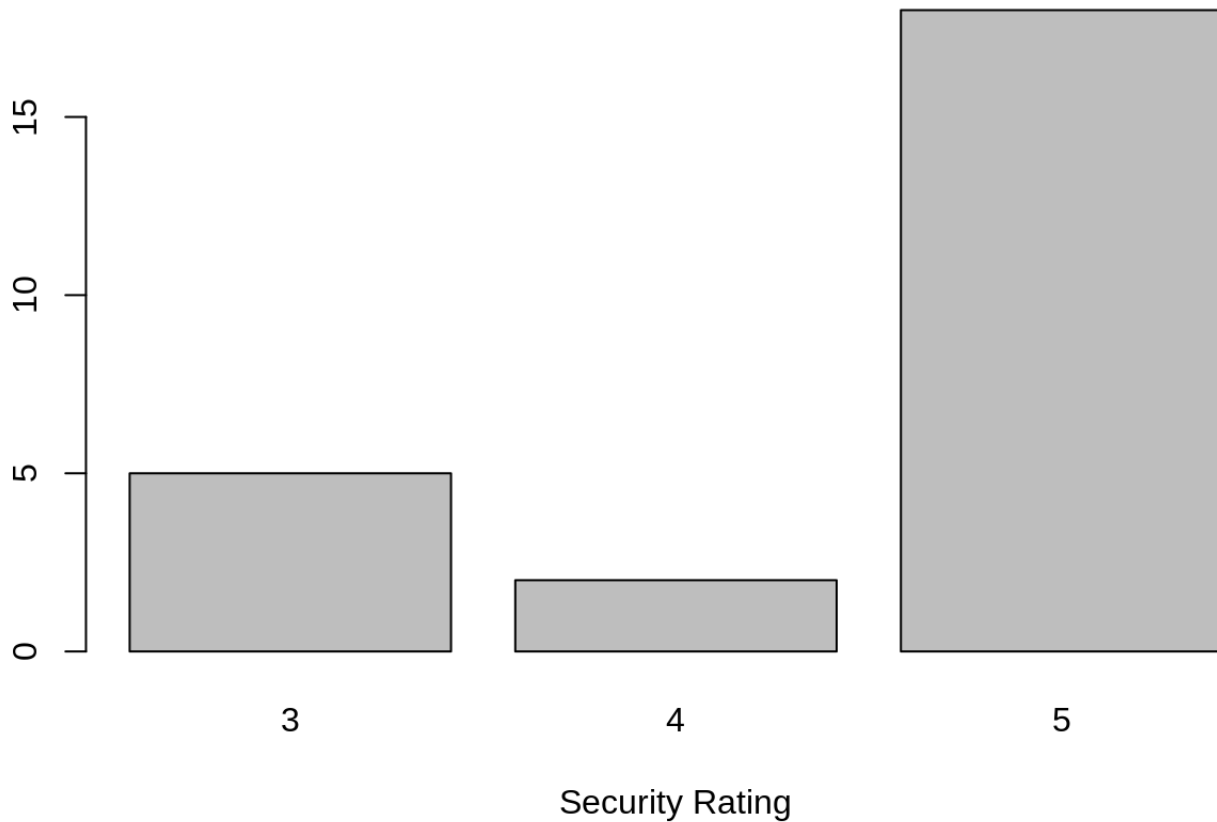


```
countSocial <- table(EvalSocial$SECURITY)
EvalSocial %>% count(EvalSocial$SECURITY)
```

```
##   EvalSocial$SECURITY   n
## 1                   3    5
## 2                   4    2
## 3                   5  168
```

```
barplot(countSocial, main="Social Apartments' Security Rating", xlab="Security Rating")
```


Social Apartments' Security Rating

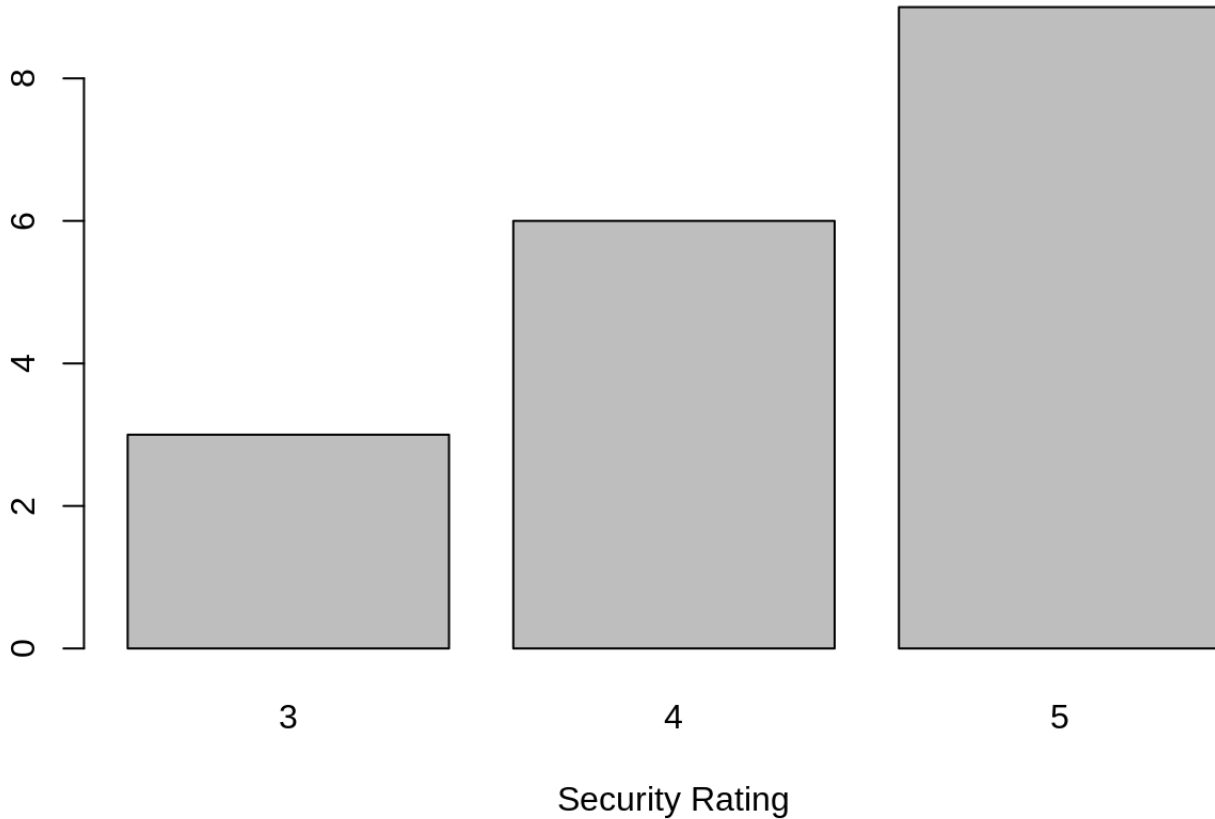


```
countTCHC <- table(EvalTCHC$SECURITY)
EvalTCHC %>% count(EvalTCHC$SECURITY)
```

```
##   EvalTCHC$SECURITY n
## 1                 3 3
## 2                 4 6
## 3                 5 9
```

```
barplot(countTCHC, main="TCHC Apartments' Security Rating", xlab="Security Rating")
```

TCHC Apartments' Security Rating

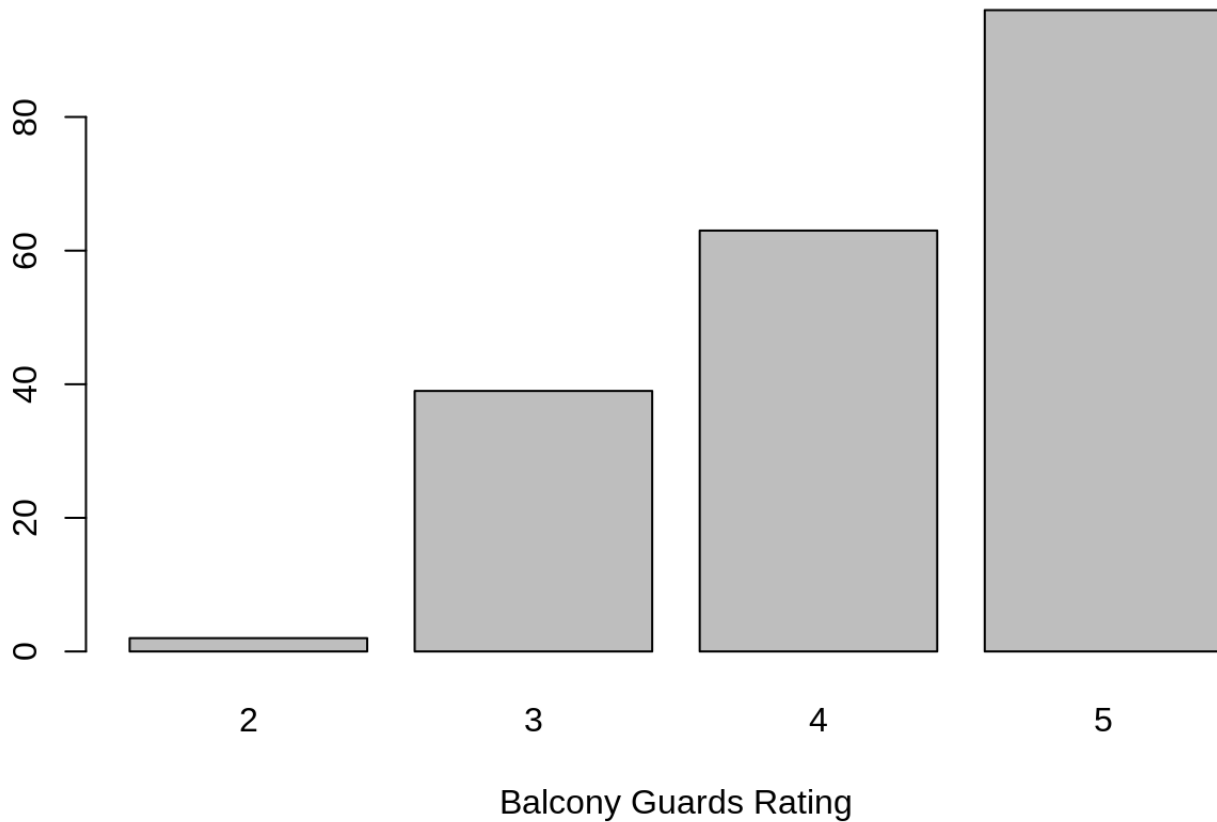


```
countPrivate1 <- table(EvalPrivate$BALCONY_GUARDS)
EvalPrivate %>% count(EvalPrivate$BALCONY_GUARDS)
```

```
##   EvalPrivate$BALCONY_GUARDS   n
## 1                          2    2
## 2                          3   39
## 3                          4   63
## 4                          5   96
```

```
barplot(countPrivate1, main="Private Apartments' Balcony Guards Rating", xlab="Balcony Guards Rating")
```

Private Apartments' Balcony Guards Rating

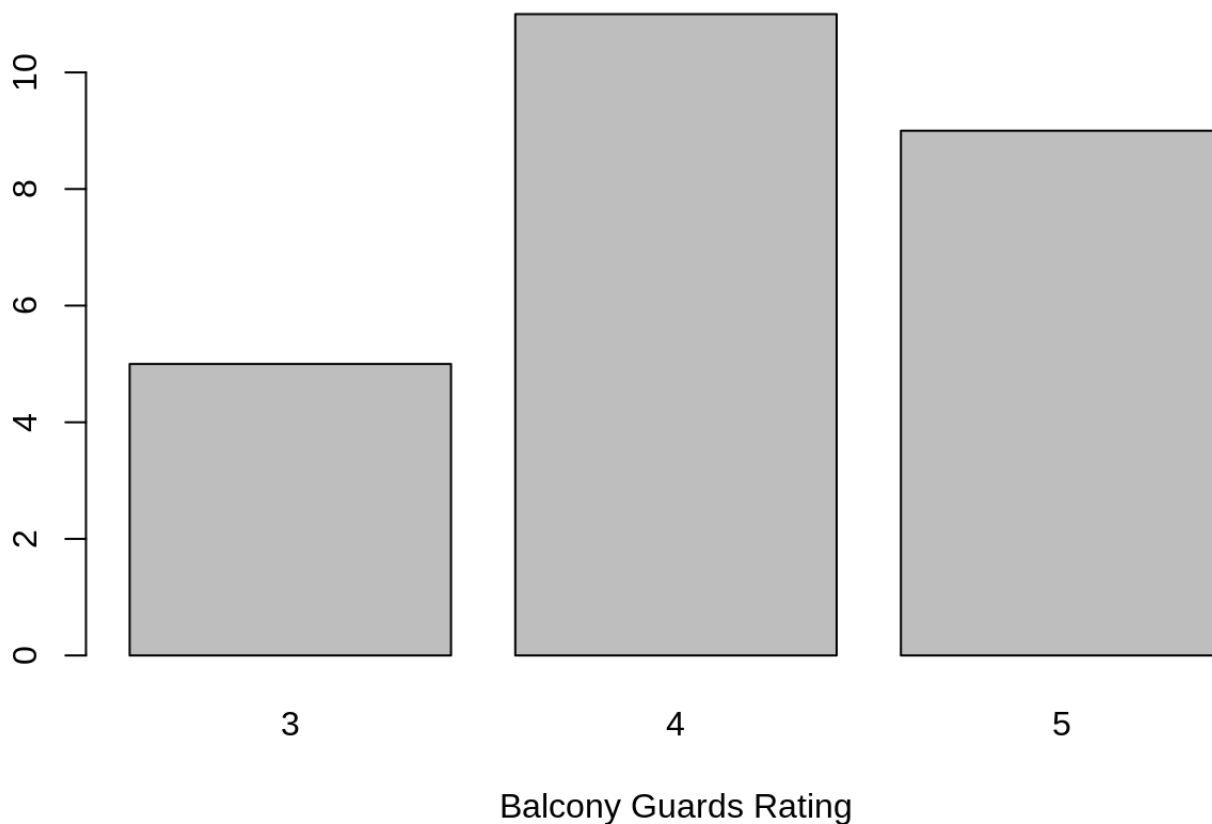


```
countSocial1 <- table(EvalSocial$BALCONY_GUARDS)
EvalSocial %>% count(EvalSocial$BALCONY_GUARDS)
```

```
##   EvalSocial$BALCONY_GUARDS   n
## 1                        3    5
## 2                        4   11
## 3                        5    9
```

```
barplot(countSocial1, main="Social Apartments' Balcony Guards Rating", xlab="Balcony Guards Rating")
```

Social Apartments' Balcony Guards Rating

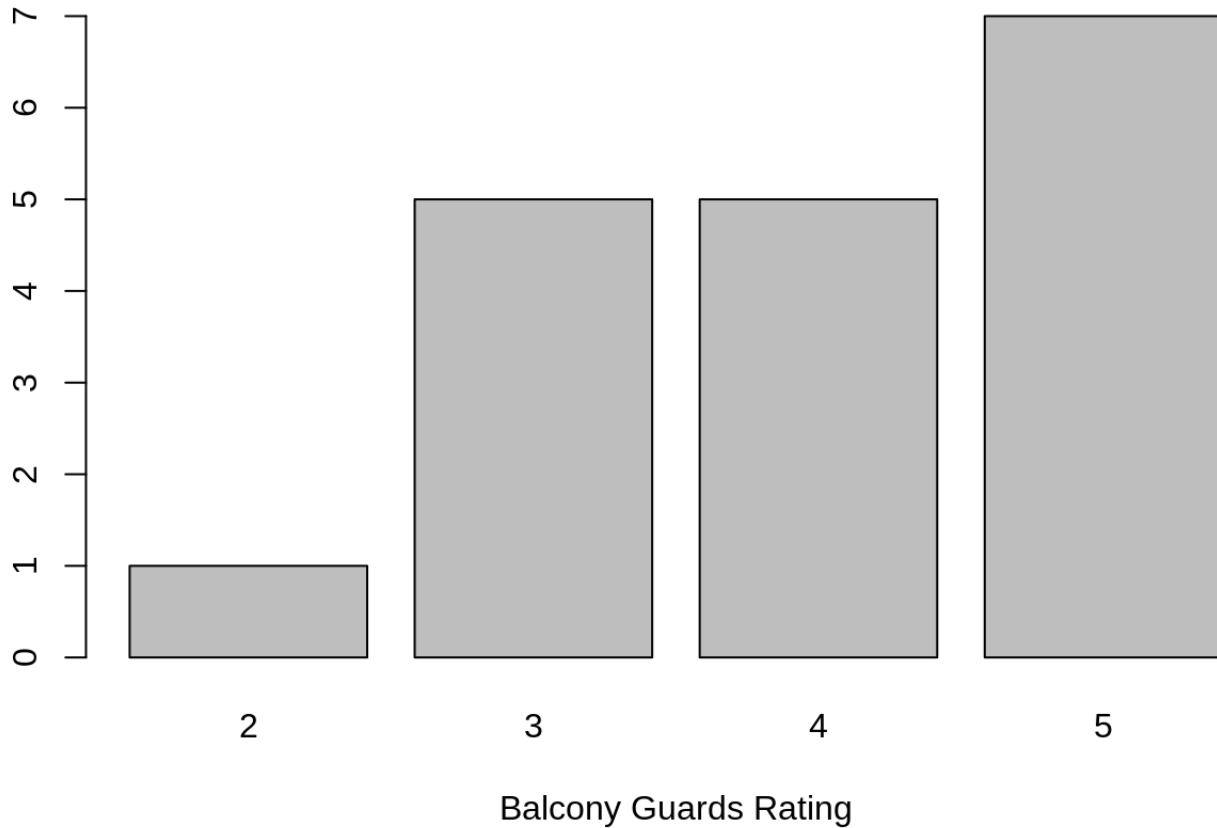


```
countTCHC1 <- table(EvalTCHC$BALCONY_GUARDS)
EvalTCHC %>% count(EvalTCHC$BALCONY_GUARDS)
```

```
##   EvalTCHC$BALCONY_GUARDS  n
## 1                        2  1
## 2                        3  5
## 3                        4  5
## 4                        5  7
```

```
barplot(countTCHC1, main="TCHC Apartments' Balcony Guards Rating", xlab="Balcony Guards Rating")
```

TCHC Apartments' Balcony Guards Rating

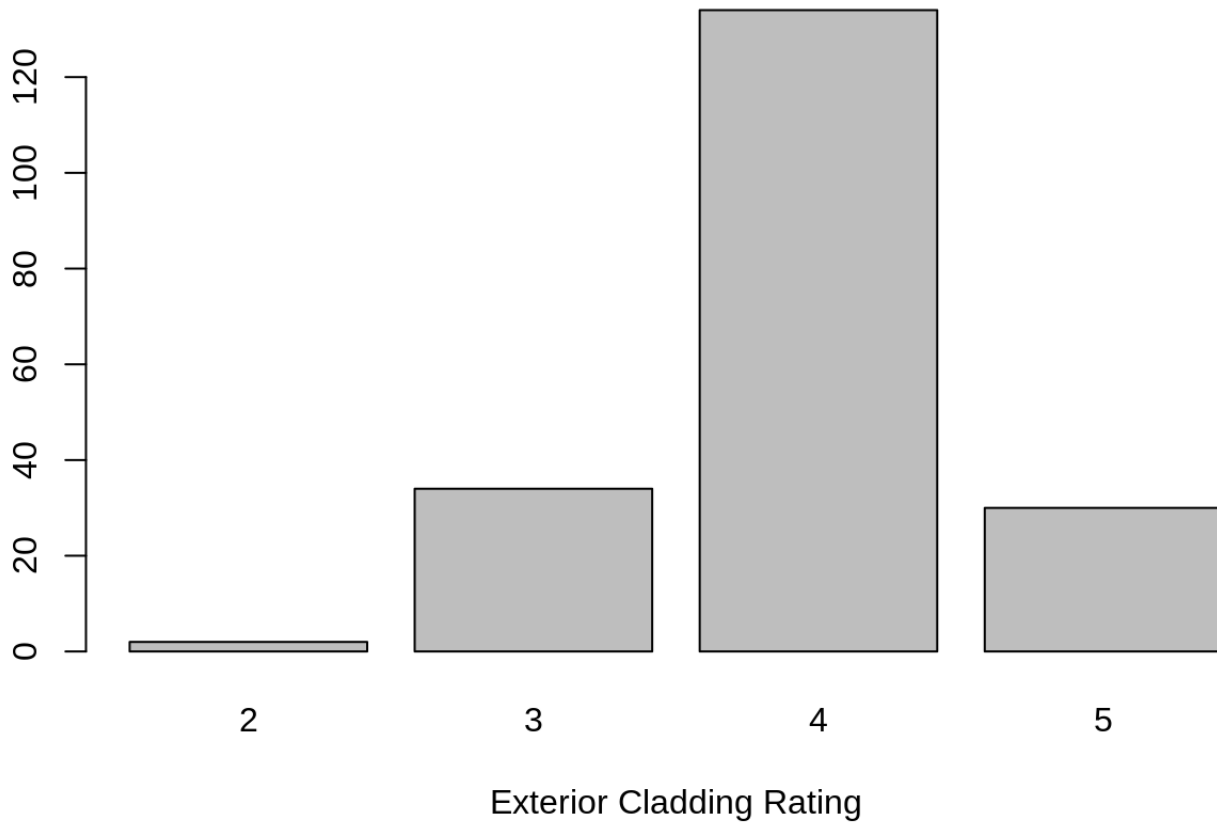


```
countPrivate2 <- table(EvalPrivate$EXTERIOR_CLADDING)
EvalPrivate %>% count(EvalPrivate$EXTERIOR_CLADDING)
```

```
##   EvalPrivate$EXTERIOR_CLADDING    n
## 1                             2     2
## 2                             3    34
## 3                             4   134
## 4                             5    30
```

```
barplot(countPrivate2, main="Private Apartments' Exterior Cladding Rating", xlab="Exterior Cladding Rating")
```

Private Apartments' Exterior Cladding Rating

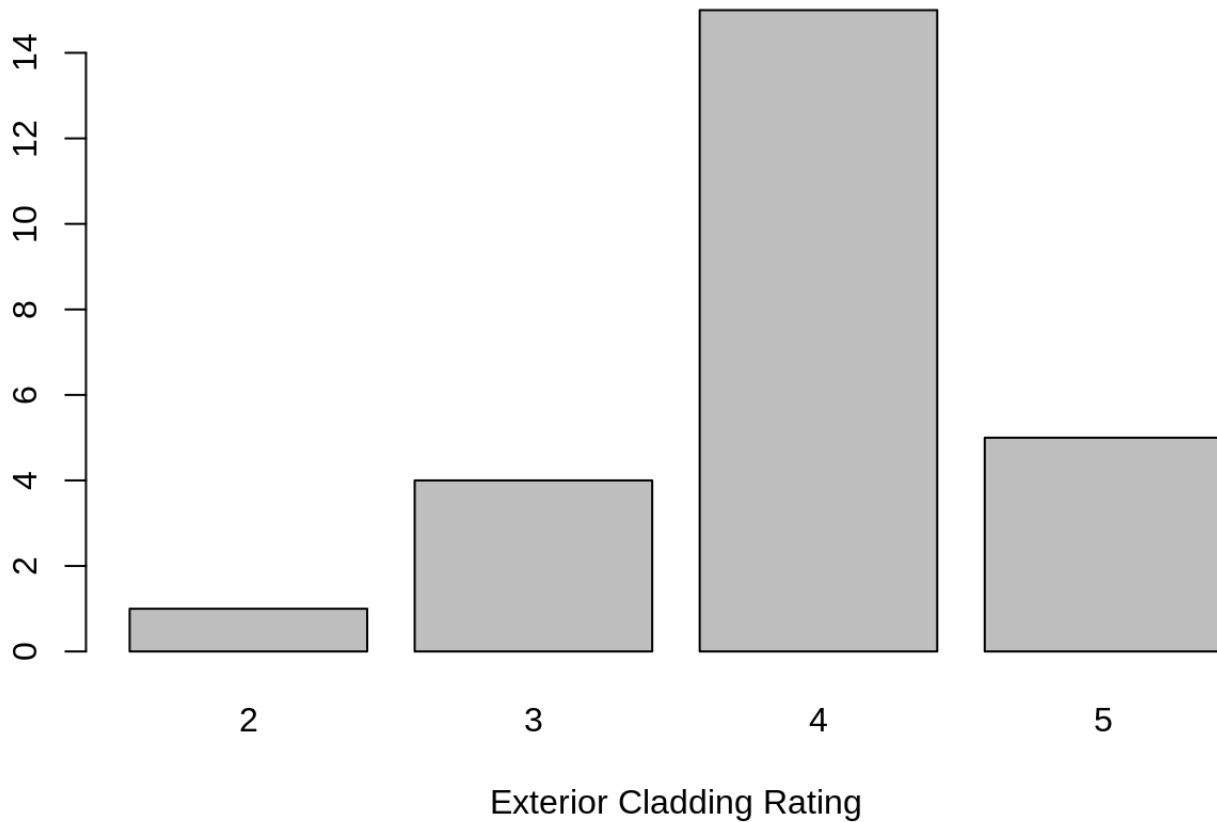


```
countSocial2 <- table(EvalSocial$EXTERIOR_CLADDING)
EvalSocial %>% count(EvalSocial$EXTERIOR_CLADDING)
```

```
##   EvalSocial$EXTERIOR_CLADDING   n
## 1                             2   1
## 2                             3   4
## 3                             4  15
## 4                             5   5
```

```
barplot(countSocial2, main="Social Apartments' Exterior Cladding Rating", xlab="Exterior Cladding Rating")
```

Social Apartments' Exterior Cladding Rating

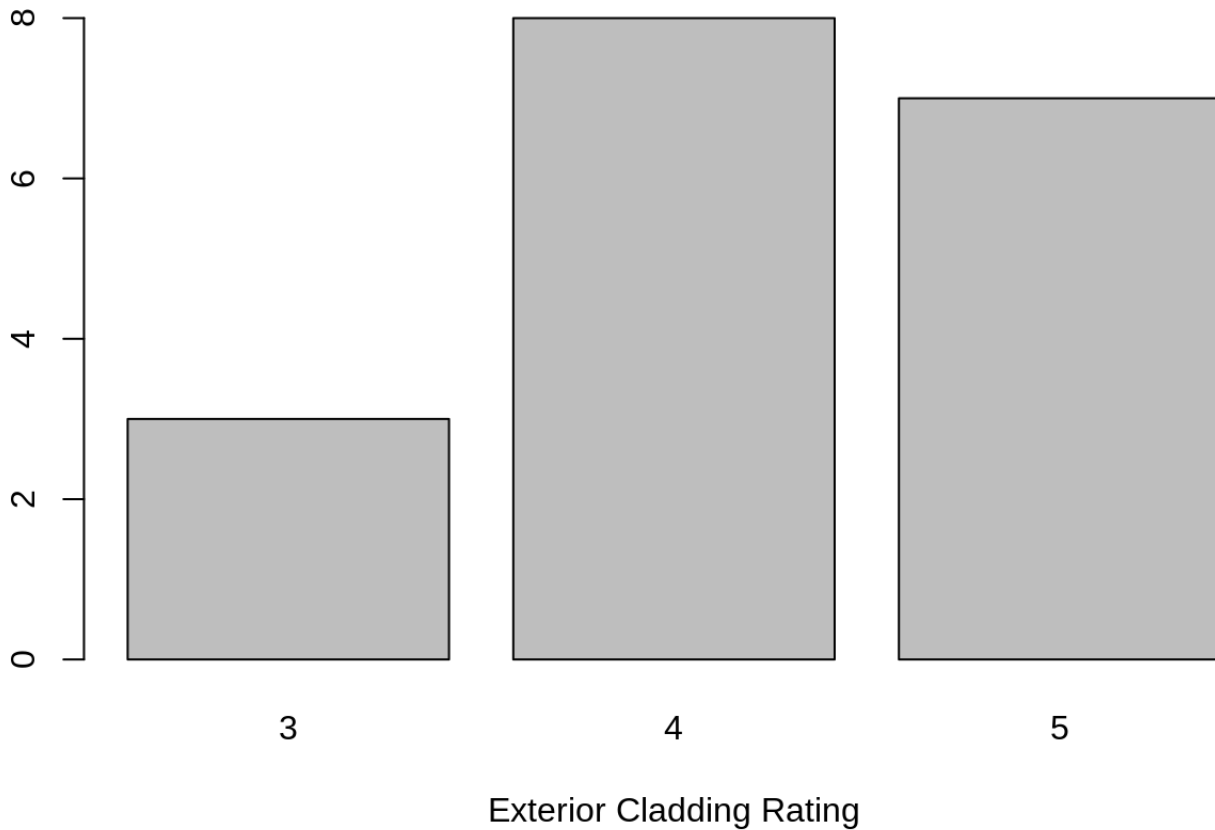


```
countTCHC2 <- table(EvalTCHC$EXTERIOR_CLADDING)
EvalTCHC %>% count(EvalTCHC$EXTERIOR_CLADDING)
```

```
##   EvalTCHC$EXTERIOR_CLADDING n
## 1                          3 3
## 2                          4 8
## 3                          5 7
```

```
barplot(countTCHC2, main="TCHC Apartments' Exterior Cladding Rating", xlab="Exterior
Cladding Rating")
```

TCHC Apartments' Exterior Cladding Rating

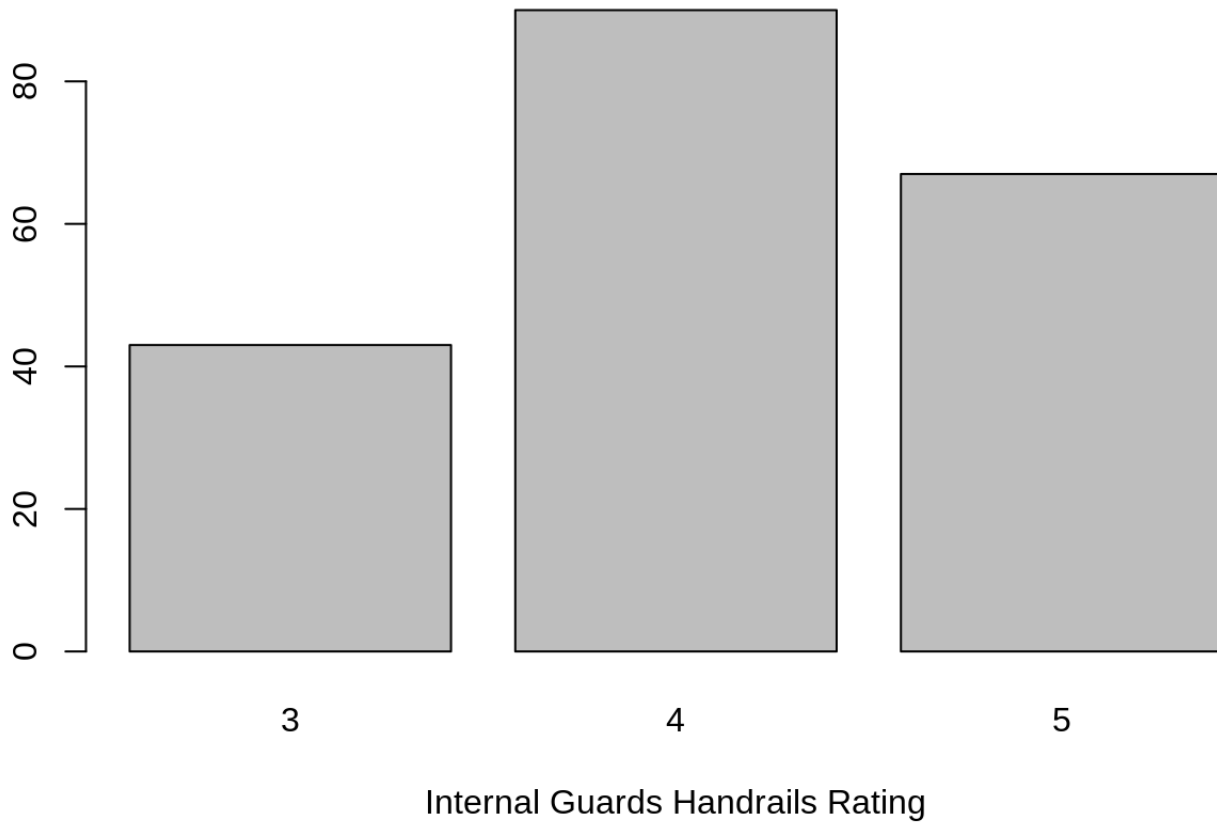


```
countPrivate3 <- table(EvalPrivate$INTERNAL_GUARDS_HANDRAILS)
EvalPrivate %>% count(EvalPrivate$INTERNAL_GUARDS_HANDRAILS)
```

```
##   EvalPrivate$INTERNAL_GUARDS_HANDRAILS   n
## 1                                     3 43
## 2                                     4 90
## 3                                     5 67
```

```
barplot(countPrivate3, main="Private Apartments' Internal Guards Handrails Rating", x
lab="Internal Guards Handrails Rating")
```


Private Apartments' Internal Guards Handrails Rating

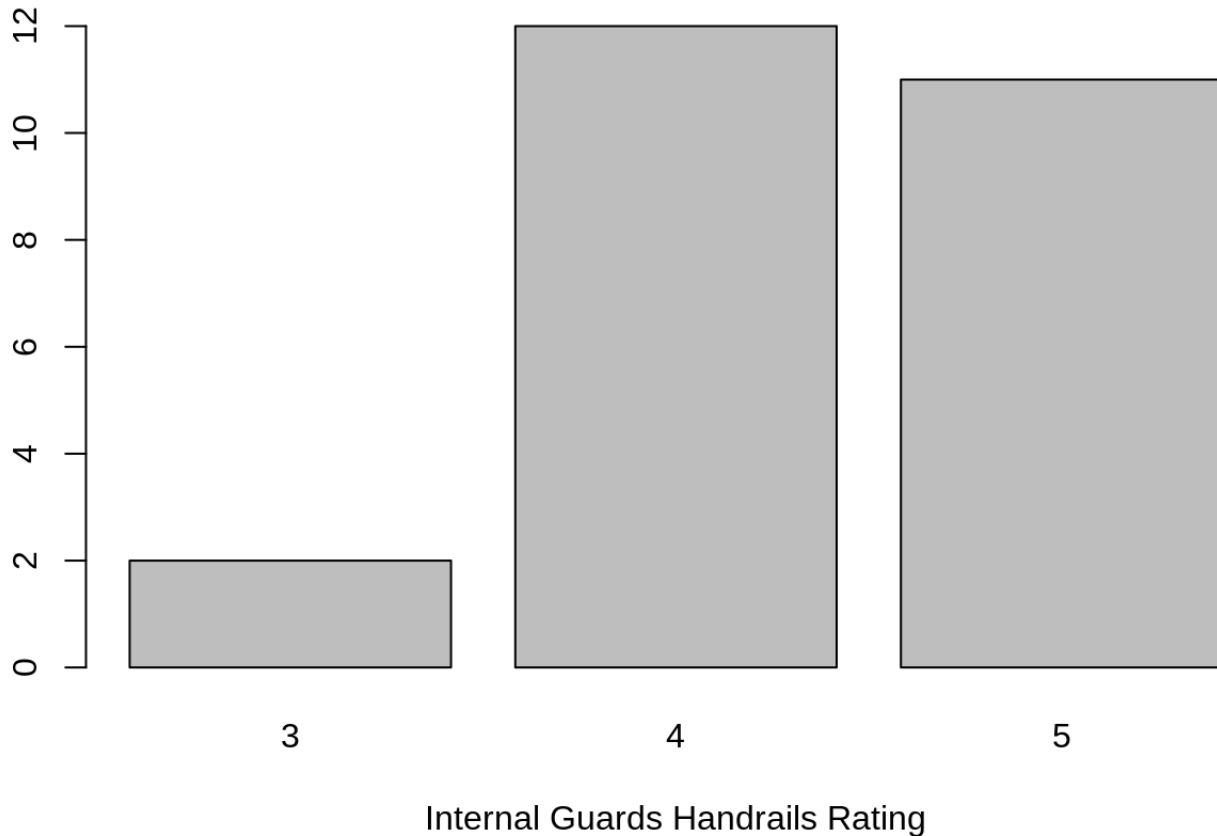


```
countSocial3 <- table(EvalSocial$INTERNAL_GUARDS_HANDRAILS)
EvalSocial %>% count(EvalSocial$INTERNAL_GUARDS_HANDRAILS)
```

```
##   EvalSocial$INTERNAL_GUARDS_HANDRAILS   n
## 1                                     3   2
## 2                                     4  12
## 3                                     5  11
```

```
barplot(countSocial3, main="Social Apartments' Internal Guards Handrails Rating", xlab="Internal Guards Handrails Rating")
```

Social Apartments' Internal Guards Handrails Rating

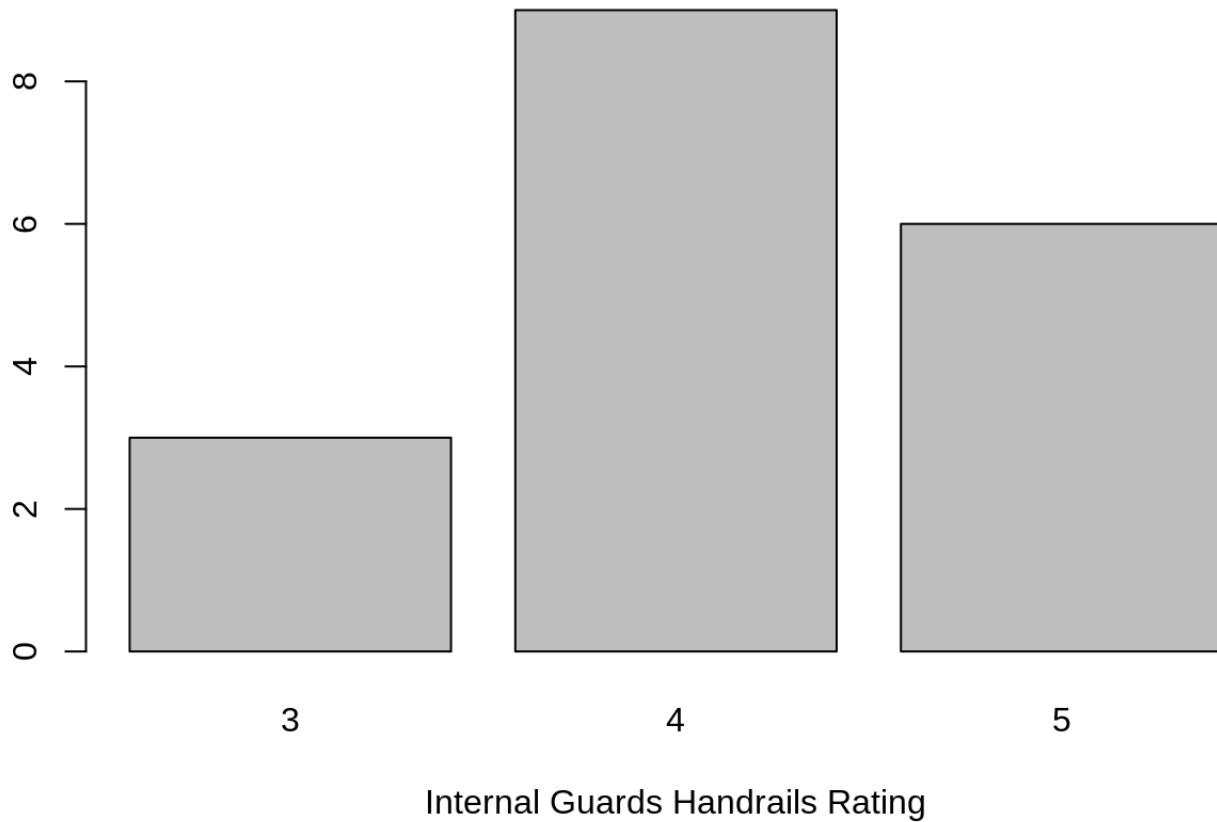


```
countTCHC3 <- table(EvalTCHC$INTERNAL_GUARDS_HANDRAILS)
EvalTCHC %>% count(EvalTCHC$INTERNAL_GUARDS_HANDRAILS)
```

```
##   EvalTCHC$INTERNAL_GUARDS_HANDRAILS  n
## 1                                     3  3
## 2                                     4  9
## 3                                     5  6
```

```
barplot(countTCHC3, main="TCHC Apartments' Internal Guards Handrails Rating", xlab="I
nternal Guards Handrails Rating")
```

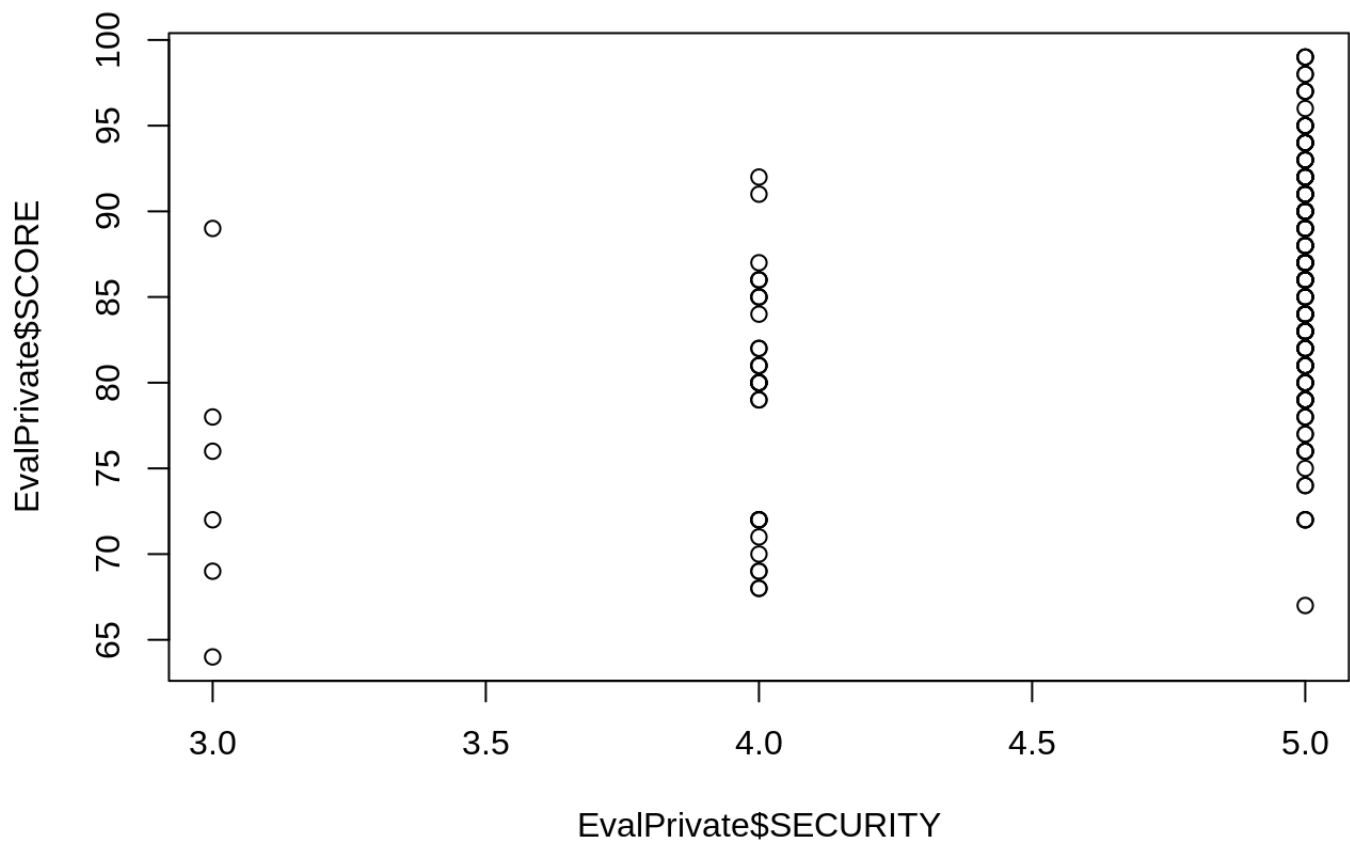
TCHC Apartments' Internal Guards Handrails Rating



#Plots comparing security with each property type, as well as comparing each property type with safety measures.
`hetcor(EvalPrivate$SECURITY, EvalPrivate$SCORE)`

```
##
## Two-Step Estimates
##
## Correlations/Type of Correlation:
##               EvalPrivate$SECURITY EvalPrivate.SCORE
## EvalPrivate$SECURITY              1          Pearson
## EvalPrivate.SCORE                0.4333              1
##
## Standard Errors:
## EvalPrivate$SECURITY    EvalPrivate.SCORE
##                        0.05763
## Levels:  0.05763
##
## n = 200
##
## P-values for Tests of Bivariate Normality:
## EvalPrivate$SECURITY    EvalPrivate.SCORE
##                        3.849e-69
## Levels:  3.849e-69
```

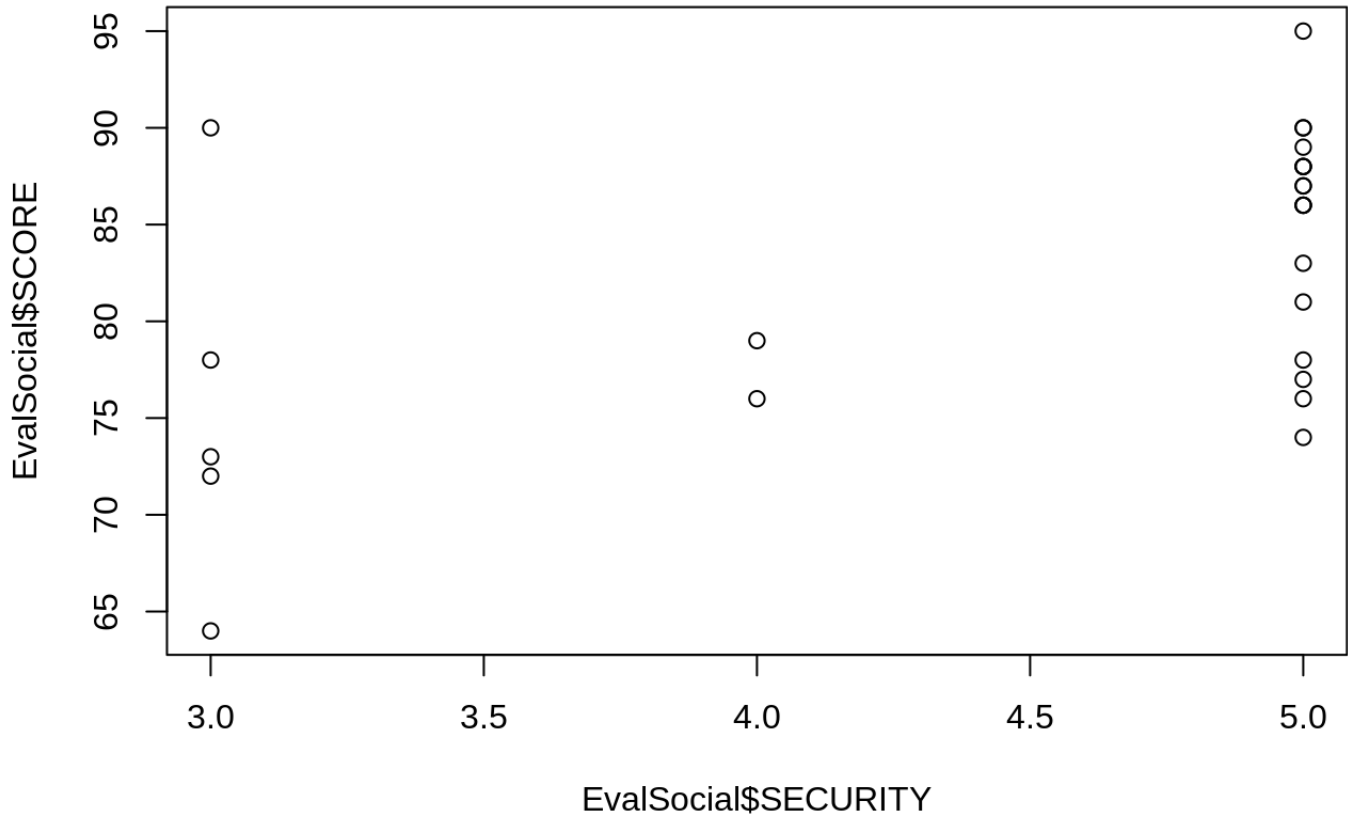
```
plot(EvalPrivate$SECURITY, EvalPrivate$SCORE)
```



```
hetcor(EvalSocial$SECURITY, EvalSocial$SCORE)
```

```
##  
## Two-Step Estimates  
##  
## Correlations/Type of Correlation:  
##               EvalSocial$SECURITY EvalSocial.SCORE  
## EvalSocial$SECURITY              1          Pearson  
## EvalSocial.SCORE                0.5483          1  
##  
## Standard Errors:  
## EvalSocial$SECURITY      EvalSocial.SCORE  
##                          0.1402  
## Levels:  0.1402  
##  
## n = 25  
##  
## P-values for Tests of Bivariate Normality:  
## EvalSocial$SECURITY      EvalSocial.SCORE  
##                          0.0003656  
## Levels:  0.0003656
```

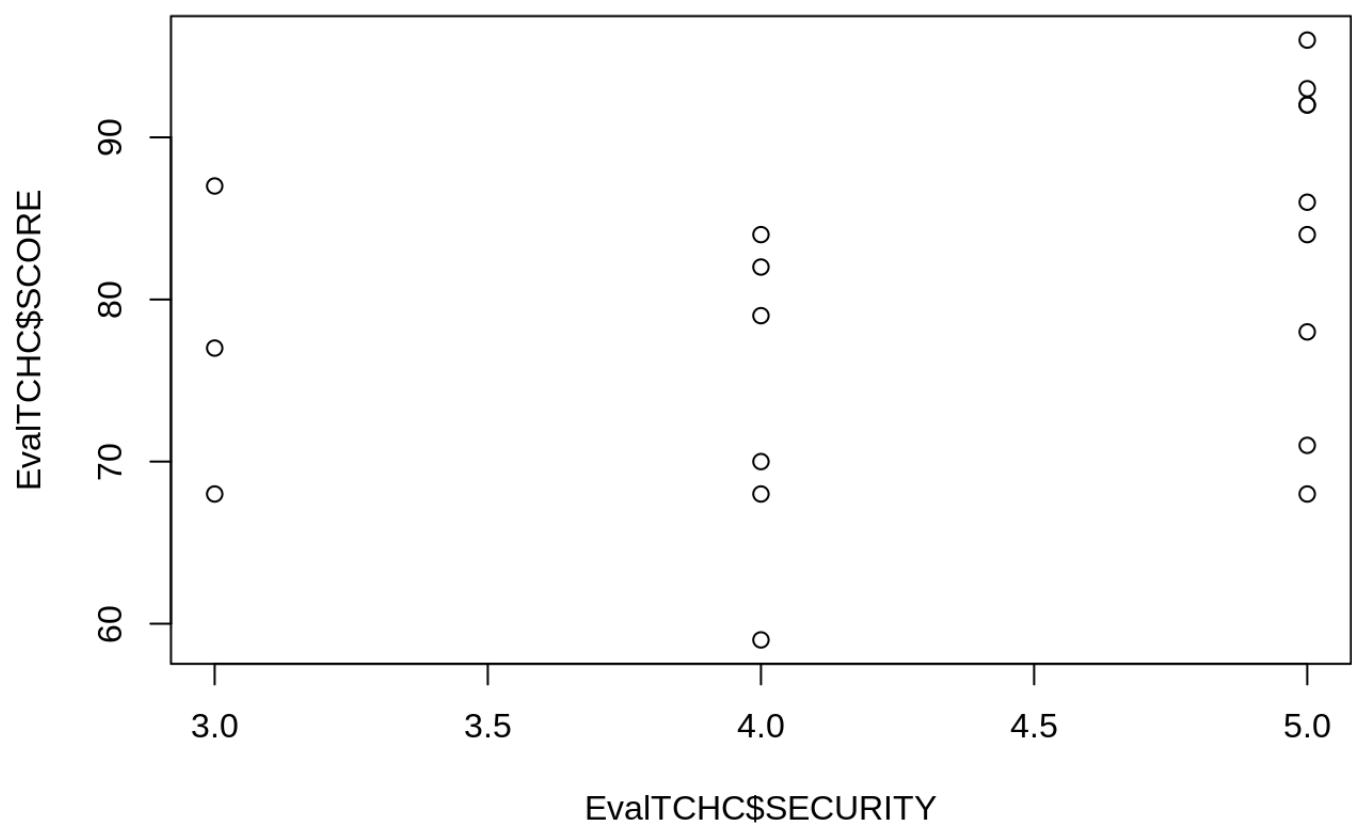
```
plot(EvalSocial$SECURITY, EvalSocial$SCORE)
```



```
hetcor(EvalTCHC$SECURITY, EvalTCHC$SCORE)
```

```
##
## Two-Step Estimates
##
## Correlations/Type of Correlation:
##           EvalTCHC$SECURITY EvalTCHC.SCORE
## EvalTCHC$SECURITY           1          Pearson
## EvalTCHC.SCORE              0.3627           1
##
## Standard Errors:
## EvalTCHC$SECURITY EvalTCHC.SCORE
##                   0.2021
## Levels:  0.2021
##
## n = 18
##
## P-values for Tests of Bivariate Normality:
## EvalTCHC$SECURITY EvalTCHC.SCORE
##                   0.1149
## Levels:  0.1149
```

```
plot(EvalTCHC$SECURITY, EvalTCHC$SCORE)
```



#Determined the correlation using a heterogeneous correlation matrix as a numeric value and factor were used.