# ThesisAnalysis

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This Rmd file will be used as the file for my Thesis Analysis on causal mediation.

## Libraries

```
library(tidyverse)
library(car)
library(foreign)
library(Hmisc)
library(knitr)
library(dplyr)
library(survival)
library(finalfit)
library(tableone)
library(lme4)
library(e1071)
library(mediation)
```

## Reading of Raw Survey Data

```
ibiccs_readin <- read.csv("Database_recoded_2012-2014_weights_Walkscore_RTA.csv")
ibiccs_readin$TransitScore <- as.numeric(ibiccs_readin$TransitScore)
ibiccs_readin$BikeScore <- as.numeric(ibiccs_readin$BikeScore)
```

## Recode BMI

```
## BMI
ibiccs_clean <- ibiccs_readin %>%
    mutate(bmi_category = case_when(
        bmi < 18.5 ~ "underweight",
        bmi >=30 & bmi <999 ~ "obese",
        bmi >=25 & bmi <30 ~ "overweight",
        bmi >=18.5 & bmi <25 ~ "normal weight",
        bmi == 9999 ~ "NA",
        TRUE ~ "other"
    ))

table(ibiccs_clean$bmi, ibiccs_clean$bmi_category)
```

```
##
##         normal weight obese other overweight underweight
##   17.5              0     0     0          0           2
```

```
##   17.51            0     0     0          0           2
##   17.54            0     0     0          0           4
##   17.56            0     0     0          0           3
##   17.57            0     0     0          0           5
##   17.58            0     0     0          0           6
##   17.59            0     0     0          0           1
##   17.63            0     0     0          0           4
##   17.64            0     0     0          0           2
##   17.65            0     0     0          0           1
##   17.68            0     0     0          0           3
##   17.7             0     0     0          0           2
##   17.71            0     0     0          0          12
##   17.72            0     0     0          0           8
##   17.74            0     0     0          0           4
##   17.75            0     0     0          0          22
##   17.76            0     0     0          0           4
##   17.77            0     0     0          0           1
##   17.79            0     0     0          0           2
##   17.81            0     0     0          0           2
##   17.85            0     0     0          0           7
##   17.87            0     0     0          0           2
##   17.89            0     0     0          0           2
##   17.91            0     0     0          0           1
##   17.92            0     0     0          0           4
##   17.94            0     0     0          0          18
##   17.95            0     0     0          0           6
##   17.96            0     0     0          0           3
##   17.97            0     0     0          0           3
##   17.98            0     0     0          0           1
##   18               0     0     0          0           3
##   18.01            0     0     0          0          15
##   18.02            0     0     0          0          25
##   18.07            0     0     0          0           5
##   18.08            0     0     0          0           9
##   18.11            0     0     0          0           3
##   18.13            0     0     0          0           8
##   18.14            0     0     0          0           5
##   18.16            0     0     0          0           3
##   18.17            0     0     0          0           2
##   18.18            0     0     0          0           4
##   18.19            0     0     0          0           5
##   18.21            0     0     0          0           1
##   18.22            0     0     0          0           1
##   18.24            0     0     0          0           1
##   18.25            0     0     0          0          21
##   18.26            0     0     0          0           2
##   18.27            0     0     0          0           2
##   18.29            0     0     0          0          31
##   18.3             0     0     0          0          33
##   18.31            0     0     0          0           7
##   18.33            0     0     0          0           3
##   18.34            0     0     0          0           7
##   18.35            0     0     0          0           2
##   18.36            0     0     0          0           3
```

```
##   18.37              0     0     0          0          11
##   18.38              0     0     0          0           1
##   18.4               0     0     0          0           2
##   18.42              0     0     0          0           3
##   18.44              0     0     0          0           1
##   18.45              0     0     0          0           1
##   18.46              0     0     0          0          23
##   18.47              0     0     0          0          10
##   18.48              0     0     0          0           3
##   18.51              2     0     0          0           0
##   18.52              5     0     0          0           0
##   18.54              9     0     0          0           0
##   18.55             22     0     0          0           0
##   18.56             30     0     0          0           0
##   18.58              1     0     0          0           0
##   18.59              1     0     0          0           0
##   18.6              27     0     0          0           0
##   18.61              1     0     0          0           0
##   18.62              4     0     0          0           0
##   18.64              8     0     0          0           0
##   18.65             15     0     0          0           0
##   18.66             12     0     0          0           0
##   18.68              2     0     0          0           0
##   18.69              1     0     0          0           0
##   18.7               2     0     0          0           0
##   18.71              4     0     0          0           0
##   18.72              2     0     0          0           0
##   18.73              4     0     0          0           0
##   18.74              4     0     0          0           0
##   18.75             13     0     0          0           0
##   18.78             14     0     0          0           0
##   18.79             24     0     0          0           0
##   18.8               7     0     0          0           0
##   18.81              1     0     0          0           0
##   18.82              1     0     0          0           0
##   18.83             10     0     0          0           0
##   18.84              5     0     0          0           0
##   18.85              1     0     0          0           0
##   18.87              4     0     0          0           0
##   18.88             55     0     0          0           0
##   18.89             15     0     0          0           0
##   18.9               2     0     0          0           0
##   18.91              1     0     0          0           0
##   18.92              2     0     0          0           0
##   18.93              1     0     0          0           0
##   18.94              7     0     0          0           0
##   18.95             11     0     0          0           0
##   18.96              1     0     0          0           0
##   18.97              5     0     0          0           0
##   18.98              1     0     0          0           0
##   18.99             24     0     0          0           0
##   19.01             36     0     0          0           0
##   19.02              3     0     0          0           0
##   19.03              1     0     0          0           0
```

```
##   19.05            17     0     0          0          0
##   19.06             1     0     0          0          0
##   19.08             5     0     0          0          0
##   19.09             1     0     0          0          0
##   19.1              1     0     0          0          0
##   19.11             9     0     0          0          0
##   19.13            10     0     0          0          0
##   19.14            51     0     0          0          0
##   19.16             8     0     0          0          0
##   19.18             1     0     0          0          0
##   19.19             4     0     0          0          0
##   19.2             40     0     0          0          0
##   19.21             1     0     0          0          0
##   19.22            15     0     0          0          0
##   19.23             4     0     0          0          0
##   19.25             2     0     0          0          0
##   19.26            10     0     0          0          0
##   19.27             7     0     0          0          0
##   19.28             1     0     0          0          0
##   19.3              6     0     0          0          0
##   19.31            11     0     0          0          0
##   19.33             3     0     0          0          0
##   19.37            74     0     0          0          0
##   19.38             6     0     0          0          0
##   19.39             5     0     0          0          0
##   19.4              5     0     0          0          0
##   19.41             1     0     0          0          0
##   19.42             5     0     0          0          0
##   19.44             3     0     0          0          0
##   19.46            12     0     0          0          0
##   19.47            13     0     0          0          0
##   19.48             3     0     0          0          0
##   19.49            53     0     0          0          0
##   19.5              1     0     0          0          0
##   19.53            59     0     0          0          0
##   19.55             1     0     0          0          0
##   19.57            22     0     0          0          0
##   19.58            67     0     0          0          0
##   19.59             2     0     0          0          0
##   19.6              2     0     0          0          0
##   19.61             3     0     0          0          0
##   19.63             1     0     0          0          0
##   19.64            18     0     0          0          0
##   19.65             6     0     0          0          0
##   19.66             5     0     0          0          0
##   19.67            12     0     0          0          0
##   19.68             2     0     0          0          0
##   19.69             8     0     0          0          0
##   19.71             1     0     0          0          0
##   19.73             6     0     0          0          0
##   19.74            49     0     0          0          0
##   19.75            18     0     0          0          0
##   19.77            59     0     0          0          0
##   19.78             1     0     0          0          0
```

```
##   19.79            17     0     0          0          0
##   19.8             13     0     0          0          0
##   19.81             4     0     0          0          0
##   19.82             1     0     0          0          0
##   19.83             2     0     0          0          0
##   19.84            37     0     0          0          0
##   19.85             9     0     0          0          0
##   19.86             1     0     0          0          0
##   19.88             1     0     0          0          0
##   19.89             6     0     0          0          0
##   19.9              7     0     0          0          0
##   19.91             6     0     0          0          0
##   19.92             8     0     0          0          0
##   19.93             1     0     0          0          0
##   19.94            34     0     0          0          0
##   19.95             2     0     0          0          0
##   19.96             2     0     0          0          0
##   19.97            62     0     0          0          0
##   19.99             8     0     0          0          0
##   20                7     0     0          0          0
##   20.01            11     0     0          0          0
##   20.02             6     0     0          0          0
##   20.03             6     0     0          0          0
##   20.05            15     0     0          0          0
##   20.06             5     0     0          0          0
##   20.07            13     0     0          0          0
##   20.08            17     0     0          0          0
##   20.09            37     0     0          0          0
##   20.11             2     0     0          0          0
##   20.12            72     0     0          0          0
##   20.14             3     0     0          0          0
##   20.16             5     0     0          0          0
##   20.17             1     0     0          0          0
##   20.18            84     0     0          0          0
##   20.19            10     0     0          0          0
##   20.2             20     0     0          0          0
##   20.22            32     0     0          0          0
##   20.23             3     0     0          0          0
##   20.24             2     0     0          0          0
##   20.25            18     0     0          0          0
##   20.27             1     0     0          0          0
##   20.28             2     0     0          0          0
##   20.29             3     0     0          0          0
##   20.3             19     0     0          0          0
##   20.31             5     0     0          0          0
##   20.32             1     0     0          0          0
##   20.33             1     0     0          0          0
##   20.34            38     0     0          0          0
##   20.35             1     0     0          0          0
##   20.36            93     0     0          0          0
##   20.37            82     0     0          0          0
##   20.38             9     0     0          0          0
##   20.39             1     0     0          0          0
##   20.4              4     0     0          0          0
```

```
##   20.41            13     0     0          0          0
##   20.42             1     0     0          0          0
##   20.43             5     0     0          0          0
##   20.45             4     0     0          0          0
##   20.47            13     0     0          0          0
##   20.48            19     0     0          0          0
##   20.5              9     0     0          0          0
##   20.51            21     0     0          0          0
##   20.52             5     0     0          0          0
##   20.53            49     0     0          0          0
##   20.54            13     0     0          0          0
##   20.55            15     0     0          0          0
##   20.56             2     0     0          0          0
##   20.57             3     0     0          0          0
##   20.58             2     0     0          0          0
##   20.6            119     0     0          0          0
##   20.61             3     0     0          0          0
##   20.62             5     0     0          0          0
##   20.63             6     0     0          0          0
##   20.64             3     0     0          0          0
##   20.66            20     0     0          0          0
##   20.67            59     0     0          0          0
##   20.68             7     0     0          0          0
##   20.69             4     0     0          0          0
##   20.7              8     0     0          0          0
##   20.71             1     0     0          0          0
##   20.72             7     0     0          0          0
##   20.73            12     0     0          0          0
##   20.74             2     0     0          0          0
##   20.75             5     0     0          0          0
##   20.76             8     0     0          0          0
##   20.77             3     0     0          0          0
##   20.78            44     0     0          0          0
##   20.8             96     0     0          0          0
##   20.81            34     0     0          0          0
##   20.82             8     0     0          0          0
##   20.83            24     0     0          0          0
##   20.85            18     0     0          0          0
##   20.87             1     0     0          0          0
##   20.89             1     0     0          0          0
##   20.9             24     0     0          0          0
##   20.91             4     0     0          0          0
##   20.92            21     0     0          0          0
##   20.93             4     0     0          0          0
##   20.94            19     0     0          0          0
##   20.95             2     0     0          0          0
##   20.96             4     0     0          0          0
##   20.97            16     0     0          0          0
##   20.98           111     0     0          0          0
##   20.99             9     0     0          0          0
##   21.01             1     0     0          0          0
##   21.02            20     0     0          0          0
##   21.03            69     0     0          0          0
##   21.06             1     0     0          0          0
```

```
##   21.08           11     0     0          0          0
##   21.09            8     0     0          0          0
##   21.1             2     0     0          0          0
##   21.11           31     0     0          0          0
##   21.12            3     0     0          0          0
##   21.13           12     0     0          0          0
##   21.14           89     0     0          0          0
##   21.16           16     0     0          0          0
##   21.18            8     0     0          0          0
##   21.19            4     0     0          0          0
##   21.2             2     0     0          0          0
##   21.21           10     0     0          0          0
##   21.22           16     0     0          0          0
##   21.23            2     0     0          0          0
##   21.24            5     0     0          0          0
##   21.25            5     0     0          0          0
##   21.26          106     0     0          0          0
##   21.27            1     0     0          0          0
##   21.28           16     0     0          0          0
##   21.29           84     0     0          0          0
##   21.3            25     0     0          0          0
##   21.31           16     0     0          0          0
##   21.34            9     0     0          0          0
##   21.35            5     0     0          0          0
##   21.37            2     0     0          0          0
##   21.38            1     0     0          0          0
##   21.4            13     0     0          0          0
##   21.41           61     0     0          0          0
##   21.42            1     0     0          0          0
##   21.43            7     0     0          0          0
##   21.44            2     0     0          0          0
##   21.45            7     0     0          0          0
##   21.46          111     0     0          0          0
##   21.47           22     0     0          0          0
##   21.48           50     0     0          0          0
##   21.5             2     0     0          0          0
##   21.51            3     0     0          0          0
##   21.52           69     0     0          0          0
##   21.53            4     0     0          0          0
##   21.54            6     0     0          0          0
##   21.55            2     0     0          0          0
##   21.56            9     0     0          0          0
##   21.57            4     0     0          0          0
##   21.58           22     0     0          0          0
##   21.59            3     0     0          0          0
##   21.6             6     0     0          0          0
##   21.61           30     0     0          0          0
##   21.62           16     0     0          0          0
##   21.63          136     0     0          0          0
##   21.64            2     0     0          0          0
##   21.66            3     0     0          0          0
##   21.67            2     0     0          0          0
##   21.68            1     0     0          0          0
##   21.7            48     0     0          0          0
```

```
##   21.71              8     0     0          0          0
##   21.72              7     0     0          0          0
##   21.73             32     0     0          0          0
##   21.74              7     0     0          0          0
##   21.75              1     0     0          0          0
##   21.76              5     0     0          0          0
##   21.77             27     0     0          0          0
##   21.79            114     0     0          0          0
##   21.8              27     0     0          0          0
##   21.81             13     0     0          0          0
##   21.83             17     0     0          0          0
##   21.86             10     0     0          0          0
##   21.87             11     0     0          0          0
##   21.88              1     0     0          0          0
##   21.89              4     0     0          0          0
##   21.9               5     0     0          0          0
##   21.91              8     0     0          0          0
##   21.92              5     0     0          0          0
##   21.93            109     0     0          0          0
##   21.94              6     0     0          0          0
##   21.95             98     0     0          0          0
##   21.96              1     0     0          0          0
##   21.97             65     0     0          0          0
##   21.99              2     0     0          0          0
##   22                 3     0     0          0          0
##   22.01              2     0     0          0          0
##   22.03              2     0     0          0          0
##   22.04             12     0     0          0          0
##   22.05             85     0     0          0          0
##   22.06              1     0     0          0          0
##   22.07              2     0     0          0          0
##   22.08              3     0     0          0          0
##   22.1               7     0     0          0          0
##   22.11             20     0     0          0          0
##   22.12              1     0     0          0          0
##   22.13              5     0     0          0          0
##   22.14             92     0     0          0          0
##   22.15             71     0     0          0          0
##   22.16              2     0     0          0          0
##   22.18              3     0     0          0          0
##   22.2               8     0     0          0          0
##   22.21              3     0     0          0          0
##   22.22             14     0     0          0          0
##   22.24             65     0     0          0          0
##   22.25              1     0     0          0          0
##   22.26              7     0     0          0          0
##   22.27             10     0     0          0          0
##   22.28              1     0     0          0          0
##   22.3              22     0     0          0          0
##   22.31            141     0     0          0          0
##   22.32             51     0     0          0          0
##   22.34              3     0     0          0          0
##   22.35              9     0     0          0          0
##   22.37              2     0     0          0          0
```

```
##   22.38            55     0     0          0          0
##   22.39             1     0     0          0          0
##   22.4              8     0     0          0          0
##   22.41             1     0     0          0          0
##   22.42             5     0     0          0          0
##   22.43            25     0     0          0          0
##   22.44             5     0     0          0          0
##   22.45             8     0     0          0          0
##   22.46           141     0     0          0          0
##   22.47            20     0     0          0          0
##   22.48             6     0     0          0          0
##   22.49             4     0     0          0          0
##   22.5             45     0     0          0          0
##   22.51             2     0     0          0          0
##   22.52             5     0     0          0          0
##   22.53             6     0     0          0          0
##   22.55             5     0     0          0          0
##   22.58             1     0     0          0          0
##   22.59            13     0     0          0          0
##   22.6            116     0     0          0          0
##   22.62             2     0     0          0          0
##   22.63            10     0     0          0          0
##   22.65             5     0     0          0          0
##   22.66            21     0     0          0          0
##   22.67            66     0     0          0          0
##   22.68            12     0     0          0          0
##   22.7              1     0     0          0          0
##   22.71            80     0     0          0          0
##   22.72             3     0     0          0          0
##   22.73             6     0     0          0          0
##   22.74             3     0     0          0          0
##   22.75             2     0     0          0          0
##   22.76             3     0     0          0          0
##   22.77             5     0     0          0          0
##   22.78             4     0     0          0          0
##   22.79            12     0     0          0          0
##   22.8             13     0     0          0          0
##   22.81            99     0     0          0          0
##   22.82             2     0     0          0          0
##   22.83            14     0     0          0          0
##   22.84             3     0     0          0          0
##   22.85            12     0     0          0          0
##   22.86            75     0     0          0          0
##   22.87             6     0     0          0          0
##   22.88             3     0     0          0          0
##   22.89            66     0     0          0          0
##   22.91             4     0     0          0          0
##   22.92            16     0     0          0          0
##   22.95             1     0     0          0          0
##   22.96           112     0     0          0          0
##   22.97             1     0     0          0          0
##   22.98             5     0     0          0          0
##   22.99             5     0     0          0          0
##   23                9     0     0          0          0
```

```
##   23.01            46     0     0          0          0
##   23.02             9     0     0          0          0
##   23.03           100     0     0          0          0
##   23.04             2     0     0          0          0
##   23.05            27     0     0          0          0
##   23.06            48     0     0          0          0
##   23.08             9     0     0          0          0
##   23.09            29     0     0          0          0
##   23.1              7     0     0          0          0
##   23.11            42     0     0          0          0
##   23.12            12     0     0          0          0
##   23.13            14     0     0          0          0
##   23.14             1     0     0          0          0
##   23.15            12     0     0          0          0
##   23.17            93     0     0          0          0
##   23.18            20     0     0          0          0
##   23.19             1     0     0          0          0
##   23.21             5     0     0          0          0
##   23.22             4     0     0          0          0
##   23.23            17     0     0          0          0
##   23.24            16     0     0          0          0
##   23.25             1     0     0          0          0
##   23.26             7     0     0          0          0
##   23.27             1     0     0          0          0
##   23.29             4     0     0          0          0
##   23.3            128     0     0          0          0
##   23.31             3     0     0          0          0
##   23.32             5     0     0          0          0
##   23.33            21     0     0          0          0
##   23.34            17     0     0          0          0
##   23.36             2     0     0          0          0
##   23.37             5     0     0          0          0
##   23.38             9     0     0          0          0
##   23.39            14     0     0          0          0
##   23.4             91     0     0          0          0
##   23.41            23     0     0          0          0
##   23.42             9     0     0          0          0
##   23.43            15     0     0          0          0
##   23.44            54     0     0          0          0
##   23.45             2     0     0          0          0
##   23.46            13     0     0          0          0
##   23.48            14     0     0          0          0
##   23.49           109     0     0          0          0
##   23.5              1     0     0          0          0
##   23.51             3     0     0          0          0
##   23.52            13     0     0          0          0
##   23.53             7     0     0          0          0
##   23.54             5     0     0          0          0
##   23.55             2     0     0          0          0
##   23.56            18     0     0          0          0
##   23.57            84     0     0          0          0
##   23.58             1     0     0          0          0
##   23.59             3     0     0          0          0
##   23.6              6     0     0          0          0
```

```
##   23.62            33     0     0          0          0
##   23.63           105     0     0          0          0
##   23.65             3     0     0          0          0
##   23.66             1     0     0          0          0
##   23.67            88     0     0          0          0
##   23.68             3     0     0          0          0
##   23.69            15     0     0          0          0
##   23.7              3     0     0          0          0
##   23.71            64     0     0          0          0
##   23.72            14     0     0          0          0
##   23.73            84     0     0          0          0
##   23.74            11     0     0          0          0
##   23.75            72     0     0          0          0
##   23.77             1     0     0          0          0
##   23.78           102     0     0          0          0
##   23.79             1     0     0          0          0
##   23.8             11     0     0          0          0
##   23.81            17     0     0          0          0
##   23.82             5     0     0          0          0
##   23.83             5     0     0          0          0
##   23.84             3     0     0          0          0
##   23.85             6     0     0          0          0
##   23.86             8     0     0          0          0
##   23.87             9     0     0          0          0
##   23.88             8     0     0          0          0
##   23.89            17     0     0          0          0
##   23.9              1     0     0          0          0
##   23.91            78     0     0          0          0
##   23.92            12     0     0          0          0
##   23.94             5     0     0          0          0
##   23.95             3     0     0          0          0
##   23.96            17     0     0          0          0
##   23.98             1     0     0          0          0
##   23.99             9     0     0          0          0
##   24                7     0     0          0          0
##   24.01            12     0     0          0          0
##   24.02            20     0     0          0          0
##   24.03           120     0     0          0          0
##   24.04             3     0     0          0          0
##   24.05             5     0     0          0          0
##   24.06             1     0     0          0          0
##   24.07             7     0     0          0          0
##   24.09            10     0     0          0          0
##   24.1              1     0     0          0          0
##   24.11             8     0     0          0          0
##   24.12             3     0     0          0          0
##   24.13            77     0     0          0          0
##   24.14            29     0     0          0          0
##   24.15             1     0     0          0          0
##   24.16             4     0     0          0          0
##   24.17             4     0     0          0          0
##   24.18             4     0     0          0          0
##   24.19            15     0     0          0          0
##   24.2              5     0     0          0          0
```

```
##   24.21          136     0     0          0          0
##   24.22           19     0     0          0          0
##   24.23            1     0     0          0          0
##   24.24           11     0     0          0          0
##   24.25            5     0     0          0          0
##   24.27           10     0     0          0          0
##   24.28           99     0     0          0          0
##   24.3             2     0     0          0          0
##   24.31            4     0     0          0          0
##   24.33          109     0     0          0          0
##   24.34           18     0     0          0          0
##   24.36            1     0     0          0          0
##   24.37           87     0     0          0          0
##   24.38            3     0     0          0          0
##   24.39          132     0     0          0          0
##   24.41          222     0     0          0          0
##   24.42            1     0     0          0          0
##   24.43            3     0     0          0          0
##   24.44            2     0     0          0          0
##   24.45           14     0     0          0          0
##   24.46            5     0     0          0          0
##   24.47            1     0     0          0          0
##   24.48            3     0     0          0          0
##   24.49            7     0     0          0          0
##   24.5             2     0     0          0          0
##   24.51           15     0     0          0          0
##   24.52            4     0     0          0          0
##   24.53            6     0     0          0          0
##   24.54            5     0     0          0          0
##   24.55           10     0     0          0          0
##   24.56           37     0     0          0          0
##   24.57            1     0     0          0          0
##   24.58            3     0     0          0          0
##   24.59           10     0     0          0          0
##   24.6             4     0     0          0          0
##   24.61            5     0     0          0          0
##   24.62            6     0     0          0          0
##   24.63           31     0     0          0          0
##   24.64            1     0     0          0          0
##   24.65            7     0     0          0          0
##   24.66            3     0     0          0          0
##   24.67            8     0     0          0          0
##   24.68           15     0     0          0          0
##   24.69           94     0     0          0          0
##   24.72            7     0     0          0          0
##   24.73            1     0     0          0          0
##   24.74            1     0     0          0          0
##   24.75           13     0     0          0          0
##   24.77            3     0     0          0          0
##   24.78            8     0     0          0          0
##   24.8            90     0     0          0          0
##   24.81           19     0     0          0          0
##   24.82            7     0     0          0          0
##   24.83           18     0     0          0          0
```

```
##   24.85              1     0     0          0           0
##   24.86             12     0     0          0           0
##   24.87              2     0     0          0           0
##   24.89             86     0     0          0           0
##   24.9               9     0     0          0           0
##   24.91              8     0     0          0           0
##   24.92              1     0     0          0           0
##   24.93              2     0     0          0           0
##   24.94              6     0     0          0           0
##   24.95             11     0     0          0           0
##   24.96            120     0     0          0           0
##   24.97             14     0     0          0           0
##   24.98              4     0     0          0           0
##   24.99              3     0     0          0           0
##   25                 0     0     0         15           0
##   25.01              0     0     0          2           0
##   25.02              0     0     0         65           0
##   25.03              0     0     0          1           0
##   25.04              0     0     0         14           0
##   25.06              0     0     0        130           0
##   25.07              0     0     0         36           0
##   25.08              0     0     0          2           0
##   25.09              0     0     0        157           0
##   25.1               0     0     0        145           0
##   25.11              0     0     0         69           0
##   25.13              0     0     0          3           0
##   25.14              0     0     0          7           0
##   25.15              0     0     0         10           0
##   25.16              0     0     0          2           0
##   25.18              0     0     0          8           0
##   25.19              0     0     0          3           0
##   25.2               0     0     0          3           0
##   25.22              0     0     0          1           0
##   25.23              0     0     0         11           0
##   25.24              0     0     0         31           0
##   25.25              0     0     0         17           0
##   25.26              0     0     0          1           0
##   25.27              0     0     0          2           0
##   25.28              0     0     0          1           0
##   25.29              0     0     0          9           0
##   25.31              0     0     0          5           0
##   25.32              0     0     0          5           0
##   25.33              0     0     0         11           0
##   25.34              0     0     0          4           0
##   25.35              0     0     0          3           0
##   25.36              0     0     0          4           0
##   25.37              0     0     0         11           0
##   25.38              0     0     0          9           0
##   25.39              0     0     0         48           0
##   25.4               0     0     0         22           0
##   25.41              0     0     0          4           0
##   25.42              0     0     0          6           0
##   25.43              0     0     0          2           0
##   25.44              0     0     0          1           0
```

```
##   25.46            0     0     0          11           0
##   25.47            0     0     0           3           0
##   25.48            0     0     0           2           0
##   25.5             0     0     0          20           0
##   25.51            0     0     0          36           0
##   25.52            0     0     0           5           0
##   25.53            0     0     0           4           0
##   25.54            0     0     0          30           0
##   25.55            0     0     0          10           0
##   25.56            0     0     0           9           0
##   25.58            0     0     0           6           0
##   25.59            0     0     0           2           0
##   25.61            0     0     0          77           0
##   25.62            0     0     0          12           0
##   25.63            0     0     0           8           0
##   25.65            0     0     0           1           0
##   25.66            0     0     0           9           0
##   25.68            0     0     0          42           0
##   25.69            0     0     0          70           0
##   25.7             0     0     0          11           0
##   25.71            0     0     0           8           0
##   25.72            0     0     0           1           0
##   25.73            0     0     0          21           0
##   25.75            0     0     0         119           0
##   25.76            0     0     0           2           0
##   25.77            0     0     0          63           0
##   25.78            0     0     0           4           0
##   25.79            0     0     0          51           0
##   25.8             0     0     0          63           0
##   25.82            0     0     0          90           0
##   25.83            0     0     0          98           0
##   25.84            0     0     0         125           0
##   25.85            0     0     0          93           0
##   25.86            0     0     0           4           0
##   25.88            0     0     0           2           0
##   25.89            0     0     0           5           0
##   25.9             0     0     0           3           0
##   25.91            0     0     0           1           0
##   25.92            0     0     0           5           0
##   25.93            0     0     0           6           0
##   25.94            0     0     0           9           0
##   25.95            0     0     0           8           0
##   25.96            0     0     0           4           0
##   25.97            0     0     0           8           0
##   25.98            0     0     0           2           0
##   25.99            0     0     0          10           0
##   26               0     0     0           7           0
##   26.01            0     0     0           1           0
##   26.04            0     0     0          10           0
##   26.05            0     0     0           4           0
##   26.07            0     0     0          10           0
##   26.08            0     0     0           5           0
##   26.09            0     0     0          11           0
##   26.11            0     0     0           6           0
```

```
##   26.12             0     0     0          10           0
##   26.13             0     0     0           4           0
##   26.14             0     0     0           5           0
##   26.15             0     0     0          31           0
##   26.16             0     0     0           7           0
##   26.17             0     0     0           9           0
##   26.18             0     0     0           2           0
##   26.19             0     0     0           8           0
##   26.21             0     0     0           1           0
##   26.22             0     0     0          20           0
##   26.23             0     0     0           4           0
##   26.24             0     0     0           4           0
##   26.25             0     0     0          14           0
##   26.26             0     0     0          20           0
##   26.29             0     0     0          17           0
##   26.3              0     0     0           9           0
##   26.31             0     0     0          19           0
##   26.32             0     0     0          13           0
##   26.33             0     0     0           1           0
##   26.34             0     0     0           5           0
##   26.35             0     0     0           1           0
##   26.36             0     0     0           6           0
##   26.37             0     0     0          21           0
##   26.39             0     0     0          46           0
##   26.4              0     0     0           2           0
##   26.41             0     0     0           1           0
##   26.42             0     0     0           1           0
##   26.43             0     0     0          15           0
##   26.45             0     0     0          88           0
##   26.46             0     0     0          11           0
##   26.47             0     0     0          12           0
##   26.48             0     0     0           1           0
##   26.49             0     0     0           1           0
##   26.5              0     0     0          51           0
##   26.51             0     0     0           1           0
##   26.52             0     0     0          44           0
##   26.54             0     0     0          76           0
##   26.56             0     0     0           4           0
##   26.57             0     0     0          76           0
##   26.58             0     0     0          98           0
##   26.59             0     0     0           2           0
##   26.6              0     0     0           1           0
##   26.61             0     0     0         128           0
##   26.62             0     0     0           2           0
##   26.63             0     0     0         231           0
##   26.64             0     0     0           3           0
##   26.65             0     0     0           2           0
##   26.66             0     0     0           6           0
##   26.68             0     0     0           9           0
##   26.69             0     0     0           7           0
##   26.7              0     0     0          11           0
##   26.71             0     0     0           2           0
##   26.72             0     0     0           3           0
##   26.73             0     0     0           3           0
```

```
##   26.75            0     0     0          2          0
##   26.76            0     0     0          4          0
##   26.78            0     0     0         19          0
##   26.79            0     0     0          5          0
##   26.81            0     0     0          1          0
##   26.82            0     0     0          1          0
##   26.83            0     0     0          8          0
##   26.84            0     0     0          1          0
##   26.85            0     0     0          6          0
##   26.86            0     0     0          1          0
##   26.87            0     0     0         10          0
##   26.88            0     0     0          7          0
##   26.89            0     0     0          9          0
##   26.9             0     0     0          2          0
##   26.91            0     0     0          8          0
##   26.92            0     0     0          2          0
##   26.93            0     0     0         13          0
##   26.94            0     0     0          6          0
##   26.95            0     0     0         11          0
##   26.96            0     0     0         32          0
##   26.97            0     0     0          5          0
##   26.98            0     0     0          2          0
##   26.99            0     0     0          3          0
##   27.01            0     0     0          2          0
##   27.02            0     0     0          6          0
##   27.04            0     0     0          2          0
##   27.05            0     0     0         17          0
##   27.06            0     0     0         15          0
##   27.07            0     0     0         14          0
##   27.09            0     0     0          1          0
##   27.1             0     0     0         10          0
##   27.12            0     0     0        131          0
##   27.13            0     0     0          3          0
##   27.14            0     0     0          3          0
##   27.15            0     0     0          3          0
##   27.16            0     0     0          4          0
##   27.17            0     0     0          9          0
##   27.18            0     0     0          1          0
##   27.2             0     0     0         31          0
##   27.21            0     0     0          3          0
##   27.22            0     0     0          8          0
##   27.25            0     0     0          8          0
##   27.26            0     0     0         77          0
##   27.27            0     0     0          8          0
##   27.28            0     0     0          6          0
##   27.29            0     0     0          6          0
##   27.31            0     0     0          3          0
##   27.32            0     0     0         45          0
##   27.34            0     0     0         36          0
##   27.35            0     0     0          3          0
##   27.36            0     0     0          2          0
##   27.37            0     0     0         80          0
##   27.39            0     0     0          6          0
##   27.4             0     0     0         14          0
```

```
##   27.41              0     0     0          46           0
##   27.44              0     0     0         133           0
##   27.46              0     0     0         144           0
##   27.47              0     0     0           2           0
##   27.48              0     0     0           9           0
##   27.49              0     0     0           1           0
##   27.5               0     0     0           7           0
##   27.51              0     0     0           4           0
##   27.52              0     0     0           1           0
##   27.53              0     0     0           2           0
##   27.54              0     0     0           1           0
##   27.55              0     0     0           3           0
##   27.56              0     0     0           3           0
##   27.57              0     0     0           5           0
##   27.59              0     0     0           1           0
##   27.6               0     0     0          22           0
##   27.61              0     0     0           4           0
##   27.62              0     0     0          14           0
##   27.63              0     0     0           6           0
##   27.64              0     0     0           4           0
##   27.67              0     0     0          12           0
##   27.68              0     0     0           3           0
##   27.69              0     0     0           5           0
##   27.7               0     0     0           1           0
##   27.71              0     0     0          19           0
##   27.72              0     0     0           5           0
##   27.73              0     0     0           6           0
##   27.74              0     0     0           1           0
##   27.75              0     0     0           3           0
##   27.76              0     0     0          21           0
##   27.78              0     0     0           6           0
##   27.79              0     0     0           6           0
##   27.8               0     0     0          34           0
##   27.81              0     0     0           7           0
##   27.82              0     0     0           6           0
##   27.84              0     0     0           7           0
##   27.86              0     0     0           1           0
##   27.87              0     0     0           4           0
##   27.88              0     0     0           6           0
##   27.89              0     0     0          62           0
##   27.91              0     0     0           4           0
##   27.92              0     0     0           2           0
##   27.93              0     0     0           3           0
##   27.94              0     0     0           1           0
##   27.96              0     0     0          11           0
##   27.97              0     0     0           2           0
##   27.98              0     0     0          41           0
##   27.99              0     0     0           5           0
##   28                 0     0     0           9           0
##   28.01              0     0     0           3           0
##   28.03              0     0     0           2           0
##   28.04              0     0     0           2           0
##   28.06              0     0     0          68           0
##   28.07              0     0     0           3           0
```

```
##   28.08            0     0     0          5           0
##   28.09            0     0     0          2           0
##   28.1             0     0     0          1           0
##   28.11            0     0     0          1           0
##   28.12            0     0     0         16           0
##   28.13            0     0     0         47           0
##   28.15            0     0     0          4           0
##   28.16            0     0     0          1           0
##   28.17            0     0     0         11           0
##   28.19            0     0     0         88           0
##   28.21            0     0     0         11           0
##   28.22            0     0     0          1           0
##   28.23            0     0     0          3           0
##   28.24            0     0     0          1           0
##   28.25            0     0     0         87           0
##   28.27            0     0     0          1           0
##   28.28            0     0     0          7           0
##   28.29            0     0     0         51           0
##   28.3             0     0     0          1           0
##   28.31            0     0     0          4           0
##   28.32            0     0     0         51           0
##   28.34            0     0     0         78           0
##   28.35            0     0     0         33           0
##   28.36            0     0     0          1           0
##   28.37            0     0     0         15           0
##   28.38            0     0     0          3           0
##   28.4             0     0     0          3           0
##   28.41            0     0     0         10           0
##   28.43            0     0     0          2           0
##   28.44            0     0     0          1           0
##   28.45            0     0     0          1           0
##   28.46            0     0     0          1           0
##   28.47            0     0     0          6           0
##   28.48            0     0     0         46           0
##   28.49            0     0     0          3           0
##   28.5             0     0     0          6           0
##   28.52            0     0     0          2           0
##   28.53            0     0     0          5           0
##   28.55            0     0     0          5           0
##   28.57            0     0     0          7           0
##   28.59            0     0     0         30           0
##   28.6             0     0     0          6           0
##   28.62            0     0     0          8           0
##   28.63            0     0     0          4           0
##   28.65            0     0     0          5           0
##   28.66            0     0     0          5           0
##   28.67            0     0     0          4           0
##   28.68            0     0     0          1           0
##   28.7             0     0     0         81           0
##   28.71            0     0     0          3           0
##   28.72            0     0     0          3           0
##   28.73            0     0     0         13           0
##   28.74            0     0     0          6           0
##   28.75            0     0     0         16           0
```

```
##   28.76              0     0     0          2           0
##   28.78              0     0     0          2           0
##   28.79              0     0     0          3           0
##   28.8               0     0     0         32           0
##   28.82              0     0     0          1           0
##   28.84              0     0     0         10           0
##   28.85              0     0     0          1           0
##   28.87              0     0     0          4           0
##   28.88              0     0     0          1           0
##   28.89              0     0     0         78           0
##   28.9               0     0     0          8           0
##   28.91              0     0     0          1           0
##   28.93              0     0     0          1           0
##   28.94              0     0     0          1           0
##   28.95              0     0     0          2           0
##   28.97              0     0     0         28           0
##   28.98              0     0     0          5           0
##   29                 0     0     0          2           0
##   29.01              0     0     0          7           0
##   29.02              0     0     0          2           0
##   29.03              0     0     0         19           0
##   29.04              0     0     0          2           0
##   29.05              0     0     0         88           0
##   29.07              0     0     0          1           0
##   29.08              0     0     0          1           0
##   29.09              0     0     0          1           0
##   29.1               0     0     0          8           0
##   29.11              0     0     0          1           0
##   29.12              0     0     0         36           0
##   29.13              0     0     0          3           0
##   29.14              0     0     0          1           0
##   29.15              0     0     0          2           0
##   29.16              0     0     0         18           0
##   29.18              0     0     0         65           0
##   29.19              0     0     0          4           0
##   29.2               0     0     0          1           0
##   29.21              0     0     0          6           0
##   29.22              0     0     0          2           0
##   29.23              0     0     0         28           0
##   29.24              0     0     0          5           0
##   29.26              0     0     0         40           0
##   29.27              0     0     0          1           0
##   29.29              0     0     0         92           0
##   29.3               0     0     0          3           0
##   29.32              0     0     0          1           0
##   29.35              0     0     0          4           0
##   29.36              0     0     0          1           0
##   29.37              0     0     0          8           0
##   29.38              0     0     0          8           0
##   29.39              0     0     0          1           0
##   29.4               0     0     0          2           0
##   29.41              0     0     0         26           0
##   29.42              0     0     0          1           0
##   29.43              0     0     0          3           0
```

```
##   29.44              0     0     0          4           0
##   29.45              0     0     0          2           0
##   29.49              0     0     0          1           0
##   29.5               0     0     0          3           0
##   29.52              0     0     0          4           0
##   29.53              0     0     0         73           0
##   29.54              0     0     0          3           0
##   29.55              0     0     0          1           0
##   29.57              0     0     0          3           0
##   29.58              0     0     0          2           0
##   29.6               0     0     0          4           0
##   29.62              0     0     0          7           0
##   29.63              0     0     0          5           0
##   29.64              0     0     0          1           0
##   29.65              0     0     0         26           0
##   29.67              0     0     0          2           0
##   29.68              0     0     0         15           0
##   29.69              0     0     0          3           0
##   29.7               0     0     0          5           0
##   29.71              0     0     0          2           0
##   29.74              0     0     0          1           0
##   29.75              0     0     0          1           0
##   29.76              0     0     0         48           0
##   29.79              0     0     0          2           0
##   29.8               0     0     0          4           0
##   29.81              0     0     0          1           0
##   29.82              0     0     0          3           0
##   29.83              0     0     0          2           0
##   29.84              0     0     0         57           0
##   29.85              0     0     0          3           0
##   29.86              0     0     0         25           0
##   29.87              0     0     0          3           0
##   29.88              0     0     0          1           0
##   29.9               0     0     0          5           0
##   29.91              0     0     0          1           0
##   29.92              0     0     0          1           0
##   29.94              0     0     0          2           0
##   29.95              0     0     0         56           0
##   29.98              0     0     0          2           0
##   29.99              0     0     0         19           0
##   30                 0    13     0          0           0
##   30.02              0     4     0          0           0
##   30.04              0    50     0          0           0
##   30.05              0     1     0          0           0
##   30.07              0     2     0          0           0
##   30.08              0     4     0          0           0
##   30.11              0    43     0          0           0
##   30.12              0     4     0          0           0
##   30.13              0    54     0          0           0
##   30.14              0     2     0          0           0
##   30.17              0     9     0          0           0
##   30.18              0    29     0          0           0
##   30.21              0     2     0          0           0
##   30.23              0    29     0          0           0
```

```
##   30.24              0     4     0          0          0
##   30.25              0     4     0          0          0
##   30.27              0    24     0          0          0
##   30.28              0     4     0          0          0
##   30.29              0     3     0          0          0
##   30.3               0     7     0          0          0
##   30.31              0     2     0          0          0
##   30.34              0    21     0          0          0
##   30.36              0     6     0          0          0
##   30.37              0     3     0          0          0
##   30.38              0     4     0          0          0
##   30.4               0     1     0          0          0
##   30.41              0    74     0          0          0
##   30.42              0    13     0          0          0
##   30.43              0     7     0          0          0
##   30.45              0     2     0          0          0
##   30.46              0     1     0          0          0
##   30.47              0     5     0          0          0
##   30.5               0     2     0          0          0
##   30.51              0     3     0          0          0
##   30.52              0    39     0          0          0
##   30.54              0    17     0          0          0
##   30.55              0     4     0          0          0
##   30.56              0     3     0          0          0
##   30.59              0     2     0          0          0
##   30.61              0     1     0          0          0
##   30.62              0    12     0          0          0
##   30.65              0     4     0          0          0
##   30.66              0     2     0          0          0
##   30.67              0    38     0          0          0
##   30.68              0    43     0          0          0
##   30.69              0     1     0          0          0
##   30.7               0     1     0          0          0
##   30.71              0     4     0          0          0
##   30.72              0     3     0          0          0
##   30.73              0     9     0          0          0
##   30.74              0     1     0          0          0
##   30.75              0     4     0          0          0
##   30.78              0     2     0          0          0
##   30.79              0    26     0          0          0
##   30.8               0     3     0          0          0
##   30.81              0     9     0          0          0
##   30.82              0     2     0          0          0
##   30.83              0     4     0          0          0
##   30.85              0    23     0          0          0
##   30.86              0    16     0          0          0
##   30.87              0     1     0          0          0
##   30.88              0     1     0          0          0
##   30.9               0    54     0          0          0
##   30.91              0     3     0          0          0
##   30.95              0     4     0          0          0
##   30.96              0     2     0          0          0
##   30.99              0     9     0          0          0
##   31                 0    35     0          0          0
```

```
##   31.01            0    21     0          0          0
##   31.02            0     2     0          0          0
##   31.04            0     3     0          0          0
##   31.05            0     3     0          0          0
##   31.07            0     2     0          0          0
##   31.08            0     1     0          0          0
##   31.09            0    30     0          0          0
##   31.12            0     1     0          0          0
##   31.14            0     4     0          0          0
##   31.15            0     1     0          0          0
##   31.16            0     1     0          0          0
##   31.17            0    11     0          0          0
##   31.18            0    12     0          0          0
##   31.19            0    23     0          0          0
##   31.2             0     1     0          0          0
##   31.21            0     1     0          0          0
##   31.22            0     1     0          0          0
##   31.24            0     5     0          0          0
##   31.25            0    35     0          0          0
##   31.28            0     3     0          0          0
##   31.29            0     1     0          0          0
##   31.31            0     5     0          0          0
##   31.32            0    58     0          0          0
##   31.33            0     1     0          0          0
##   31.35            0     6     0          0          0
##   31.36            0     1     0          0          0
##   31.38            0    15     0          0          0
##   31.4             0     2     0          0          0
##   31.41            0     2     0          0          0
##   31.42            0     1     0          0          0
##   31.45            0     2     0          0          0
##   31.46            0    13     0          0          0
##   31.47            0    15     0          0          0
##   31.48            0     2     0          0          0
##   31.5             0     1     0          0          0
##   31.51            0     2     0          0          0
##   31.52            0     2     0          0          0
##   31.53            0     4     0          0          0
##   31.55            0     1     0          0          0
##   31.57            0    39     0          0          0
##   31.58            0     5     0          0          0
##   31.59            0     1     0          0          0
##   31.6             0     2     0          0          0
##   31.62            0    37     0          0          0
##   31.63            0     5     0          0          0
##   31.64            0     4     0          0          0
##   31.65            0     3     0          0          0
##   31.66            0    20     0          0          0
##   31.67            0     1     0          0          0
##   31.69            0     1     0          0          0
##   31.71            0     3     0          0          0
##   31.72            0     1     0          0          0
##   31.74            0     7     0          0          0
##   31.75            0    32     0          0          0
```

```
##   31.78            0     2     0          0          0
##   31.79            0     2     0          0          0
##   31.8             0     5     0          0          0
##   31.82            0     1     0          0          0
##   31.83            0     1     0          0          0
##   31.84            0     1     0          0          0
##   31.85            0     1     0          0          0
##   31.86            0     1     0          0          0
##   31.87            0    18     0          0          0
##   31.89            0    39     0          0          0
##   31.91            0     1     0          0          0
##   31.92            0     2     0          0          0
##   31.93            0    24     0          0          0
##   31.95            0     5     0          0          0
##   31.96            0     4     0          0          0
##   31.99            0     2     0          0          0
##   32               0     3     0          0          0
##   32.01            0    16     0          0          0
##   32.02            0     3     0          0          0
##   32.06            0     1     0          0          0
##   32.08            0    21     0          0          0
##   32.1             0    17     0          0          0
##   32.11            0    10     0          0          0
##   32.12            0    15     0          0          0
##   32.14            0     2     0          0          0
##   32.17            0     1     0          0          0
##   32.22            0     2     0          0          0
##   32.23            0     1     0          0          0
##   32.24            0     1     0          0          0
##   32.26            0     2     0          0          0
##   32.27            0     2     0          0          0
##   32.28            0    89     0          0          0
##   32.29            0     5     0          0          0
##   32.32            0    12     0          0          0
##   32.36            0     2     0          0          0
##   32.38            0     1     0          0          0
##   32.41            0     2     0          0          0
##   32.42            0     1     0          0          0
##   32.43            0     1     0          0          0
##   32.44            0     4     0          0          0
##   32.45            0     8     0          0          0
##   32.49            0    33     0          0          0
##   32.5             0     7     0          0          0
##   32.54            0     1     0          0          0
##   32.55            0    17     0          0          0
##   32.56            0     7     0          0          0
##   32.58            0     1     0          0          0
##   32.6             0     5     0          0          0
##   32.61            0    36     0          0          0
##   32.62            0     3     0          0          0
##   32.64            0     1     0          0          0
##   32.65            0     3     0          0          0
##   32.66            0     1     0          0          0
##   32.69            0    17     0          0          0
```

```
##   32.71            0     1     0          0          0
##   32.73            0     2     0          0          0
##   32.74            0     7     0          0          0
##   32.77            0     5     0          0          0
##   32.78            0    12     0          0          0
##   32.8             0     1     0          0          0
##   32.81            0     1     0          0          0
##   32.84            0     2     0          0          0
##   32.85            0     1     0          0          0
##   32.86            0     1     0          0          0
##   32.87            0     3     0          0          0
##   32.88            0     1     0          0          0
##   32.89            0    24     0          0          0
##   32.9             0     1     0          0          0
##   32.91            0     2     0          0          0
##   32.92            0    24     0          0          0
##   32.93            0     2     0          0          0
##   32.95            0     7     0          0          0
##   32.96            0     2     0          0          0
##   32.98            0    21     0          0          0
##   32.99            0     1     0          0          0
##   33               0    24     0          0          0
##   33.02            0     1     0          0          0
##   33.03            0     1     0          0          0
##   33.05            0     2     0          0          0
##   33.07            0     5     0          0          0
##   33.08            0     1     0          0          0
##   33.09            0    11     0          0          0
##   33.11            0     2     0          0          0
##   33.12            0     9     0          0          0
##   33.13            0     2     0          0          0
##   33.14            0     1     0          0          0
##   33.19            0     4     0          0          0
##   33.2             0    14     0          0          0
##   33.21            0     1     0          0          0
##   33.23            0    21     0          0          0
##   33.25            0     2     0          0          0
##   33.28            0    49     0          0          0
##   33.29            0     4     0          0          0
##   33.3             0     1     0          0          0
##   33.31            0     1     0          0          0
##   33.32            0     2     0          0          0
##   33.33            0     3     0          0          0
##   33.36            0     1     0          0          0
##   33.38            0     8     0          0          0
##   33.43            0     1     0          0          0
##   33.44            0     1     0          0          0
##   33.45            0    25     0          0          0
##   33.46            0     1     0          0          0
##   33.47            0    26     0          0          0
##   33.48            0     4     0          0          0
##   33.49            0     1     0          0          0
##   33.52            0     5     0          0          0
##   33.57            0     1     0          0          0
```

```
##   33.58            0     1     0          0          0
##   33.59            0     3     0          0          0
##   33.61            0     2     0          0          0
##   33.63            0     2     0          0          0
##   33.64            0    12     0          0          0
##   33.66            0    17     0          0          0
##   33.67            0    11     0          0          0
##   33.68            0     1     0          0          0
##   33.72            0     8     0          0          0
##   33.73            0     1     0          0          0
##   33.75            0     7     0          0          0
##   33.76            0     1     0          0          0
##   33.77            0     1     0          0          0
##   33.79            0     1     0          0          0
##   33.8             0     4     0          0          0
##   33.81            0     2     0          0          0
##   33.82            0     1     0          0          0
##   33.84            0     7     0          0          0
##   33.86            0     1     0          0          0
##   33.87            0     1     0          0          0
##   33.89            0    15     0          0          0
##   33.91            0    29     0          0          0
##   33.93            0     1     0          0          0
##   33.96            0    13     0          0          0
##   33.97            0     2     0          0          0
##   33.99            0     4     0          0          0
##   34.01            0    12     0          0          0
##   34.02            0     7     0          0          0
##   34.03            0     1     0          0          0
##   34.04            0     1     0          0          0
##   34.06            0     5     0          0          0
##   34.08            0     4     0          0          0
##   34.11            0     4     0          0          0
##   34.14            0     2     0          0          0
##   34.15            0     1     0          0          0
##   34.16            0     2     0          0          0
##   34.17            0     6     0          0          0
##   34.18            0    12     0          0          0
##   34.21            0    11     0          0          0
##   34.22            0     4     0          0          0
##   34.27            0     2     0          0          0
##   34.28            0     1     0          0          0
##   34.3             0     5     0          0          0
##   34.31            0     1     0          0          0
##   34.33            0    38     0          0          0
##   34.34            0     3     0          0          0
##   34.36            0     2     0          0          0
##   34.37            0     3     0          0          0
##   34.38            0     1     0          0          0
##   34.39            0     3     0          0          0
##   34.4             0     1     0          0          0
##   34.41            0     2     0          0          0
##   34.44            0    24     0          0          0
##   34.45            0     4     0          0          0
```

```
##   34.46            0    23     0          0          0
##   34.48            0     1     0          0          0
##   34.5             0     1     0          0          0
##   34.52            0     1     0          0          0
##   34.53            0     3     0          0          0
##   34.54            0     3     0          0          0
##   34.56            0     1     0          0          0
##   34.57            0     5     0          0          0
##   34.58            0     5     0          0          0
##   34.6             0     3     0          0          0
##   34.61            0     3     0          0          0
##   34.67            0     6     0          0          0
##   34.68            0     1     0          0          0
##   34.69            0     1     0          0          0
##   34.7             0    20     0          0          0
##   34.72            0     4     0          0          0
##   34.74            0     1     0          0          0
##   34.75            0    11     0          0          0
##   34.77            0     1     0          0          0
##   34.78            0     1     0          0          0
##   34.8             0     1     0          0          0
##   34.81            0     2     0          0          0
##   34.85            0     2     0          0          0
##   34.87            0    18     0          0          0
##   34.88            0     1     0          0          0
##   34.9             0     5     0          0          0
##   34.93            0     2     0          0          0
##   34.95            0    14     0          0          0
##   34.96            0     2     0          0          0
##   34.97            0    19     0          0          0
##   34.98            0     1     0          0          0
##   34.99            0     2     0          0          0
##   35               0     2     0          0          0
##   35.02            0     1     0          0          0
##   35.05            0     2     0          0          0
##   35.08            0     1     0          0          0
##   35.11            0     3     0          0          0
##   35.12            0     1     0          0          0
##   35.13            0     1     0          0          0
##   35.15            0    17     0          0          0
##   35.16            0     1     0          0          0
##   35.19            0     4     0          0          0
##   35.24            0    12     0          0          0
##   35.26            0    12     0          0          0
##   35.28            0     4     0          0          0
##   35.29            0     1     0          0          0
##   35.3             0     1     0          0          0
##   35.31            0     5     0          0          0
##   35.33            0     3     0          0          0
##   35.35            0     1     0          0          0
##   35.36            0     3     0          0          0
##   35.4             0     1     0          0          0
##   35.43            0    22     0          0          0
##   35.44            0    16     0          0          0
```

```
##   35.48            0     2     0          0          0
##   35.49            0     1     0          0          0
##   35.5             0     1     0          0          0
##   35.51            0    19     0          0          0
##   35.52            0     1     0          0          0
##   35.54            0     2     0          0          0
##   35.55            0     1     0          0          0
##   35.56            0     6     0          0          0
##   35.57            0     1     0          0          0
##   35.58            0     7     0          0          0
##   35.59            0     1     0          0          0
##   35.61            0     2     0          0          0
##   35.62            0    10     0          0          0
##   35.67            0     8     0          0          0
##   35.71            0     3     0          0          0
##   35.73            0     9     0          0          0
##   35.74            0     8     0          0          0
##   35.75            0     1     0          0          0
##   35.78            0     4     0          0          0
##   35.8             0     1     0          0          0
##   35.81            0     1     0          0          0
##   35.82            0     3     0          0          0
##   35.83            0     3     0          0          0
##   35.85            0     1     0          0          0
##   35.87            0    20     0          0          0
##   35.88            0     3     0          0          0
##   35.89            0     1     0          0          0
##   35.9             0     5     0          0          0
##   35.93            0     2     0          0          0
##   35.94            0    11     0          0          0
##   35.95            0    18     0          0          0
##   35.98            0     2     0          0          0
##   35.99            0     1     0          0          0
##   36               0     1     0          0          0
##   36.01            0     1     0          0          0
##   36.02            0    14     0          0          0
##   36.03            0     2     0          0          0
##   36.04            0     3     0          0          0
##   36.05            0     6     0          0          0
##   36.11            0     1     0          0          0
##   36.13            0     1     0          0          0
##   36.15            0     1     0          0          0
##   36.18            0     6     0          0          0
##   36.19            0     2     0          0          0
##   36.2             0     1     0          0          0
##   36.21            0     3     0          0          0
##   36.22            0     1     0          0          0
##   36.25            0     3     0          0          0
##   36.26            0     7     0          0          0
##   36.28            0     7     0          0          0
##   36.29            0     3     0          0          0
##   36.31            0     4     0          0          0
##   36.32            0     6     0          0          0
##   36.33            0     1     0          0          0
```

```
##   36.35            0     1     0          0          0
##   36.36            0     4     0          0          0
##   36.38            0     1     0          0          0
##   36.39            0     3     0          0          0
##   36.48            0     1     0          0          0
##   36.49            0    17     0          0          0
##   36.52            0     1     0          0          0
##   36.56            0     2     0          0          0
##   36.58            0    23     0          0          0
##   36.59            0     4     0          0          0
##   36.6             0     2     0          0          0
##   36.61            0    13     0          0          0
##   36.62            0     6     0          0          0
##   36.65            0     1     0          0          0
##   36.68            0     1     0          0          0
##   36.69            0     9     0          0          0
##   36.73            0     1     0          0          0
##   36.78            0     2     0          0          0
##   36.8             0     2     0          0          0
##   36.81            0     4     0          0          0
##   36.82            0     1     0          0          0
##   36.84            0     1     0          0          0
##   36.87            0     7     0          0          0
##   36.88            0     1     0          0          0
##   36.9             0     8     0          0          0
##   36.91            0     2     0          0          0
##   36.92            0    16     0          0          0
##   36.93            0     1     0          0          0
##   36.94            0     5     0          0          0
##   36.95            0     1     0          0          0
##   36.96            0     8     0          0          0
##   37               0     1     0          0          0
##   37.01            0     2     0          0          0
##   37.03            0     1     0          0          0
##   37.08            0     1     0          0          0
##   37.09            0     5     0          0          0
##   37.1             0    10     0          0          0
##   37.11            0     7     0          0          0
##   37.12            0    13     0          0          0
##   37.18            0     1     0          0          0
##   37.2             0     4     0          0          0
##   37.22            0     2     0          0          0
##   37.23            0     3     0          0          0
##   37.25            0     9     0          0          0
##   37.28            0     1     0          0          0
##   37.3             0     6     0          0          0
##   37.31            0     9     0          0          0
##   37.36            0     6     0          0          0
##   37.37            0     6     0          0          0
##   37.38            0     2     0          0          0
##   37.41            0     3     0          0          0
##   37.42            0     2     0          0          0
##   37.44            0     7     0          0          0
##   37.45            0     1     0          0          0
```

```
##   37.46            0     1     0          0          0
##   37.49            0    10     0          0          0
##   37.5             0    10     0          0          0
##   37.54            0     1     0          0          0
##   37.57            0     1     0          0          0
##   37.59            0    11     0          0          0
##   37.6             0     2     0          0          0
##   37.61            0     4     0          0          0
##   37.64            0     1     0          0          0
##   37.65            0     1     0          0          0
##   37.66            0    12     0          0          0
##   37.68            0     2     0          0          0
##   37.71            0     1     0          0          0
##   37.73            0     2     0          0          0
##   37.75            0     1     0          0          0
##   37.76            0    19     0          0          0
##   37.77            0     1     0          0          0
##   37.79            0    11     0          0          0
##   37.8             0     2     0          0          0
##   37.83            0     1     0          0          0
##   37.84            0    13     0          0          0
##   37.86            0     1     0          0          0
##   37.87            0     1     0          0          0
##   37.88            0     1     0          0          0
##   37.89            0     6     0          0          0
##   37.91            0     3     0          0          0
##   37.93            0     5     0          0          0
##   37.95            0     3     0          0          0
##   37.96            0     8     0          0          0
##   37.97            0     8     0          0          0
##   37.98            0    14     0          0          0
##   38.01            0    19     0          0          0
##   38.02            0     1     0          0          0
##   38.04            0     2     0          0          0
##   38.06            0     4     0          0          0
##   38.07            0     1     0          0          0
##   38.08            0     2     0          0          0
##   38.09            0     7     0          0          0
##   38.1             0     1     0          0          0
##   38.11            0     1     0          0          0
##   38.14            0     1     0          0          0
##   38.17            0     1     0          0          0
##   38.21            0     3     0          0          0
##   38.22            0     4     0          0          0
##   38.24            0     1     0          0          0
##   38.25            0     1     0          0          0
##   38.26            0     1     0          0          0
##   38.27            0    17     0          0          0
##   38.28            0     4     0          0          0
##   38.31            0     3     0          0          0
##   38.34            0     1     0          0          0
##   38.35            0     3     0          0          0
##   38.37            0     3     0          0          0
##   38.39            0     4     0          0          0
```

```
##   38.41            0     4     0          0          0
##   38.42            0     1     0          0          0
##   38.43            0     6     0          0          0
##   38.44            0     2     0          0          0
##   38.45            0     1     0          0          0
##   38.52            0     9     0          0          0
##   38.53            0     1     0          0          0
##   38.58            0     1     0          0          0
##   38.59            0     1     0          0          0
##   38.61            0     1     0          0          0
##   38.62            0     4     0          0          0
##   38.65            0     4     0          0          0
##   38.66            0     1     0          0          0
##   38.67            0     1     0          0          0
##   38.69            0     2     0          0          0
##   38.73            0     2     0          0          0
##   38.74            0    18     0          0          0
##   38.75            0     1     0          0          0
##   38.77            0     2     0          0          0
##   38.79            0     2     0          0          0
##   38.82            0     1     0          0          0
##   38.91            0     1     0          0          0
##   38.92            0     1     0          0          0
##   38.95            0     1     0          0          0
##   38.97            0    14     0          0          0
##   39               0     1     0          0          0
##   39.05            0     5     0          0          0
##   39.06            0     7     0          0          0
##   39.08            0     1     0          0          0
##   39.11            0     1     0          0          0
##   39.13            0     5     0          0          0
##   39.14            0     2     0          0          0
##   39.16            0    16     0          0          0
##   39.2             0     1     0          0          0
##   39.22            0     1     0          0          0
##   39.25            0     1     0          0          0
##   39.27            0     1     0          0          0
##   39.28            0     1     0          0          0
##   39.32            0     5     0          0          0
##   39.33            0     4     0          0          0
##   39.36            0     1     0          0          0
##   39.38            0     1     0          0          0
##   39.45            0     1     0          0          0
##   39.46            0     2     0          0          0
##   39.48            0     9     0          0          0
##   39.49            0     1     0          0          0
##   39.53            0     8     0          0          0
##   39.54            0     1     0          0          0
##   39.58            0     4     0          0          0
##   39.6             0     2     0          0          0
##   39.67            0     1     0          0          0
##   39.68            0     5     0          0          0
##   39.75            0     5     0          0          0
##   39.77            0     2     0          0          0
```

```
##   39.8              0     4     0          0          0
##   39.84             0     1     0          0          0
##   39.86             0     1     0          0          0
##   39.87             0     8     0          0          0
##   39.89             0     1     0          0          0
##   39.94             0    16     0          0          0
##   40.03             0     1     0          0          0
##   40.09             0     3     0          0          0
##   40.14             0     2     0          0          0
##   40.17             0     2     0          0          0
##   40.18             0     6     0          0          0
##   40.19             0     1     0          0          0
##   40.21             0     1     0          0          0
##   40.24             0     4     0          0          0
##   40.25             0     1     0          0          0
##   40.27             0     1     0          0          0
##   40.29             0     1     0          0          0
##   40.31             0     1     0          0          0
##   40.34             0     4     0          0          0
##   40.35             0    19     0          0          0
##   40.37             0     1     0          0          0
##   40.39             0     1     0          0          0
##   40.41             0     2     0          0          0
##   40.42             0     1     0          0          0
##   40.44             0     1     0          0          0
##   40.45             0     3     0          0          0
##   40.49             0     1     0          0          0
```

```r
summary(ibiccs_clean$bmi)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    17.5    22.1    24.9    25.6    28.2    40.5    2741
```

## Recode Language

```r
table(ibiccs_clean$lang)
```

```
##
##  Anglais Espagnol Français
##    22236       44     1621
```

```r
## Language
ibiccs_clean <- ibiccs_clean %>%
    mutate(language = case_when(
        lang == "Anglais" ~ "English",
        lang == "Espagnol" ~ "Fren/Span",
        lang == "Français" ~ "Fren/Span"
    ))
table(ibiccs_clean$lang, ibiccs_clean$language)
```

```
##
##            English Fren/Span
##   Anglais    22236         0
##   Espagnol       0        44
```

```
##   Français       0      1621
```

## Recode Gender

```
table(ibiccs_clean$q54)
```

```
##
## Femme Homme
## 14042  9859
```

```
#Gender
ibiccs_clean <- ibiccs_clean %>%
  mutate(gender = case_when(
    q54 == "Femme" ~ "Female",
    q54 == "Homme" ~ "Male"
  ))
table(ibiccs_clean$q54, ibiccs_clean$gender)
```

```
##
##         Female  Male
##   Femme  14042     0
##   Homme      0  9859
```

## Recode Self-Rated Health

```
table(ibiccs_clean$q2)
```

```
##
##                             Bon                       Excellent
##                            6725                            4803
##                         Mauvais                           Moyen
##                             489                            2104
## Ne sais pas/Refuse de répondre                        Très bon
##                              39                            9741
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(health = case_when(
    q2 == "Excellent" ~ "Excellent",
    q2 == "Très bon" ~ "Very Good",
    q2 == "Bon" ~ "Good",
    q2 == "Moyen" ~ "Poor/Fair",
    q2 == "Mauvais" ~ "Poor/Fair"
  ))
table(ibiccs_clean$q2, ibiccs_clean$health)
```

```
##
##                                 Excellent Good Poor/Fair Very Good
##   Bon                                   0 6725         0         0
##   Excellent                          4803    0         0         0
##   Mauvais                               0    0       489         0
##   Moyen                                 0    0      2104         0
##   Ne sais pas/Refuse de répondre        0    0         0         0
```

```
##   Très bon                                0    0         0      9741
```

## Recode Transportation

```
table(ibiccs_clean$q13)
```

```
##
##                                Autre (précisez:)
##                                               35
##                                           Marche
##                                             4484
##                                Ne s'applique pas
##                                               61
##                                      Ne sais pas
##                                               36
##                                          Scooter
##                                               21
##                                             Taxi
##                                              205
##                               Transport en commun
##                                             7886
## Véhicule motorisé (loué, emprunté, covoiturage)
##                                             9768
##                             Vélo en libre-service
##                                              243
##                                   Vélo personnel
##                                              934
##                                Voiture personnelle
##                                              228
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(common_transportation = case_when(
    q13 == "Marche" ~ "Walking",
    q13 == "Véhicule motorisé (loué, emprunté, covoiturage)" ~ "Car",
    q13 == "Voiture personnelle" ~ "Car",
    q13 == "Scooter" ~ "Other",
    q13 == "Taxi" ~ "Other",
    q13 == "Autre (précisez:)" ~ "Other",
    q13 == "Transport en commun" ~ "Public Transportation",
    q13 == "Vélo en libre-service" ~ "Bicycle",
    q13 == "Vélo personnel" ~ "Bicycle"
  ))
table(ibiccs_clean$q13, ibiccs_clean$common_transportation)
```

```
##
##                                           Bicycle  Car Other
##   Autre (précisez:)                             0    0    35
##   Marche                                        0    0     0
##   Ne s'applique pas                             0    0     0
##   Ne sais pas                                   0    0     0
##   Scooter                                       0    0    21
##   Taxi                                          0    0   205
##   Transport en commun                           0    0     0
```

```
##   Véhicule motorisé (loué, emprunté, covoiturage)       0 9768     0
##   Vélo en libre-service                                243    0     0
##   Vélo personnel                                       934    0     0
##   Voiture personnelle                                    0  228     0
##
##                                                  Public Transportation
##   Autre (précisez:)                                                  0
##   Marche                                                             0
##   Ne s'applique pas                                                  0
##   Ne sais pas                                                        0
##   Scooter                                                            0
##   Taxi                                                               0
##   Transport en commun                                             7886
##   Véhicule motorisé (loué, emprunté, covoiturage)                    0
##   Vélo en libre-service                                              0
##   Vélo personnel                                                     0
##   Voiture personnelle                                                0
##
##                                                  Walking
##   Autre (précisez:)                                    0
##   Marche                                            4484
##   Ne s'applique pas                                    0
##   Ne sais pas                                          0
##   Scooter                                              0
##   Taxi                                                 0
##   Transport en commun                                  0
##   Véhicule motorisé (loué, emprunté, covoiturage)      0
##   Vélo en libre-service                                0
##   Vélo personnel                                       0
##   Voiture personnelle                                  0
```

## Recode Physically Active (Y/N)

```
table(ibiccs_clean$q14)
```

```
##
## Ne sais pas/Ne s'applique pas                         Non
##                           276                        4124
##                           Oui           Refuse de répondre
##                         19471                          30
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(physically_active = case_when(
    q14 == "Oui" ~ "Yes",
    q14 == "Non" ~ "No"
  ))
table(ibiccs_clean$q14, ibiccs_clean$physically_active)
```

```
##
##                                  No   Yes
##   Ne sais pas/Ne s'applique pas     0     0
##   Non                            4124     0
##   Oui                               0 19471
```

```
##   Refuse de répondre                0     0
```

## Recode Type of Physical Activity

```
# Code into Sedentary, Walking, Moderate, Vigorous Activity
table(ibiccs_clean$q18)
```

```
##
##    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
##  266  447   49   97  243  508  976   52  204   78  291   10   53  332  662
##   16   17   18   19   20   21   22   23   24   25   26   27   28   29   30
##   51   31  561  101  181    8  254  102   29   24   13   17  649    5   30
##   31   32   33   34   35   36   37   38   39   40   41   42   43   44   45
##  206    6   55  254   22  229  920   24   17   44    4    9   11   46    1
##   46   47   48   49   50   51   52   53   54   55   56   57   58   59   60
##   12    8   15   16    5  139   58   23  266    3    5  355  225   55   80
##   61   62   63   64   65   66   67   68   69   70   71   96   97   98   99
##  145   30   75 3243    8 1203   20  862   34   52   17  544 3167  594   40
```

```
  ibiccs_clean <- ibiccs_clean %>%
    mutate(pa_level = case_when(
      q15 == 1 ~ "Low",
      q15 == 2 ~ "Moderate",
      q15 == 3 ~ "Low",
      q15 == 4 ~ "Moderate",
      q15 == 5 ~ "Vigorous",
      q15 == 6 ~ "Moderate",
      q15 == 7 ~ "Moderate",
      q15 == 8 ~ "Low",
      q15 == 9 ~ "Low",
      q15 == 10 ~ "Vigorous",
      q15 == 11 ~ "Vigorous",
      q15 == 12 ~ "Moderate",
      q15 == 13 ~ "Low",
      q15 == 14 ~ "Vigorous",
      q15 == 15 ~ "Vigorous",
      q15 == 16 ~ "Sedentary",
      q15 == 17 ~ "Low",
      q15 == 18 ~ "Moderate",
      q15 == 19 ~ "Low",
      q15 == 20 ~ "Moderate",
      q15 == 21 ~ "Moderate",
      q15 == 22 ~ "Vigorous",
      q15 == 23 ~ "Vigorous",
      q15 == 24 ~ "Low",
      q15 == 25 ~ "Low",
      q15 == 26 ~ "Low",
      q15 == 27 ~ "Moderate",
      q15 == 28 ~ "Vigorous",
      q15 == 29 ~ "Vigorous",
      q15 == 30 ~ "Vigorous",
      q15 == 31 ~ "Low",
      q15 == 32 ~ "Moderate",
```

```
      q15 == 33 ~ "Moderate",
      q15 == 34 ~ "Moderate",
      q15 == 35 ~ "Moderate",
      q15 == 36 ~ "Moderate",
      q15 == 37 ~ "Vigorous",
      q15 == 38 ~ "Vigorous",
      q15 == 39 ~ "Vigorous",
      q15 == 40 ~ "Vigorous",
      q15 == 41 ~ "Vigorous",
      q15 == 42 ~ "Moderate",
      q15 == 43 ~ "Moderate",
      q15 == 44 ~ "Vigorous",
      q15 == 45 ~ "Low",
      q15 == 46 ~ "Moderate",
      q15 == 47 ~ "Moderate",
      q15 == 48 ~ "Vigorous",
      q15 == 49 ~ "Moderate",
      q15 == 50 ~ "Moderate",
      q15 == 51 ~ "Vigorous",
      q15 == 52 ~ "Vigorous",
      q15 == 53 ~ "Vigorous",
      q15 == 54 ~ "Moderate",
      q15 == 55 ~ "Low",
      q15 == 56 ~ "Vigorous",
      q15 == 57 ~ "Moderate",
      q15 == 58 ~ "Vigorous",
      q15 == 59 ~ "Moderate",
      q15 == 60 ~ "Vigorous",
      q15 == 61 ~ "Vigorous",
      q15 == 62 ~ "Vigorous",
      q15 == 63 ~ "Vigorous",
      q15 == 64 ~ "Moderate",
      q15 == 65 ~ "Moderate",
      q15 == 66 ~ "Vigorous",
      q15 == 67 ~ "Vigorous",
      q15 == 68 ~ "Low",
      q15 == 69 ~ "Moderate",
      q15 == 96 ~ "NA",
      q15 == 97 ~ "Sedentary",
      q15 == 98 ~ "NA",
      q15 == 99 ~ "NA",
      TRUE ~ "NA"
    ))
table(ibiccs_clean$q15, ibiccs_clean$pa_level)
```

```
##
##       Low Moderate   NA Sedentary Vigorous
##   1   157        0    0         0        0
##   2     0      629    0         0        0
##   3    47        0    0         0        0
##   4     0       81    0         0        0
##   5     0        0    0         0      288
##   6     0      436    0         0        0
##   7     0     1044    0         0        0
```

```
##    8    26          0     0          0          0
##    9   131          0     0          0          0
##   10     0          0     0          0         74
##   11     0          0     0          0        179
##   12     0         12     0          0          0
##   13    33          0     0          0          0
##   14     0          0     0          0        316
##   15     0          0     0          0        828
##   16     0          0     0         30          0
##   17    27          0     0          0          0
##   18     0        357     0          0          0
##   19   122          0     0          0          0
##   20     0        174     0          0          0
##   21     0          9     0          0          0
##   22     0          0     0          0        156
##   23     0          0     0          0        182
##   24    29          0     0          0          0
##   25    27          0     0          0          0
##   26     8          0     0          0          0
##   27     0         14     0          0          0
##   28     0          0     0          0        852
##   29     0          0     0          0          2
##   30     0          0     0          0         23
##   31    92          0     0          0          0
##   32     0          3     0          0          0
##   33     0         30     0          0          0
##   34     0        188     0          0          0
##   35     0         15     0          0          0
##   36     0         93     0          0          0
##   37     0          0     0          0       1555
##   38     0          0     0          0         25
##   39     0          0     0          0          8
##   40     0          0     0          0         34
##   41     0          0     0          0         15
##   42     0         18     0          0          0
##   43     0         13     0          0          0
##   44     0          0     0          0         56
##   46     0          1     0          0          0
##   47     0          3     0          0          0
##   48     0          0     0          0         11
##   49     0         11     0          0          0
##   50     0          4     0          0          0
##   51     0          0     0          0        167
##   52     0          0     0          0         56
##   53     0          0     0          0         25
##   54     0        142     0          0          0
##   55     8          0     0          0          0
##   56     0          0     0          0         10
##   57     0        300     0          0          0
##   58     0          0     0          0        199
##   59     0         28     0          0          0
##   60     0          0     0          0         60
##   61     0          0     0          0        179
##   62     0          0     0          0         28
```

```
##   63    0        0    0         0       98
##   64    0     7090    0         0        0
##   65    0        2    0         0        0
##   66    0        0    0         0     1165
##   67    0        0    0         0       13
##   68  840        0    0         0        0
##   69    0       74    0         0        0
##   70    0        0   65         0        0
##   71    0        0   21         0        0
##   96    0        0  362         0        0
##   98    0        0   54         0        0
##   99    0        0   17         0        0
```

## Recode Days Per Week Spent Travelling via Car

```
table(ibiccs_clean$q21)
```

```
##
##    0    1    2    3    4    5    6    7   98   99
## 2785 2527 2631 2070 1648 3136 2019 4925 2037  123
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(day_per_week_motor_vehicle = case_when(
    q21 == 0 ~ 0,
    q21 == 1 ~ 1,
    q21 == 2 ~ 2,
    q21 == 3 ~ 3,
    q21 == 4 ~ 4,
    q21 == 5 ~ 5,
    q21 == 6 ~ 6,
    q21 == 7 ~ 7,
    q21 == 98 ~ NA_real_,
    q21 == 99 ~ NA_real_
  ))
table(ibiccs_clean$day_per_week_motor_vehicle)
```

```
##
##    0    1    2    3    4    5    6    7
## 2785 2527 2631 2070 1648 3136 2019 4925
```

## Recode Days Per Week Spent Travelling via Public Transport

```
table(ibiccs_clean$q23)
```

```
##
##    0    1    2    3    4    5    6    7    8    9
## 6169 2993 2167 1598 1339 3617 1482 1583 2726  227
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(day_per_week_public_transit = case_when(
    q23 == 0 ~ 0,
```

```
    q23 == 1 ~ 1,
    q23 == 2 ~ 2,
    q23 == 3 ~ 3,
    q23 == 4 ~ 4,
    q23 == 5 ~ 5,
    q23 == 6 ~ 6,
    q23 == 7 ~ 7,
    q23 == 8 ~ NA_real_,
    q23 == 9 ~ NA_real_
  ))

table(ibiccs_clean$q23, ibiccs_clean$day_per_week_public_transit)
```

```
##
##        0    1    2    3    4    5    6    7
##   0 6169    0    0    0    0    0    0    0
##   1    0 2993    0    0    0    0    0    0
##   2    0    0 2167    0    0    0    0    0
##   3    0    0    0 1598    0    0    0    0
##   4    0    0    0    0 1339    0    0    0
##   5    0    0    0    0    0 3617    0    0
##   6    0    0    0    0    0    0 1482    0
##   7    0    0    0    0    0    0    0 1583
##   8    0    0    0    0    0    0    0    0
##   9    0    0    0    0    0    0    0    0
```

## Recode Days Per Week Spent Travelling via Walking

```
table(ibiccs_clean$q25)
```

```
##
##    0    1    2    3    4    5    6    7    8    9
## 2115 1841 2361 2245 1831 3994 1711 5436 2149  218
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(day_per_week_walking = case_when(
    q25 == 0 ~ 0,
    q25 == 1 ~ 1,
    q25 == 2 ~ 2,
    q25 == 3 ~ 3,
    q25 == 4 ~ 4,
    q25 == 5 ~ 5,
    q25 == 6 ~ 6,
    q25 == 7 ~ 7,
    q25 == 8 ~ NA_real_,
    q25 == 9 ~ NA_real_
  ))

table(ibiccs_clean$q25, ibiccs_clean$day_per_week_walking)
```

```
##
##        0    1    2    3    4    5    6    7
##   0 2115    0    0    0    0    0    0    0
```

```
##   1    0 1841    0    0    0    0    0    0
##   2    0    0 2361    0    0    0    0    0
##   3    0    0    0 2245    0    0    0    0
##   4    0    0    0    0 1831    0    0    0
##   5    0    0    0    0    0 3994    0    0
##   6    0    0    0    0    0    0 1711    0
##   7    0    0    0    0    0    0    0 5436
##   8    0    0    0    0    0    0    0    0
##   9    0    0    0    0    0    0    0    0
```

## Recode Days Per Week Spent Travelling via Bike

```
table(ibiccs_clean$q27)
```

```
##
##     0     1     2     3     4     5     6     7    98    99
## 12010  1793  1185   741   462   632   215   294  6395   174
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(day_per_week_bike = case_when(
    q27 == 0 ~ 0,
    q27 == 1 ~ 1,
    q27 == 2 ~ 2,
    q27 == 3 ~ 3,
    q27 == 4 ~ 4,
    q27 == 5 ~ 5,
    q27 == 6 ~ 6,
    q27 == 7 ~ 7,
    q27 == 98 ~ NA_real_,
    q27 == 99 ~ NA_real_
  ))

table(ibiccs_clean$q27, ibiccs_clean$day_per_week_bike)
```

```
##
##          0     1     2     3     4     5     6     7
##   0  12010     0     0     0     0     0     0     0
##   1      0  1793     0     0     0     0     0     0
##   2      0     0  1185     0     0     0     0     0
##   3      0     0     0   741     0     0     0     0
##   4      0     0     0     0   462     0     0     0
##   5      0     0     0     0     0   632     0     0
##   6      0     0     0     0     0     0   215     0
##   7      0     0     0     0     0     0     0   294
##   98     0     0     0     0     0     0     0     0
##   99     0     0     0     0     0     0     0     0
```

## Recode Age

```
summary(ibiccs_clean$q42)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    18.0    31.0    41.0    42.6    53.0    94.0
```

```
#CCHS/STATCAN or continuous
```

## Recode Marital Status

```
table(ibiccs_clean$q44)
```

```
##
##               Célibatiare               Divorcé (e)
##                      9452                      1854
##                 En couple Marié(e)/Conjoint de fait
##                        79                     11287
##        Refuse de répondre                 Séparé (e)
##                       291                       460
##                 Veuf (ve)
##                       478
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(marital_status = case_when(
    q44 == "Célibatiare" ~ "Single",
    q44 == "Divorcé(e)" ~ "Divorced/Separated/Widowed",
    q44 == "En couple" ~ "Relationship/Married/Common-Law",
    q44 == "Marié(e)/Conjoint de fait" ~ "Relationship/Married/Common-Law",
    q44 == "Séparé(e)" ~ "Divorced/Separated/Widowed",
    q44 == "Veuf(ve)" ~ "Divorced/Separated/Widowed"
  ))
table(ibiccs_clean$q44, ibiccs_clean$marital_status)
```

```
##
##                            Relationship/Married/Common-Law Single
##   Célibatiare                                            0   9452
##   Divorcé (e)                                            0      0
##   En couple                                             79      0
##   Marié(e)/Conjoint de fait                          11287      0
##   Refuse de répondre                                     0      0
##   Séparé (e)                                             0      0
##   Veuf (ve)                                              0      0
```

## Recode Number of Children in Home

```
table(ibiccs_clean$q45)
```

```
##
##     1     2     3     4     5     6     7     8     9
##  2915  1863   471   119    40    18     9 18191   275
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(children_household = case_when(
    q45 == 1 ~ 1,
    q45 == 2 ~ 2,
```

```
    q45 == 3 ~ 3,
    q45 == 4 ~ 3,
    q45 == 5 ~ 3,
    q45 == 6 ~ 3,
    q45 == 7 ~ 3,
    q45 == 8 ~ 0,
    q45 == 9 ~ NA_real_
  ))
table(ibiccs_clean$q45, ibiccs_clean$children_household)
```

```
##
##         0     1     2     3
##   1     0  2915     0     0
##   2     0     0  1863     0
##   3     0     0     0   471
##   4     0     0     0   119
##   5     0     0     0    40
##   6     0     0     0    18
##   7     0     0     0     9
##   8 18191     0     0     0
##   9     0     0     0     0
```

## Recode Months in Current Home?

```
summary(ibiccs_clean$q46b)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##       0       3       5       5       6      81   15358
```

## Recode Ethnicity

```
table(ibiccs_clean$q47)
```

```
##
## Amérindien des États-Unis / Autochtone d'Amérique
##                                                79
##             Arabe (Moyen-Orient, Afrique du Nord)
##                                               135
##                Asiatique / insulaire du Pacifique
##                                              2661
##                                             Autre
##                                               129
##                             Blanc(che) / Caucasien
##                                             17154
##                Hispanique / Latino / Espagnol(e)
##                                               933
##                              Indien / Pakistanais
##                                               330
##                       Je préfère ne pas répondre
##                                               639
```

```
##                                          Jewish
##                                              16
##                     Mixed / Mixed race / Bi-racial
##                                             171
##          Noir(e) / Africain(e) / Afro-Américain(e)
##                                            1654
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(ethnicity = case_when(
    q47 == "Amérindien des États-Unis / Autochtone d'Amérique" ~ "Native American/Indigenous",
    q47 == "Arabe (Moyen-Orient, Afrique du Nord)" ~ "Other",
    q47 == "Asiatique / insulaire du Pacifique" ~ "Asian",
    q47 == "Autre" ~ "Other",
    q47 == "Blanc(che) / Caucasien" ~ "Caucasian",
    q47 == "Hispanique / Latino / Espagnol(e)" ~ "Hispanic",
    q47 == "Indien / Pakistanais" ~ "Other",
    q47 == "Jewish" ~ "Other",
    q47 == "Mixed / Mixed race / Bi-racial" ~ "Other",
    q47 == "Noir(e) / Africain(e) / Afro-Américain(e)" ~ "African American/Canadian"
  ))
table(ibiccs_clean$q47, ibiccs_clean$ethnicity)
```

```
##
##                                                 African American/Canadian
##   Amérindien des États-Unis / Autochtone d'Amérique                         0
##   Arabe (Moyen-Orient, Afrique du Nord)                                     0
##   Asiatique / insulaire du Pacifique                                        0
##   Autre                                                                     0
##   Blanc(che) / Caucasien                                                    0
##   Hispanique / Latino / Espagnol(e)                                         0
##   Indien / Pakistanais                                                      0
##   Je préfère ne pas répondre                                                0
##   Jewish                                                                    0
##   Mixed / Mixed race / Bi-racial                                            0
##   Noir(e) / Africain(e) / Afro-Américain(e)                              1654
##
##                                                 Asian Caucasian
##   Amérindien des États-Unis / Autochtone d'Amérique     0         0
##   Arabe (Moyen-Orient, Afrique du Nord)                 0         0
##   Asiatique / insulaire du Pacifique                 2661         0
##   Autre                                                 0         0
##   Blanc(che) / Caucasien                                0     17154
##   Hispanique / Latino / Espagnol(e)                     0         0
##   Indien / Pakistanais                                  0         0
##   Je préfère ne pas répondre                            0         0
##   Jewish                                                0         0
##   Mixed / Mixed race / Bi-racial                        0         0
##   Noir(e) / Africain(e) / Afro-Américain(e)             0         0
##
##                                                 Hispanic
##   Amérindien des États-Unis / Autochtone d'Amérique        0
##   Arabe (Moyen-Orient, Afrique du Nord)                    0
##   Asiatique / insulaire du Pacifique                       0
##   Autre                                                    0
##   Blanc(che) / Caucasien                                   0
```

```
##   Hispanique / Latino / Espagnol(e)                     933
##   Indien / Pakistanais                                    0
##   Je préfère ne pas répondre                              0
##   Jewish                                                  0
##   Mixed / Mixed race / Bi-racial                          0
##   Noir(e) / Africain(e) / Afro-Américain(e)               0
##
##                                                  Native American/Indigenous
##   Amérindien des États-Unis / Autochtone d'Amérique                        79
##   Arabe (Moyen-Orient, Afrique du Nord)                                     0
##   Asiatique / insulaire du Pacifique                                        0
##   Autre                                                                     0
##   Blanc(che) / Caucasien                                                    0
##   Hispanique / Latino / Espagnol(e)                                         0
##   Indien / Pakistanais                                                      0
##   Je préfère ne pas répondre                                                0
##   Jewish                                                                    0
##   Mixed / Mixed race / Bi-racial                                            0
##   Noir(e) / Africain(e) / Afro-Américain(e)                                 0
##
##                                                  Other
##   Amérindien des États-Unis / Autochtone d'Amérique    0
##   Arabe (Moyen-Orient, Afrique du Nord)              135
##   Asiatique / insulaire du Pacifique                   0
##   Autre                                              129
##   Blanc(che) / Caucasien                               0
##   Hispanique / Latino / Espagnol(e)                    0
##   Indien / Pakistanais                               330
##   Je préfère ne pas répondre                           0
##   Jewish                                              16
##   Mixed / Mixed race / Bi-racial                     171
##   Noir(e) / Africain(e) / Afro-Américain(e)            0
```

## Recode Country Born

```
table(ibiccs_clean$q48)
```

```
##
##     1     2     3     4     5     6     7     8     9    10    11    12
##  7171 13175   246    11    11    20    29    49    20    28    14    17
##    13    14    15    16    17    18    19    20    21    22    23    24
##    15    12   109   153   104   231   166    39     7    22    77    43
##    25    26    27    28    29    30    31    32    33    34    35    36
##    73    28    21    57    27    18    93    63    44    48    66    33
##    37    38    39    40    41    42    43    44    45    46    47    48
##    33    23    25    24   159    51    27    43     8    15     4    40
##    49    50    51    52    53    54    55    56    57    58    59    60
##     5    26    14    11    20    11    13    34     3    18    13    13
##    61    62    63    64    65    66    67    68    69    70    71    72
##    12     9    33    24    13    15    20     9     6    13    10     3
##    73    74    75    76    77    78    79    80    81    96    99
##    16     8     4     5    19    12     6     9    13   196   473
```

```r
ibiccs_clean <- ibiccs_clean %>%
  mutate(country_born = case_when(
    q48 == 1 ~ "Canada",
    q48 == 2 ~ "United States",
    q48 >= 3 ~ "Other",
    q48 <= 81 ~ "Other",
    q48 == 96 ~ "Other"
  ))
table(ibiccs_clean$q48, ibiccs_clean$country_born)
```

```
##
##      Canada Other United States
##   1    7171     0             0
##   2       0     0         13175
##   3       0   246             0
##   4       0    11             0
##   5       0    11             0
##   6       0    20             0
##   7       0    29             0
##   8       0    49             0
##   9       0    20             0
##   10      0    28             0
##   11      0    14             0
##   12      0    17             0
##   13      0    15             0
##   14      0    12             0
##   15      0   109             0
##   16      0   153             0
##   17      0   104             0
##   18      0   231             0
##   19      0   166             0
##   20      0    39             0
##   21      0     7             0
##   22      0    22             0
##   23      0    77             0
##   24      0    43             0
##   25      0    73             0
##   26      0    28             0
##   27      0    21             0
##   28      0    57             0
##   29      0    27             0
##   30      0    18             0
##   31      0    93             0
##   32      0    63             0
##   33      0    44             0
##   34      0    48             0
##   35      0    66             0
##   36      0    33             0
##   37      0    33             0
##   38      0    23             0
##   39      0    25             0
##   40      0    24             0
##   41      0   159             0
##   42      0    51             0
```

```
##   43      0    27             0
##   44      0    43             0
##   45      0     8             0
##   46      0    15             0
##   47      0     4             0
##   48      0    40             0
##   49      0     5             0
##   50      0    26             0
##   51      0    14             0
##   52      0    11             0
##   53      0    20             0
##   54      0    11             0
##   55      0    13             0
##   56      0    34             0
##   57      0     3             0
##   58      0    18             0
##   59      0    13             0
##   60      0    13             0
##   61      0    12             0
##   62      0     9             0
##   63      0    33             0
##   64      0    24             0
##   65      0    13             0
##   66      0    15             0
##   67      0    20             0
##   68      0     9             0
##   69      0     6             0
##   70      0    13             0
##   71      0    10             0
##   72      0     3             0
##   73      0    16             0
##   74      0     8             0
##   75      0     4             0
##   76      0     5             0
##   77      0    19             0
##   78      0    12             0
##   79      0     6             0
##   80      0     9             0
##   81      0    13             0
##   96      0   196             0
##   99      0   473             0
```

## Recode Motor Vehicle Access

```
table(ibiccs_clean$q50)
```

```
##
## Ne sais pas/Ne s'applique pas                          Non
##                           230                         6295
##                           Oui
##                         17376
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(motor_vehicle_access = case_when(
    q50 == "Non" ~ "No",
    q50 == "Oui" ~ "Yes"
  ))
table(ibiccs_clean$q50, ibiccs_clean$motor_vehicle_access)
```

```
##
##                                    No   Yes
##   Ne sais pas/Ne s'applique pas     0     0
##   Non                            6295     0
##   Oui                               0 17376
```

## Recode Education Level

```
table(ibiccs_clean$q51)
```

```
##
##                  Aucun grade, certificat ou diplôme
##                                                  32
##                                  Autre (précisez):
##                                                  81
##                                       Baccalauréat
##                                               8638
##                                             Cégep
##                                               3197
## Certificat d'école de métier, certificat ou diplôme
##                                               2559
##         Diplôme d'études secondaire ou l'équivalent
##                                               2471
##     Diplôme universitaire supérieur au baccalauréat
##                                               6655
##                                     École primaire
##                                                 88
##                                  Refuse de répondre
##                                                180
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(education = case_when(
    q51 == "Aucun grade, certificat ou diplôme" ~ "High School/Lower",
    q51 == "Baccalauréat" ~ "Baccalaureate",
    q51 == "Cégep" ~ "Cégep",
    q51 == "Certificat d'école de métier, certificat ou diplôme" ~ "Certificate/Diploma",
    q51 == "Diplôme d'études secondaire ou l'équivalent" ~ "High School/Lower",
    q51 == "Diplôme universitaire supérieur au baccalauréat" ~ "Graduate School",
    q51 == "École primaire" ~ "High School/Lower"
  ))
table(ibiccs_clean$q51, ibiccs_clean$education)
```

```
##
##                                                  Baccalaureate Cégep
##   Aucun grade, certificat ou diplôme                         0     0
##   Autre (précisez):                                          0     0
```

```
##   Baccalauréat                                                 8638     0
##   Cégep                                                           0  3197
##   Certificat d'école de métier, certificat ou diplôme             0     0
##   Diplôme d'études secondaire ou l'équivalent                     0     0
##   Diplôme universitaire supérieur au baccalauréat                 0     0
##   École primaire                                                  0     0
##   Refuse de répondre                                              0     0
##
##                                                          Certificate/Diploma
##   Aucun grade, certificat ou diplôme                                     0
##   Autre (précisez):                                                      0
##   Baccalauréat                                                           0
##   Cégep                                                                  0
##   Certificat d'école de métier, certificat ou diplôme                 2559
##   Diplôme d'études secondaire ou l'équivalent                            0
##   Diplôme universitaire supérieur au baccalauréat                        0
##   École primaire                                                         0
##   Refuse de répondre                                                     0
##
##                                                          Graduate School
##   Aucun grade, certificat ou diplôme                                   0
##   Autre (précisez):                                                    0
##   Baccalauréat                                                         0
##   Cégep                                                                0
##   Certificat d'école de métier, certificat ou diplôme                  0
##   Diplôme d'études secondaire ou l'équivalent                          0
##   Diplôme universitaire supérieur au baccalauréat                   6655
##   École primaire                                                       0
##   Refuse de répondre                                                   0
##
##                                                          High School/Lower
##   Aucun grade, certificat ou diplôme                                    32
##   Autre (précisez):                                                      0
##   Baccalauréat                                                           0
##   Cégep                                                                  0
##   Certificat d'école de métier, certificat ou diplôme                    0
##   Diplôme d'études secondaire ou l'équivalent                         2471
##   Diplôme universitaire supérieur au baccalauréat                        0
##   École primaire                                                        88
##   Refuse de répondre                                                     0
```

## Recode Occupation Status

```
table(ibiccs_clean$Q52_occupational_status_category)
```

```
##
##                  Disability  Full time or Self-employed
##                         453                       15373
## Homemaker or parental leave                   Part time
##                         983                        1899
##                     Retired                     Student
##                        2434                        1586
```

```
##     Unemployed seeking work
##                         977
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(occupation_status = case_when(
    Q52_occupational_status_category == "Disability" ~ "Unemployed",
    Q52_occupational_status_category == "Full time or Self-employed" ~ "Employed",
    Q52_occupational_status_category == "Homemaker or parental leave" ~ "Unemployed",
    Q52_occupational_status_category == "Part time" ~ "Employed",
    Q52_occupational_status_category == "Retired" ~ "Unemployed",
    Q52_occupational_status_category == "Student" ~ "Student",
    Q52_occupational_status_category == "Unemployed seeking work" ~ "Unemployed"
  ))
table(ibiccs_clean$Q52_occupational_status_category, ibiccs_clean$occupation_status)
```

```
##
##                               Employed Student Unemployed
##   Disability                         0       0        453
##   Full time or Self-employed     15373       0          0
##   Homemaker or parental leave        0       0        983
##   Part time                       1899       0          0
##   Retired                            0       0       2434
##   Student                            0    1586          0
##   Unemployed seeking work            0       0        977
```

## Recode Household Income

```
table(ibiccs_clean$q53)
```

```
##
##   Entre 10000 $ and 19999 $ par année
##                                  1084
## Entre 100000 $ and 149999 $ par année
##                                  3490
## Entre 150000 $ and 199999 $ par année
##                                  1296
##   Entre 20000 $ and 34999 $ par année
##                                  2061
##   Entre 35000 $ and 49999 $ par année
##                                  2700
##   Entre 50000 $ and 74999 $ par année
##                                  4396
##   Entre 75000 $ and 99999 $ par année
##                                  3425
##            Moins de 10000 $ par année
##                                  1366
##            Plus de 200000 $ par année
##                                  1104
##                    Refuse de répondre
##                                  2979
```

```
ibiccs_clean <- ibiccs_clean %>%
  mutate(household_income = case_when(
```

```
    q53 == "Moins de 10000 $ par année" ~ "$0-$49999",
    q53 == "Entre 10000 $ and 19999 $ par année" ~ "$0-$49999",
    q53 == "Entre 20000 $ and 34999 $ par année" ~ "$0-$49999",
    q53 == "Entre 35000 $ and 49999 $ par année" ~ "$0-$49999",
    q53 == "Entre 50000 $ and 74999 $ par année" ~ "$50000-$99999",
    q53 == "Entre 75000 $ and 99999 $ par année" ~ "$50000-$99999",
    q53 == "Entre 100000 $ and 149999 $ par année" ~ "$100000-$149999",
    q53 == "Entre 150000 $ and 199999 $ par année" ~ "$150000+",
    q53 == "Plus de 200000 $ par année" ~ "$150000+",
    q53 == "Refuse de répondre" ~ "Missing"
  ))
table(ibiccs_clean$q53, ibiccs_clean$household_income)
```

```
##
##                                       $0-$49999 $100000-$149999 $150000+
##   Entre 10000 $ and 19999 $ par année        1084               0        0
##   Entre 100000 $ and 149999 $ par année         0            3490        0
##   Entre 150000 $ and 199999 $ par année         0               0     1296
##   Entre 20000 $ and 34999 $ par année        2061               0        0
##   Entre 35000 $ and 49999 $ par année        2700               0        0
##   Entre 50000 $ and 74999 $ par année           0               0        0
##   Entre 75000 $ and 99999 $ par année           0               0        0
##   Moins de 10000 $ par année                 1366               0        0
##   Plus de 200000 $ par année                    0               0     1104
##   Refuse de répondre                            0               0        0
##
##                                       $50000-$99999 Missing
##   Entre 10000 $ and 19999 $ par année              0       0
##   Entre 100000 $ and 149999 $ par année            0       0
##   Entre 150000 $ and 199999 $ par année            0       0
##   Entre 20000 $ and 34999 $ par année              0       0
##   Entre 35000 $ and 49999 $ par année              0       0
##   Entre 50000 $ and 74999 $ par année           4396       0
##   Entre 75000 $ and 99999 $ par année           3425       0
##   Moins de 10000 $ par année                       0       0
##   Plus de 200000 $ par année                       0       0
##   Refuse de répondre                               0    2979
```

## Filtering Out Cities

```
Boston <- filter(ibiccs_clean, ville == "Boston")
Chicago <- filter(ibiccs_clean, ville == "Chicago")
Detroit <- filter(ibiccs_clean, ville == "Détroit")
NewYork <- filter(ibiccs_clean, ville == "New-York")
Philadelphia <- filter(ibiccs_clean, ville == "Philadelphie")
Montreal <- filter(ibiccs_clean, ville == "Montréal")
Toronto <- filter(ibiccs_clean, ville == "Toronto")
Vancouver <- filter(ibiccs_clean, ville == "Vancouver")
```

## Filtering Out Variables in Clean Data & Filtering Cities

```
vars_clean <- c('language', 'ville', 'gender', 'health', 'common_transportation', 'physically_active',

ibiccs <- dplyr::select(ibiccs_clean, vars_clean)
Boston <- dplyr::select(Boston, vars_clean)
Chicago <- dplyr::select(Chicago, vars_clean)
Detroit <- dplyr::select(Detroit, vars_clean)
NewYork <- dplyr::select(NewYork, vars_clean)
Philadelphia <- dplyr::select(Philadelphia, vars_clean)
Montreal <- dplyr::select(Montreal, vars_clean)
Toronto <- dplyr::select(Toronto, vars_clean)
Vancouver <- dplyr::select(Vancouver, vars_clean)
city <- rbind(Philadelphia, NewYork, Detroit, Chicago, Boston, Montreal, Toronto, Vancouver)
```

#Tables for Each City and Combined

```
vars <- c('language', 'ville', 'gender', 'health', 'common_transportation', 'physically_active', 'pa_le
CreateTableOne(vars = vars, strata = "ville", data = ibiccs)
```

```
##                                          Stratified by ville
##                                           Boston          Chicago
##   n                                         1977            4085
##   language = Fren/Span (%)                     3 (  0.2)      20 (  0.5)
##   ville (%)
##      Boston                                 1977 (100.0)       0 (  0.0)
##      Chicago                                   0 (  0.0)    4085 (100.0)
##      Détroit                                   0 (  0.0)       0 (  0.0)
##      Montréal                                  0 (  0.0)       0 (  0.0)
##      New-York                                  0 (  0.0)       0 (  0.0)
##      Philadelphie                              0 (  0.0)       0 (  0.0)
##      Toronto                                   0 (  0.0)       0 (  0.0)
##      Vancouver                                 0 (  0.0)       0 (  0.0)
##   gender = Male (%)                          694 ( 35.1)    1628 ( 39.9)
##   health (%)
##      Excellent                               467 ( 23.7)     832 ( 20.4)
##      Good                                    521 ( 26.4)    1105 ( 27.1)
##      Poor/Fair                               166 (  8.4)     412 ( 10.1)
##      Very Good                               818 ( 41.5)    1727 ( 42.4)
##   common_transportation (%)
##      Bicycle                                 104 (  5.3)     170 (  4.2)
##      Car                                     685 ( 34.7)    1803 ( 44.3)
##      Other                                    16 (  0.8)      48 (  1.2)
##      Public Transportation                   669 ( 33.9)    1473 ( 36.2)
##      Walking                                 500 ( 25.3)     576 ( 14.2)
##   physically_active = Yes (%)               1703 ( 87.0)    3418 ( 84.5)
##   pa_level (%)
##      Low                                     132 (  6.7)     285 (  7.0)
##      Moderate                                837 ( 42.3)    1712 ( 41.9)
##      NA                                      317 ( 16.0)     743 ( 18.2)
##      Sedentary                                 2 (  0.1)       4 (  0.1)
##      Vigorous                                689 ( 34.9)    1341 ( 32.8)
##   day_per_week_motor_vehicle (mean (SD))    3.68 (2.47)     4.08 (2.35)
##   day_per_week_public_transit (mean (SD))   2.95 (2.37)     2.77 (2.36)
```

```
##   day_per_week_walking (mean (SD))          4.62 (2.25)    4.10 (2.30)
##   day_per_week_bike (mean (SD))             0.87 (1.74)    0.84 (1.58)
##   q42 (mean (SD))                          37.21 (13.86)  39.59 (12.73)
##   marital_status = Single (%)               1025 ( 57.8)   1844 ( 50.5)
##   children_household (mean (SD))            0.25 (0.62)    0.37 (0.77)
##   ethnicity (%)
##      African American/Canadian               110 (  5.7)    449 ( 11.2)
##      Asian                                   218 ( 11.3)    313 (  7.8)
##      Caucasian                              1480 ( 76.6)   2863 ( 71.5)
##      Hispanic                                 67 (  3.5)    300 (  7.5)
##      Native American/Indigenous                7 (  0.4)      8 (  0.2)
##      Other                                    49 (  2.5)     72 (  1.8)
##   country_born (%)
##      Canada                                   21 (  1.1)     31 (  0.8)
##      Other                                   220 ( 11.1)    342 (  8.4)
##      United States                          1736 ( 87.8)   3712 ( 90.9)
##   motor_vehicle_access = Yes (%)            1442 ( 73.5)   3266 ( 80.5)
##   education (%)
##      Baccalaureate                           757 ( 38.6)   1624 ( 40.1)
##      Cégep                                   231 ( 11.8)    495 ( 12.2)
##      Certificate/Diploma                      65 (  3.3)    293 (  7.2)
##      Graduate School                         774 ( 39.5)   1320 ( 32.6)
##      High School/Lower                       132 (  6.7)    317 (  7.8)
##   occupation_status (%)
##      Employed                               1442 ( 73.5)   3160 ( 78.0)
##      Student                                 272 ( 13.9)    271 (  6.7)
##      Unemployed                              249 ( 12.7)    622 ( 15.3)
##   household_income (%)
##      $0-$49999                               599 ( 30.3)   1248 ( 30.6)
##      $100000-$149999                         304 ( 15.4)    617 ( 15.1)
##      $150000+                                232 ( 11.7)    438 ( 10.7)
##      $50000-$99999                           617 ( 31.2)   1403 ( 34.3)
##      Missing                                 225 ( 11.4)    379 (  9.3)
##   bmi (mean (SD))                          25.06 (4.59)   25.89 (4.86)
##   bmi_category (%)
##      normal weight                           982 ( 49.7)   1745 ( 42.7)
##      obese                                   248 ( 12.5)    698 ( 17.1)
##      other                                   192 (  9.7)    438 ( 10.7)
##      overweight                              511 ( 25.8)   1139 ( 27.9)
##      underweight                              44 (  2.2)     65 (  1.6)
##   WalkScore (mean (SD))                    86.19 (17.12)  80.36 (17.45)
##   WalkScoreLabel (%)
##                                               38 (  1.9)     51 (  1.2)
##      Car-Dependent                            96 (  4.9)    274 (  6.7)
##      Somewhat Walkable                        85 (  4.3)    510 ( 12.5)
##      Very Walkable                           598 ( 30.2)   1680 ( 41.1)
##      Walker's Paradise                      1160 ( 58.7)   1570 ( 38.4)
##   TransitScore (mean (SD))                 73.62 (16.68)  77.05 (11.31)
##   TransitScoreLabel (%)
##                                            1694 ( 85.7)   3713 ( 90.9)
##      Excellent Transit                       201 ( 10.2)    277 (  6.8)
##      Good Transit                             64 (  3.2)     82 (  2.0)
##      Minimal Transit                           0 (  0.0)      0 (  0.0)
##      Rider's Paradise                         16 (  0.8)     13 (  0.3)
```

```
##      Some Transit                              2 (  0.1)      0 (  0.0)
##   BikeScore (mean (SD))                  106.50 (32.02)  87.29 (29.96)
##   BikeScoreLabel (%)
##                                            598 ( 30.2)    558 ( 13.7)
##      Bikeable                              475 ( 24.0)   1113 ( 27.2)
##      Biker's Paradise                      323 ( 16.3)      0 (  0.0)
##      Somewhat Bikeable                      26 (  1.3)    264 (  6.5)
##      Very Bikeable                         555 ( 28.1)   2150 ( 52.6)
##   DiningandDrinkingScore (mean (SD))       86.12 (17.23)  82.41 (18.59)
##   GroceryScore (mean (SD))                 88.94 (21.26)  78.71 (28.21)
##                                          Stratified by ville
##                                           Détroit         Montréal
##   n                                         3077            2678
##   language = Fren/Span (%)                     3 (  0.1)   1617 ( 60.4)
##   ville (%)
##      Boston                                    0 (  0.0)      0 (  0.0)
##      Chicago                                   0 (  0.0)      0 (  0.0)
##      Détroit                                3077 (100.0)      0 (  0.0)
##      Montréal                                  0 (  0.0)   2678 (100.0)
##      New-York                                  0 (  0.0)      0 (  0.0)
##      Philadelphie                              0 (  0.0)      0 (  0.0)
##      Toronto                                   0 (  0.0)      0 (  0.0)
##      Vancouver                                 0 (  0.0)      0 (  0.0)
##   gender = Male (%)                         1134 ( 36.9)   1159 ( 43.3)
##   health (%)
##      Excellent                              566 ( 18.4)    454 ( 17.0)
##      Good                                   928 ( 30.2)    791 ( 29.6)
##      Poor/Fair                              390 ( 12.7)    383 ( 14.3)
##      Very Good                             1192 ( 38.8)   1047 ( 39.1)
##   common_transportation (%)
##      Bicycle                                 75 (  2.5)    207 (  7.8)
##      Car                                   2718 ( 89.2)    914 ( 34.3)
##      Other                                   11 (  0.4)     29 (  1.1)
##      Public Transportation                  105 (  3.4)   1019 ( 38.3)
##      Walking                                139 (  4.6)    492 ( 18.5)
##   physically_active = Yes (%)               2355 ( 77.6)   2107 ( 80.0)
##   pa_level (%)
##      Low                                    242 (  7.9)    160 (  6.0)
##      Moderate                              1246 ( 40.5)   1335 ( 49.9)
##      NA                                     776 ( 25.2)    647 ( 24.2)
##      Sedentary                               11 (  0.4)      3 (  0.1)
##      Vigorous                               802 ( 26.1)    533 ( 19.9)
##   day_per_week_motor_vehicle (mean (SD))    5.75 (1.74)    3.24 (2.47)
##   day_per_week_public_transit (mean (SD))   0.58 (1.55)    2.63 (2.39)
##   day_per_week_walking (mean (SD))          2.32 (2.37)    3.96 (2.32)
##   day_per_week_bike (mean (SD))             0.65 (1.43)    0.89 (1.67)
##   q42 (mean (SD))                          41.11 (12.74)  47.02 (14.17)
##   marital_status = Single (%)               988 ( 36.6)    906 ( 40.5)
##   children_household (mean (SD))            0.60 (0.92)    0.31 (0.68)
##   ethnicity (%)
##      African American/Canadian              361 ( 11.9)     52 (  2.0)
##      Asian                                  123 (  4.1)    104 (  4.0)
##      Caucasian                             2422 ( 80.0)   2301 ( 88.1)
##      Hispanic                                44 (  1.5)     50 (  1.9)
```

```
##      Native American/Indigenous              15 (  0.5)      8 (  0.3)
##      Other                                   61 (  2.0)     97 (  3.7)
##   country_born (%)
##      Canada                                  38 (  1.2)   2144 ( 80.1)
##      Other                                  172 (  5.6)    500 ( 18.7)
##      United States                         2867 ( 93.2)     34 (  1.3)
##   motor_vehicle_access = Yes (%)           2936 ( 96.0)   1821 ( 68.5)
##   education (%)
##      Baccalaureate                          951 ( 31.2)    788 ( 29.8)
##      Cégep                                  506 ( 16.6)    528 ( 19.9)
##      Certificate/Diploma                    444 ( 14.6)    330 ( 12.5)
##      Graduate School                        736 ( 24.1)    581 ( 21.9)
##      High School/Lower                      411 ( 13.5)    421 ( 15.9)
##   occupation_status (%)
##      Employed                              2152 ( 70.4)   1750 ( 65.8)
##      Student                                243 (  7.9)    141 (  5.3)
##      Unemployed                             663 ( 21.7)    769 ( 28.9)
##   household_income (%)
##      $0-$49999                             1078 ( 35.0)   1017 ( 38.0)
##      $100000-$149999                        443 ( 14.4)    271 ( 10.1)
##      $150000+                               193 (  6.3)    148 (  5.5)
##      $50000-$99999                          997 ( 32.4)    888 ( 33.2)
##      Missing                                366 ( 11.9)    354 ( 13.2)
##   bmi (mean (SD))                        26.75 (5.11)   25.88 (4.65)
##   bmi_category (%)
##      normal weight                         1073 ( 34.9)   1122 ( 41.9)
##      obese                                  661 ( 21.5)    454 ( 17.0)
##      other                                  439 ( 14.3)    321 ( 12.0)
##      overweight                             864 ( 28.1)    746 ( 27.9)
##      underweight                             40 (  1.3)     35 (  1.3)
##   WalkScore (mean (SD))                  36.05 (24.44)  81.88 (16.05)
##   WalkScoreLabel (%)
##                                           27 (  0.9)     28 (  1.0)
##      Car-Dependent                        2094 ( 68.1)    135 (  5.0)
##      Somewhat Walkable                     733 ( 23.8)    303 ( 11.3)
##      Very Walkable                         175 (  5.7)   1117 ( 41.7)
##      Walker's Paradise                      48 (  1.6)   1095 ( 40.9)
##   TransitScore (mean (SD))               79.31 (7.37)   13.38 (18.57)
##   TransitScoreLabel (%)
##                                         3077 (100.0)     45 (  1.7)
##      Excellent Transit                     0 (  0.0)     71 (  2.7)
##      Good Transit                          0 (  0.0)    485 ( 18.1)
##      Minimal Transit                       0 (  0.0)     43 (  1.6)
##      Rider's Paradise                      0 (  0.0)   1911 ( 71.4)
##      Some Transit                          0 (  0.0)    123 (  4.6)
##   BikeScore (mean (SD))                 133.74 (18.39)  86.99 (43.07)
##   BikeScoreLabel (%)
##                                         2898 ( 94.2)    624 ( 23.3)
##      Bikeable                             90 (  2.9)    719 ( 26.8)
##      Biker's Paradise                     40 (  1.3)    496 ( 18.5)
##      Somewhat Bikeable                     1 (  0.0)     83 (  3.1)
##      Very Bikeable                        48 (  1.6)    756 ( 28.2)
##   DiningandDrinkingScore (mean (SD))     40.56 (26.92)  82.34 (17.58)
##   GroceryScore (mean (SD))               38.81 (34.49)  89.47 (17.42)
```

```
##                                          Stratified by ville
##                                           New-York       Philadelphie
##   n                                        3824            1478
##   language = Fren/Span (%)                   16 (  0.4)       3 (  0.2)
##   ville (%)
##      Boston                                   0 (  0.0)       0 (  0.0)
##      Chicago                                  0 (  0.0)       0 (  0.0)
##      Détroit                                  0 (  0.0)       0 (  0.0)
##      Montréal                                 0 (  0.0)       0 (  0.0)
##      New-York                              3824 (100.0)       0 (  0.0)
##      Philadelphie                             0 (  0.0)    1478 (100.0)
##      Toronto                                  0 (  0.0)       0 (  0.0)
##      Vancouver                                0 (  0.0)       0 (  0.0)
##   gender = Male (%)                        1593 ( 41.7)     536 ( 36.3)
##   health (%)
##      Excellent                             909 ( 23.8)     297 ( 20.1)
##      Good                                  986 ( 25.8)     404 ( 27.4)
##      Poor/Fair                             295 (  7.7)     144 (  9.8)
##      Very Good                            1628 ( 42.6)     631 ( 42.8)
##   common_transportation (%)
##      Bicycle                               184 (  4.8)      87 (  5.9)
##      Car                                   360 (  9.4)     606 ( 41.1)
##      Other                                  83 (  2.2)      17 (  1.2)
##      Public Transportation                2207 ( 57.9)     321 ( 21.8)
##      Walking                               978 ( 25.7)     443 ( 30.1)
##   physically_active = Yes (%)              3088 ( 82.0)    1193 ( 81.5)
##   pa_level (%)
##      Low                                   236 (  6.2)      99 (  6.7)
##      Moderate                             1578 ( 41.3)     627 ( 42.4)
##      NA                                    809 ( 21.2)     312 ( 21.1)
##      Sedentary                               2 (  0.1)       0 (  0.0)
##      Vigorous                             1199 ( 31.4)     440 ( 29.8)
##   day_per_week_motor_vehicle (mean (SD))   2.26 (2.21)     3.85 (2.41)
##   day_per_week_public_transit (mean (SD))  4.17 (2.16)     2.32 (2.22)
##   day_per_week_walking (mean (SD))         5.15 (2.00)     4.32 (2.31)
##   day_per_week_bike (mean (SD))            0.89 (1.63)     0.98 (1.76)
##   q42 (mean (SD))                         39.74 (13.55)   39.19 (13.51)
##   marital_status = Single (%)              1879 ( 54.7)     729 ( 55.6)
##   children_household (mean (SD))           0.33 (0.70)     0.38 (0.77)
##   ethnicity (%)
##      African American/Canadian             336 (  9.0)     231 ( 15.9)
##      Asian                                 483 ( 13.0)     128 (  8.8)
##      Caucasian                            2493 ( 66.9)     999 ( 68.6)
##      Hispanic                              317 (  8.5)      60 (  4.1)
##      Native American/Indigenous              9 (  0.2)       0 (  0.0)
##      Other                                  90 (  2.4)      38 (  2.6)
##   country_born (%)
##      Canada                                 50 (  1.3)       7 (  0.5)
##      Other                                 497 ( 13.0)      94 (  6.4)
##      United States                        3277 ( 85.7)    1377 ( 93.2)
##   motor_vehicle_access = Yes (%)           1671 ( 44.2)    1109 ( 75.9)
##   education (%)
##      Baccalaureate                        1589 ( 41.8)     509 ( 34.9)
##      Cégep                                 466 ( 12.3)     206 ( 14.1)
```

```
##      Certificate/Diploma                  168 (  4.4)      86 (  5.9)
##      Graduate School                     1284 ( 33.8)     447 ( 30.6)
##      High School/Lower                    294 (  7.7)     212 ( 14.5)
##   occupation_status (%)
##      Employed                            2943 ( 77.7)    1049 ( 71.3)
##      Student                              270 (  7.1)     172 ( 11.7)
##      Unemployed                           574 ( 15.2)     251 ( 17.1)
##   household_income (%)
##      $0-$49999                           1002 ( 26.2)     562 ( 38.0)
##      $100000-$149999                      631 ( 16.5)     182 ( 12.3)
##      $150000+                             598 ( 15.6)     124 (  8.4)
##      $50000-$99999                       1156 ( 30.2)     483 ( 32.7)
##      Missing                              437 ( 11.4)     127 (  8.6)
##   bmi (mean (SD))                      25.05 (4.52)    26.02 (4.97)
##   bmi_category (%)
##      normal weight                       1841 ( 48.1)     618 ( 41.8)
##      obese                                490 ( 12.8)     273 ( 18.5)
##      other                                450 ( 11.8)     164 ( 11.1)
##      overweight                           971 ( 25.4)     404 ( 27.3)
##      underweight                           72 (  1.9)      19 (  1.3)
##   WalkScore (mean (SD))                95.88 (11.04)   86.27 (17.72)
##   WalkScoreLabel (%)
##                                           65 (  1.7)      22 (  1.5)
##      Car-Dependent                        61 (  1.6)      83 (  5.6)
##      Somewhat Walkable                    33 (  0.9)      96 (  6.5)
##      Very Walkable                       169 (  4.4)     244 ( 16.5)
##      Walker's Paradise                  3496 ( 91.4)    1033 ( 69.9)
##   TransitScore (mean (SD))             71.19 (24.19)   73.31 (21.71)
##   TransitScoreLabel (%)
##                                         3394 ( 88.8)    1371 ( 92.8)
##      Excellent Transit                    34 (  0.9)       0 (  0.0)
##      Good Transit                          7 (  0.2)       2 (  0.1)
##      Minimal Transit                       0 (  0.0)       0 (  0.0)
##      Rider's Paradise                    389 ( 10.2)     105 (  7.1)
##      Some Transit                          0 (  0.0)       0 (  0.0)
##   BikeScore (mean (SD))                90.15 (24.92)  106.32 (30.52)
##   BikeScoreLabel (%)
##                                          178 (  4.7)     148 ( 10.0)
##      Bikeable                           1137 ( 29.7)     236 ( 16.0)
##      Biker's Paradise                    145 (  3.8)     594 ( 40.2)
##      Somewhat Bikeable                    71 (  1.9)      38 (  2.6)
##      Very Bikeable                      2293 ( 60.0)     462 ( 31.3)
##   DiningandDrinkingScore (mean (SD))   96.05 (11.20)   87.70 (16.44)
##   GroceryScore (mean (SD))             97.91 (11.21)   90.43 (22.07)
##                                       Stratified by ville
##                                        Toronto        Vancouver
##   n                                     4264           2518
##   language = Fren/Span (%)                 3 (  0.1)       0 (  0.0)
##   ville (%)
##      Boston                                0 (  0.0)       0 (  0.0)
##      Chicago                               0 (  0.0)       0 (  0.0)
##      Détroit                               0 (  0.0)       0 (  0.0)
##      Montréal                              0 (  0.0)       0 (  0.0)
##      New-York                              0 (  0.0)       0 (  0.0)
```

```
##      Philadelphie                              0 (  0.0)      0 (  0.0)
##      Toronto                                4264 (100.0)      0 (  0.0)
##      Vancouver                                 0 (  0.0)   2518 (100.0)
##   gender = Male (%)                         1984 ( 46.5)   1131 ( 44.9)
##   health (%)
##      Excellent                               811 ( 19.1)    467 ( 18.6)
##      Good                                   1220 ( 28.7)    770 ( 30.6)
##      Poor/Fair                               464 ( 10.9)    339 ( 13.5)
##      Very Good                              1761 ( 41.4)    937 ( 37.3)
##   common_transportation (%)
##      Bicycle                                 231 (  5.4)    119 (  4.7)
##      Car                                    1665 ( 39.2)   1245 ( 49.5)
##      Other                                    42 (  1.0)     15 (  0.6)
##      Public Transportation                  1459 ( 34.3)    633 ( 25.2)
##      Walking                                 853 ( 20.1)    503 ( 20.0)
##   physically_active = Yes (%)               3493 ( 83.0)   2114 ( 85.0)
##   pa_level (%)
##      Low                                     256 (  6.0)    137 (  5.4)
##      Moderate                               2131 ( 50.0)   1305 ( 51.8)
##      NA                                      871 ( 20.4)    474 ( 18.8)
##      Sedentary                                 3 (  0.1)      5 (  0.2)
##      Vigorous                               1003 ( 23.5)    597 ( 23.7)
##   day_per_week_motor_vehicle (mean (SD))    3.66 (2.41)    4.05 (2.32)
##   day_per_week_public_transit (mean (SD))   2.68 (2.27)    2.22 (2.23)
##   day_per_week_walking (mean (SD))          4.19 (2.25)    4.22 (2.26)
##   day_per_week_bike (mean (SD))             0.95 (1.73)    0.78 (1.53)
##   q42 (mean (SD))                          46.98 (14.52)  47.49 (14.51)
##   marital_status = Single (%)               1345 ( 37.6)    736 ( 34.4)
##   children_household (mean (SD))            0.31 (0.68)    0.36 (0.72)
##   ethnicity (%)
##      African American/Canadian                96 (  2.3)     19 (  0.8)
##      Asian                                   572 ( 14.0)    720 ( 29.9)
##      Caucasian                              3065 ( 74.8)   1531 ( 63.6)
##      Hispanic                                 71 (  1.7)     24 (  1.0)
##      Native American/Indigenous               14 (  0.3)     18 (  0.7)
##      Other                                   279 (  6.8)     95 (  3.9)
##   country_born (%)
##      Canada                                 3058 ( 71.7)   1822 ( 72.4)
##      Other                                  1100 ( 25.8)    630 ( 25.0)
##      United States                           106 (  2.5)     66 (  2.6)
##   motor_vehicle_access = Yes (%)            3057 ( 72.7)   2074 ( 83.1)
##   education (%)
##      Baccalaureate                          1543 ( 36.6)    877 ( 35.7)
##      Cégep                                   451 ( 10.7)    314 ( 12.8)
##      Certificate/Diploma                     746 ( 17.7)    427 ( 17.4)
##      Graduate School                         995 ( 23.6)    518 ( 21.1)
##      High School/Lower                       481 ( 11.4)    323 ( 13.1)
##   occupation_status (%)
##      Employed                               3051 ( 72.2)   1725 ( 69.4)
##      Student                                 134 (  3.2)     83 (  3.3)
##      Unemployed                             1040 ( 24.6)    679 ( 27.3)
##   household_income (%)
##      $0-$49999                              1069 ( 25.1)    636 ( 25.3)
##      $100000-$149999                         673 ( 15.8)    369 ( 14.7)
```

```
##      $150000+                                463 ( 10.9)    204 (  8.1)
##      $50000-$99999                          1399 ( 32.8)    878 ( 34.9)
##      Missing                                 660 ( 15.5)    431 ( 17.1)
##   bmi (mean (SD))                          25.60 (4.46)   24.87 (4.27)
##   bmi_category (%)
##      normal weight                          1843 ( 43.2)   1213 ( 48.2)
##      obese                                   586 ( 13.7)    262 ( 10.4)
##      other                                   498 ( 11.7)    239 (  9.5)
##      overweight                             1276 ( 29.9)    747 ( 29.7)
##      underweight                              61 (  1.4)     57 (  2.3)
##   WalkScore (mean (SD))                    79.56 (18.77)  78.79 (19.52)
##   WalkScoreLabel (%)
##                                              26 (  0.6)     27 (  1.1)
##      Car-Dependent                           351 (  8.2)    243 (  9.7)
##      Somewhat Walkable                       700 ( 16.4)    403 ( 16.0)
##      Very Walkable                          1467 ( 34.4)    869 ( 34.5)
##      Walker's Paradise                      1720 ( 40.3)    976 ( 38.8)
##   TransitScore (mean (SD))                 48.42 (25.00)  45.29 (19.95)
##   TransitScoreLabel (%)
##                                              33 (  0.8)     88 (  3.5)
##      Excellent Transit                      1547 ( 36.3)   1035 ( 41.1)
##      Good Transit                            939 ( 22.0)    865 ( 34.4)
##      Minimal Transit                          34 (  0.8)      5 (  0.2)
##      Rider's Paradise                       1671 ( 39.2)    371 ( 14.7)
##      Some Transit                             40 (  0.9)    154 (  6.1)
##   BikeScore (mean (SD))                    70.90 (30.62)  92.61 (36.44)
##   BikeScoreLabel (%)
##                                             120 (  2.8)    512 ( 20.3)
##      Bikeable                               2214 ( 51.9)    745 ( 29.6)
##      Biker's Paradise                        431 ( 10.1)    422 ( 16.8)
##      Somewhat Bikeable                       500 ( 11.7)    179 (  7.1)
##      Very Bikeable                           999 ( 23.4)    660 ( 26.2)
##   DiningandDrinkingScore (mean (SD))       81.64 (19.10)  81.17 (19.59)
##   GroceryScore (mean (SD))                 82.99 (23.65)  84.45 (22.22)
##                                           Stratified by ville
##                                            p      test
##   n
##   language = Fren/Span (%)                 <0.001
##   ville (%)                                <0.001
##      Boston
##      Chicago
##      Détroit
##      Montréal
##      New-York
##      Philadelphie
##      Toronto
##      Vancouver
##   gender = Male (%)                        <0.001
##   health (%)                               <0.001
##      Excellent
##      Good
##      Poor/Fair
##      Very Good
##   common_transportation (%)                <0.001
```

```
##      Bicycle
##      Car
##      Other
##      Public Transportation
##      Walking
##   physically_active = Yes (%)             <0.001
##   pa_level (%)                            <0.001
##      Low
##      Moderate
##      NA
##      Sedentary
##      Vigorous
##   day_per_week_motor_vehicle (mean (SD))  <0.001
##   day_per_week_public_transit (mean (SD)) <0.001
##   day_per_week_walking (mean (SD))        <0.001
##   day_per_week_bike (mean (SD))           <0.001
##   q42 (mean (SD))                         <0.001
##   marital_status = Single (%)             <0.001
##   children_household (mean (SD))          <0.001
##   ethnicity (%)                           <0.001
##      African American/Canadian
##      Asian
##      Caucasian
##      Hispanic
##      Native American/Indigenous
##      Other
##   country_born (%)                        <0.001
##      Canada
##      Other
##      United States
##   motor_vehicle_access = Yes (%)          <0.001
##   education (%)                           <0.001
##      Baccalaureate
##      Cégep
##      Certificate/Diploma
##      Graduate School
##      High School/Lower
##   occupation_status (%)                   <0.001
##      Employed
##      Student
##      Unemployed
##   household_income (%)                    <0.001
##      $0-$49999
##      $100000-$149999
##      $150000+
##      $50000-$99999
##      Missing
##   bmi (mean (SD))                         <0.001
##   bmi_category (%)                        <0.001
##      normal weight
##      obese
##      other
##      overweight
##      underweight
```

```
##   WalkScore (mean (SD))                  <0.001
##   WalkScoreLabel (%)                     <0.001
##
##      Car-Dependent
##      Somewhat Walkable
##      Very Walkable
##      Walker's Paradise
##   TransitScore (mean (SD))               <0.001
##   TransitScoreLabel (%)                  <0.001
##
##      Excellent Transit
##      Good Transit
##      Minimal Transit
##      Rider's Paradise
##      Some Transit
##   BikeScore (mean (SD))                  <0.001
##   BikeScoreLabel (%)                     <0.001
##
##      Bikeable
##      Biker's Paradise
##      Somewhat Bikeable
##      Very Bikeable
##   DiningandDrinkingScore (mean (SD))     <0.001
##   GroceryScore (mean (SD))               <0.001
```

## Table of Cities Combined

```
vars <- c('language', 'ville', 'gender', 'health', 'common_transportation', 'physically_active', 'pa_le
CreateTableOne(vars = vars, data = ibiccs)
```

```
##
##                                        Overall
##   n                                    23901
##   language = Fren/Span (%)              1665 ( 7.0)
##   ville (%)
##      Boston                             1977 ( 8.3)
##      Chicago                            4085 (17.1)
##      Détroit                            3077 (12.9)
##      Montréal                           2678 (11.2)
##      New-York                           3824 (16.0)
##      Philadelphie                       1478 ( 6.2)
##      Toronto                            4264 (17.8)
##      Vancouver                          2518 (10.5)
##   gender = Male (%)                     9859 (41.2)
##   health (%)
##      Excellent                          4803 (20.1)
##      Good                               6725 (28.2)
##      Poor/Fair                          2593 (10.9)
##      Very Good                          9741 (40.8)
##   common_transportation (%)
##      Bicycle                            1177 ( 4.9)
##      Car                                9996 (42.0)
```

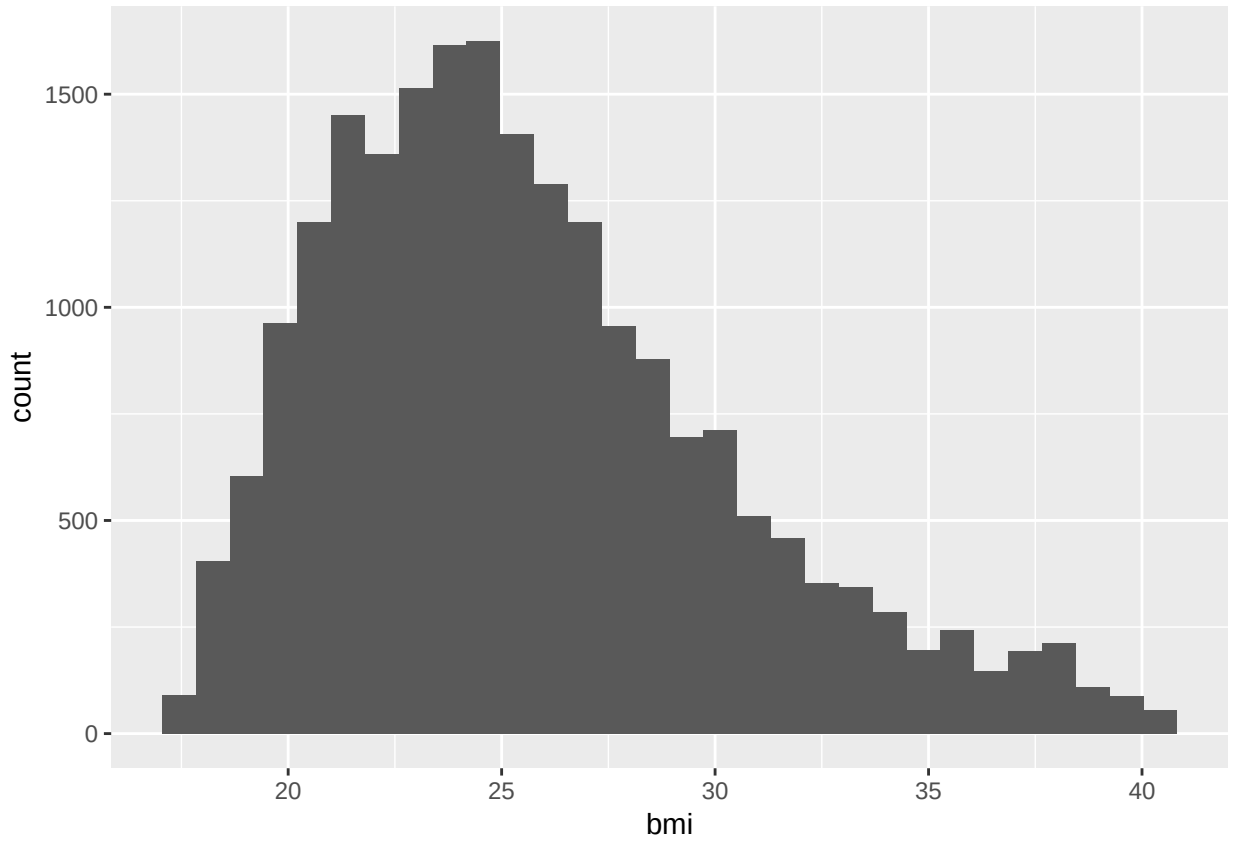
```
##      Other                                  261 ( 1.1)
##      Public Transportation                 7886 (33.1)
##      Walking                               4484 (18.8)
##   physically_active = Yes (%)             19471 (82.5)
##   pa_level (%)
##      Low                                   1547 ( 6.5)
##      Moderate                             10771 (45.1)
##      NA                                    4949 (20.7)
##      Sedentary                               30 ( 0.1)
##      Vigorous                              6604 (27.6)
##   day_per_week_motor_vehicle (mean (SD))   3.81 (2.49)
##   day_per_week_public_transit (mean (SD))  2.65 (2.41)
##   day_per_week_walking (mean (SD))         4.13 (2.38)
##   day_per_week_bike (mean (SD))            0.85 (1.63)
##   q42 (mean (SD))                         42.57 (14.20)
##   marital_status = Single (%)              9452 (45.4)
##   children_household (mean (SD))           0.36 (0.75)
##   ethnicity (%)
##      African American/Canadian             1654 ( 7.1)
##      Asian                                 2661 (11.4)
##      Caucasian                            17154 (73.7)
##      Hispanic                               933 ( 4.0)
##      Native American/Indigenous              79 ( 0.3)
##      Other                                  781 ( 3.4)
##   country_born (%)
##      Canada                                7171 (30.0)
##      Other                                 3555 (14.9)
##      United States                        13175 (55.1)
##   motor_vehicle_access = Yes (%)          17376 (73.4)
##   education (%)
##      Baccalaureate                         8638 (36.5)
##      Cégep                                 3197 (13.5)
##      Certificate/Diploma                   2559 (10.8)
##      Graduate School                       6655 (28.2)
##      High School/Lower                     2591 (11.0)
##   occupation_status (%)
##      Employed                             17272 (72.9)
##      Student                               1586 ( 6.7)
##      Unemployed                            4847 (20.4)
##   household_income (%)
##      $0-$49999                             7211 (30.2)
##      $100000-$149999                       3490 (14.6)
##      $150000+                              2400 (10.0)
##      $50000-$99999                         7821 (32.7)
##      Missing                               2979 (12.5)
##   bmi (mean (SD))                         25.64 (4.70)
##   bmi_category (%)
##      normal weight                        10437 (43.7)
##      obese                                 3672 (15.4)
##      other                                 2741 (11.5)
##      overweight                            6658 (27.9)
##      underweight                            393 ( 1.6)
##   WalkScore (mean (SD))                   77.81 (24.80)
##   WalkScoreLabel (%)
```

```
##                                          284 ( 1.2)
##      Car-Dependent                      3337 (14.0)
##      Somewhat Walkable                  2863 (12.0)
##      Very Walkable                      6319 (26.4)
##      Walker's Paradise                 11098 (46.4)
##   TransitScore (mean (SD))             60.30 (28.30)
##   TransitScoreLabel (%)
##                                         13415 (56.1)
##      Excellent Transit                  3165 (13.2)
##      Good Transit                       2444 (10.2)
##      Minimal Transit                      82 ( 0.3)
##      Rider's Paradise                   4476 (18.7)
##      Some Transit                        319 ( 1.3)
##   BikeScore (mean (SD))                94.10 (35.92)
##   BikeScoreLabel (%)
##                                          5636 (23.6)
##      Bikeable                           6729 (28.2)
##      Biker's Paradise                   2451 (10.3)
##      Somewhat Bikeable                  1162 ( 4.9)
##      Very Bikeable                      7923 (33.1)
##   DiningandDrinkingScore (mean (SD))    79.53 (24.59)
##   GroceryScore (mean (SD))              80.76 (29.33)
```

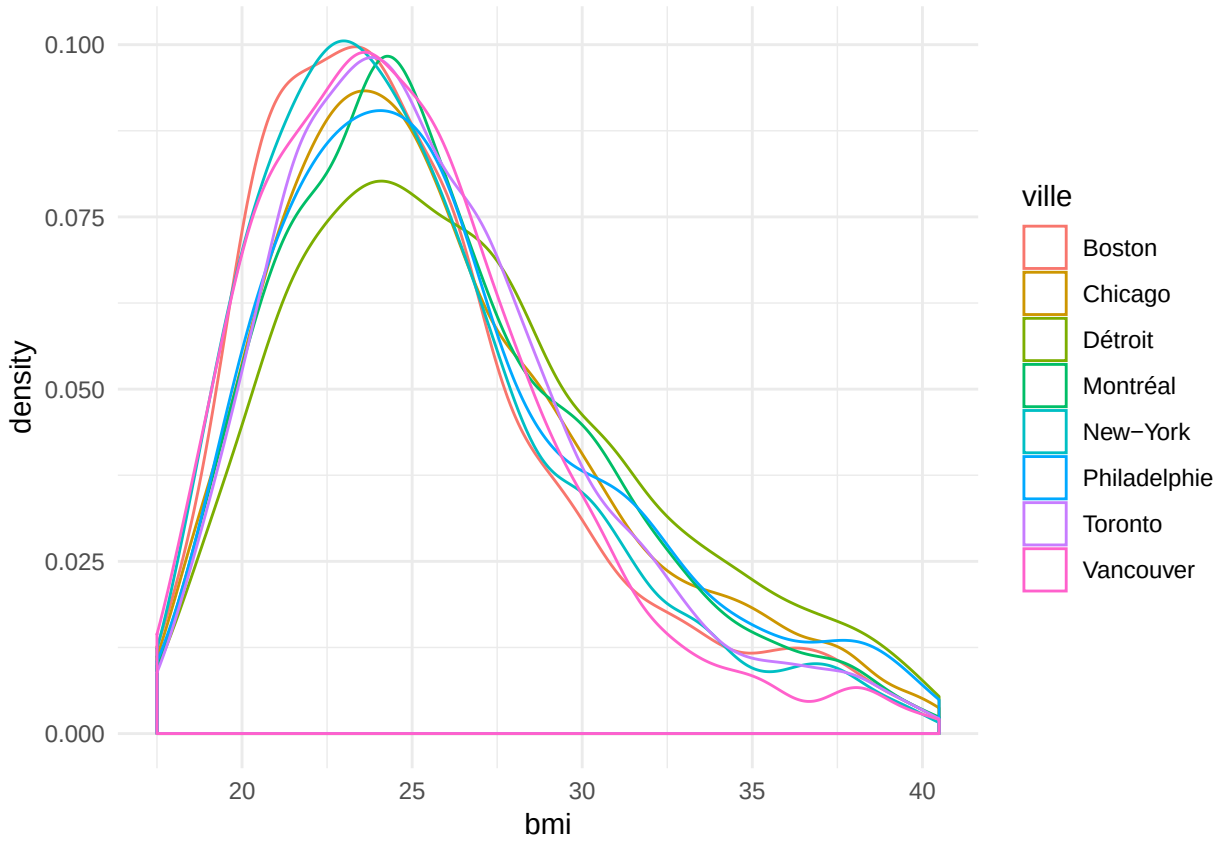
## Histogram of BMI

```
hist_bmi <- ggplot(city, aes(bmi)) +
  geom_histogram()
plot(hist_bmi)
```

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



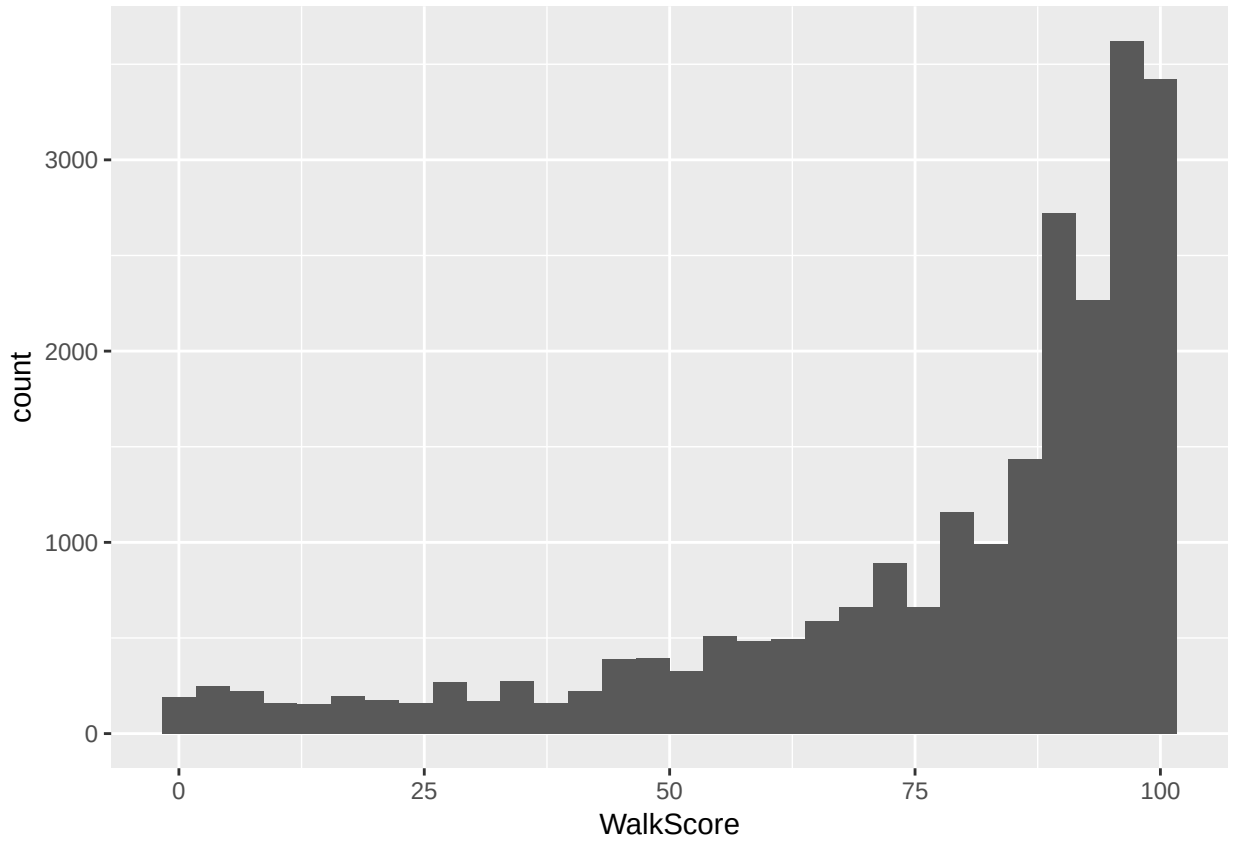

```
hist_bmi_city <- ggplot(city, aes(bmi)) +
  geom_density(aes(group = ville, colour = ville)) +
  theme_minimal()
plot(hist_bmi_city)
```



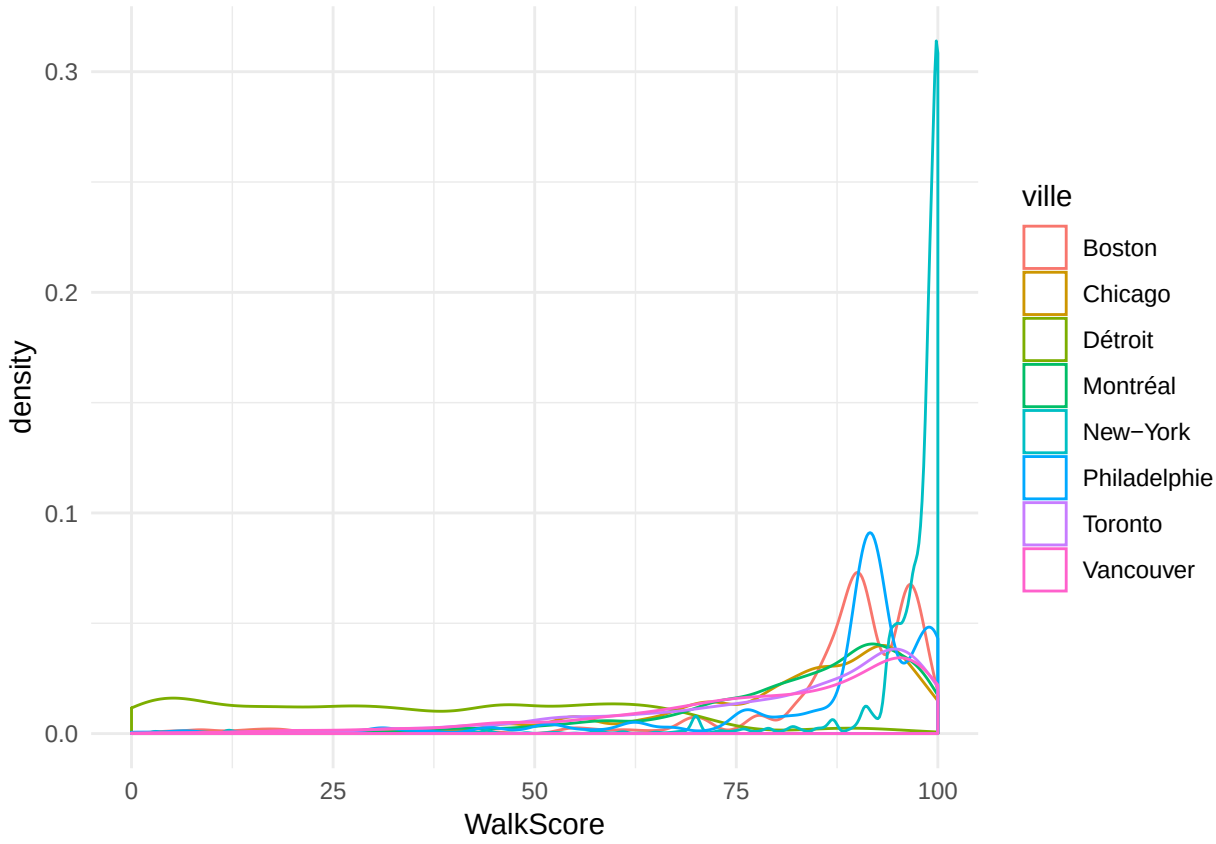

## Histogram of WalkScore

```
hist_walkscore <- ggplot(city, aes(WalkScore)) +
  geom_histogram()
plot(hist_walkscore)
```

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



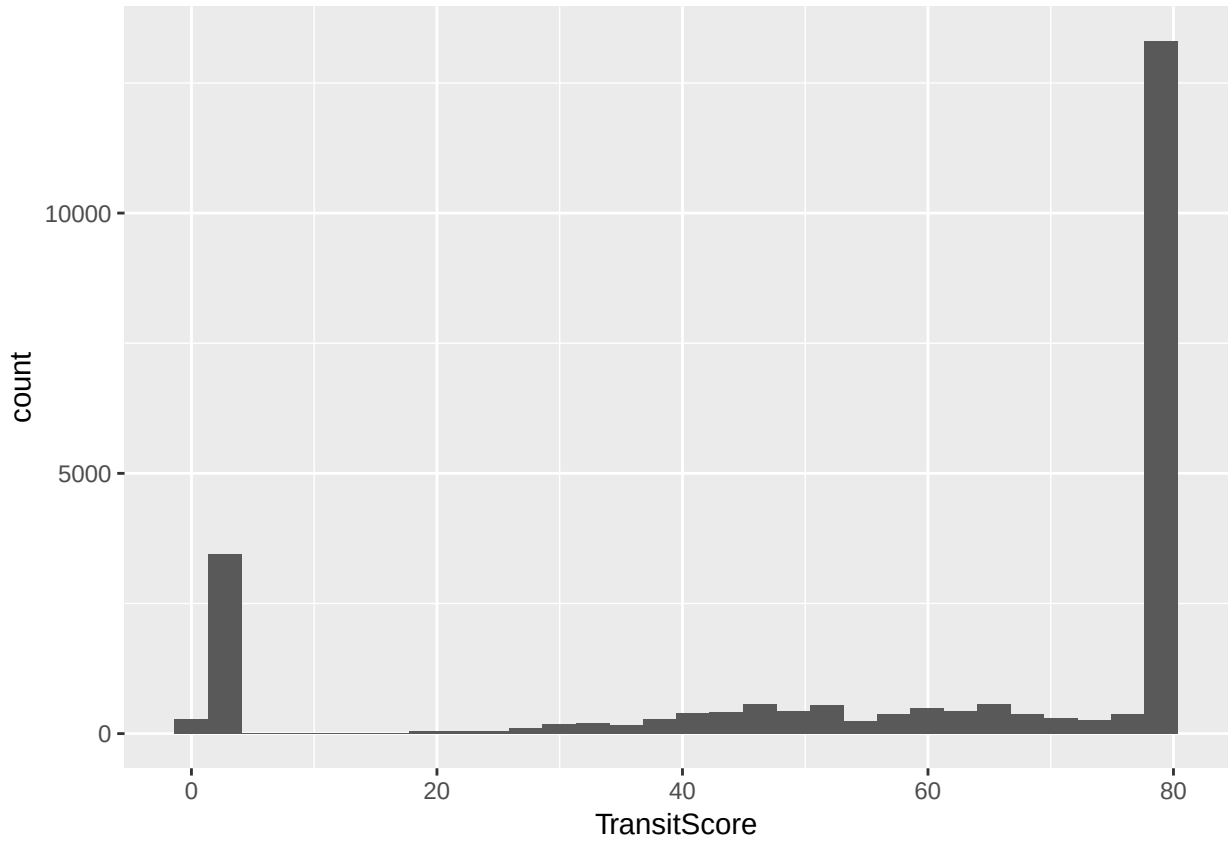

```
hist_walkscore_city <- ggplot(city, aes(WalkScore)) +
  geom_density(aes(group = ville, colour = ville)) +
  theme_minimal()
plot(hist_walkscore_city)
```



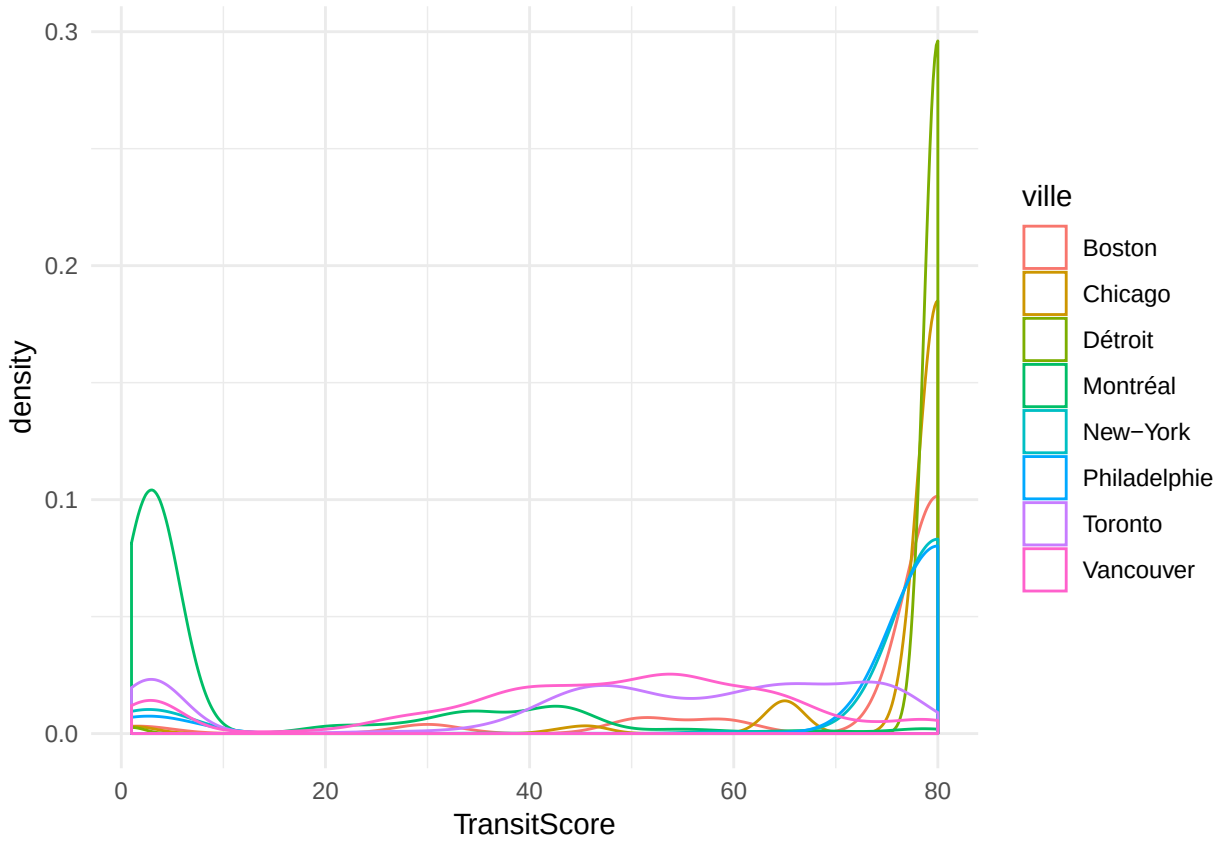

## Histogram of TransitScore

```
hist_trasnsitscore <- ggplot(city, aes(TransitScore)) +
  geom_histogram()
plot(hist_trasnsitscore)
```

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



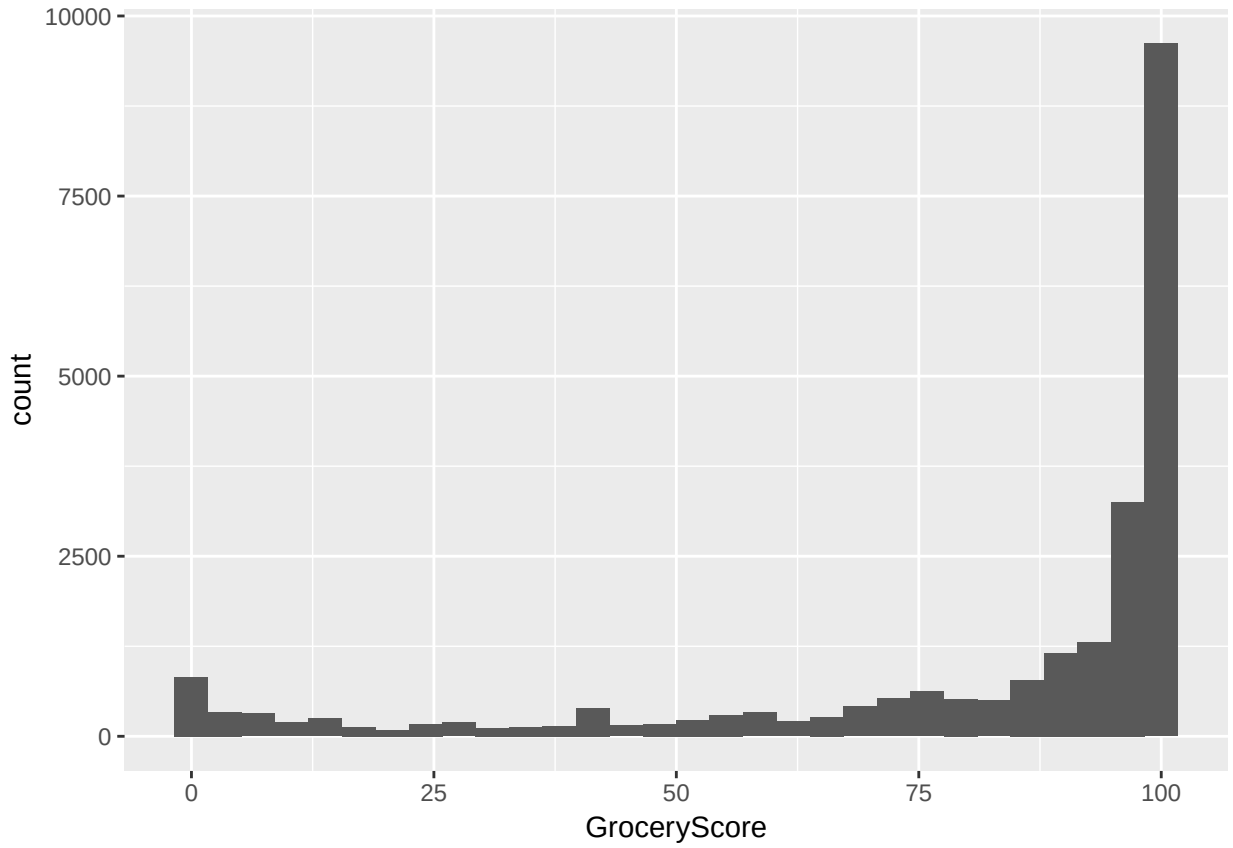

```
hist_trasnsitscore_city <- ggplot(city, aes(TransitScore)) +
  geom_density(aes(group = ville, colour = ville)) +
  theme_minimal()
plot(hist_trasnsitscore_city)
```



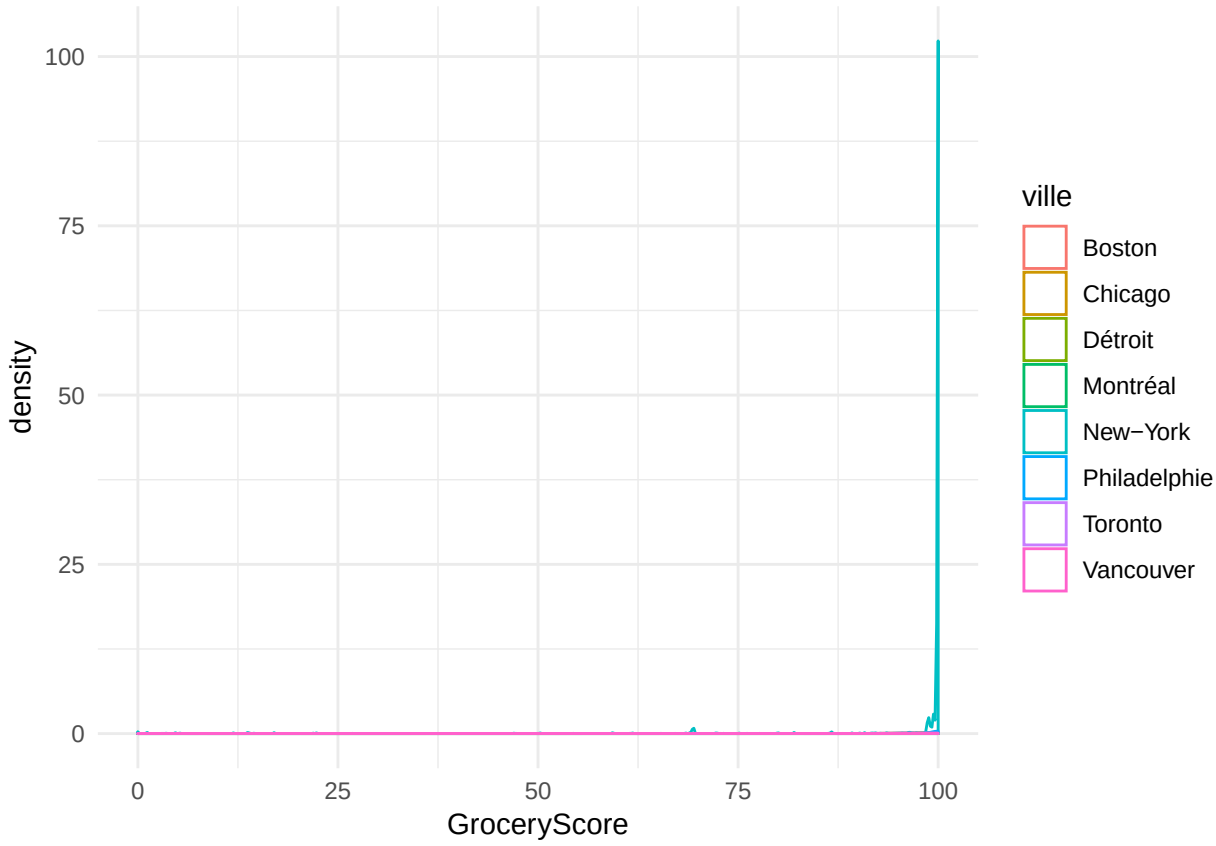

## Histogram of GroceryScore

```
hist_groceryscore <- ggplot(city, aes(GroceryScore)) +
  geom_histogram()
plot(hist_groceryscore)
```

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



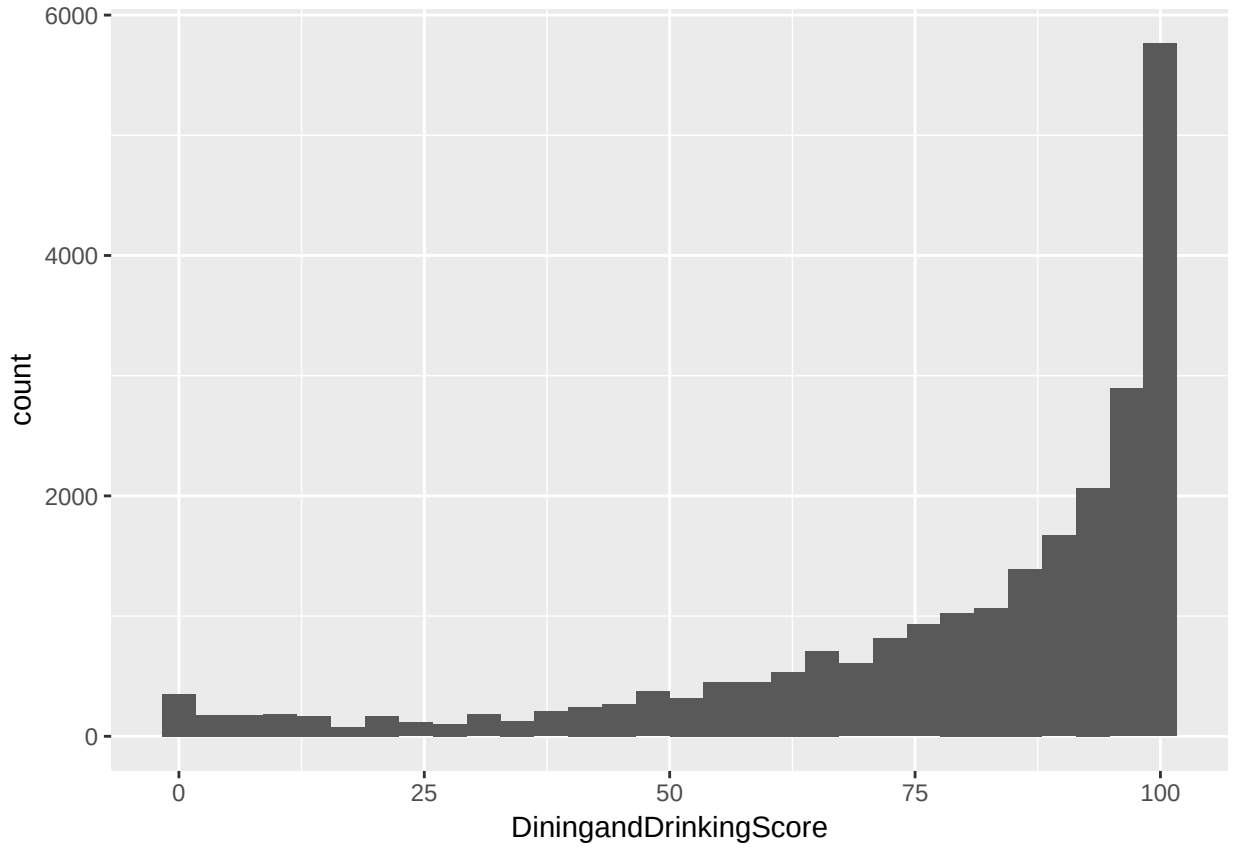

```
hist_groceryscore_city <- ggplot(city, aes(GroceryScore)) +
  geom_density(aes(group = ville, colour = ville)) +
  theme_minimal()
plot(hist_groceryscore_city)
```



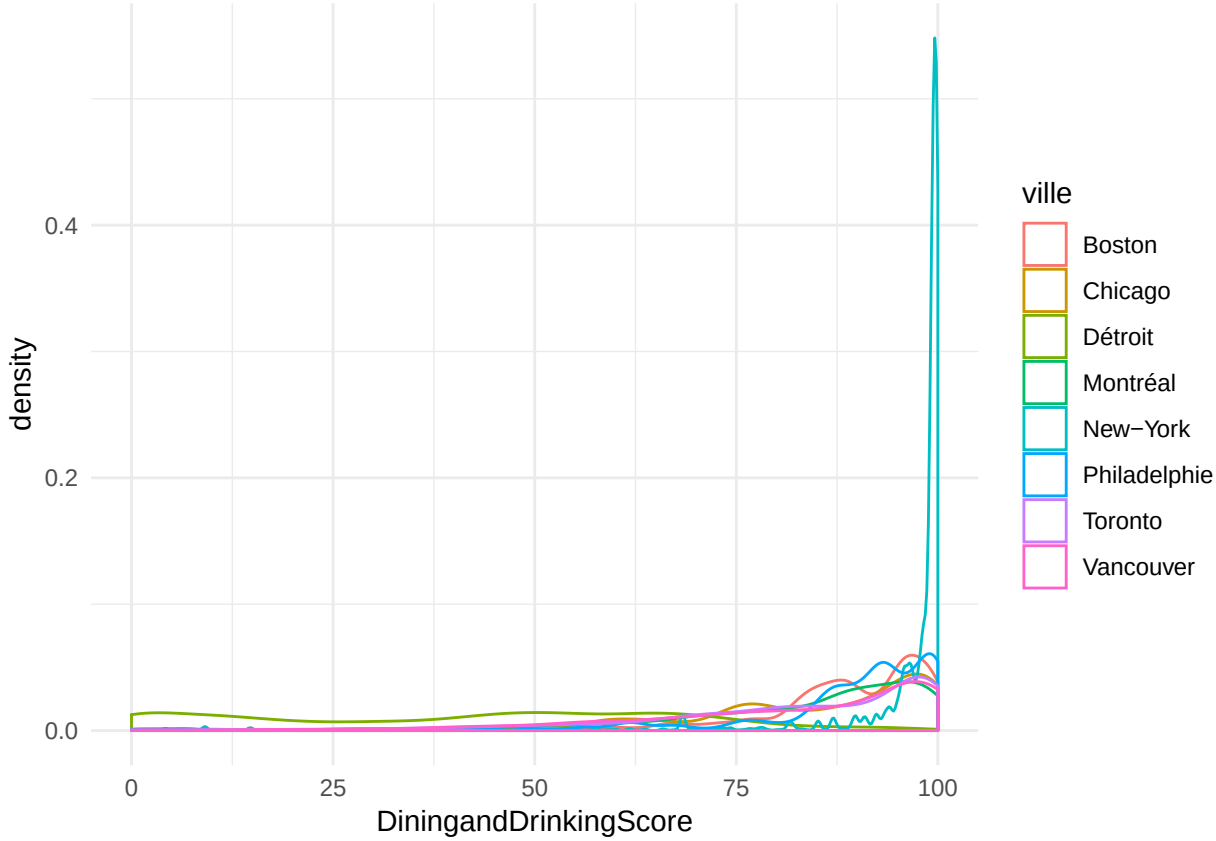

## Histogram of DiningAndDrinkingScore

```
hist_diningdrinkingscore <- ggplot(city, aes(DiningandDrinkingScore)) +
  geom_histogram()
plot(hist_diningdrinkingscore)
```

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




```
hist_diningdrinkingscore_city <- ggplot(city, aes(DiningandDrinkingScore)) +
  geom_density(aes(group = ville, colour = ville)) +
  theme_minimal()
plot(hist_diningdrinkingscore_city)
```




## Linear Regression

```
explanatory <- c('language', 'ville', 'gender', 'health', 'physically_active', 'q42', 'marital_status',
dependent <- "bmi"
ibiccs %>%
  finalfit.lm(dependent, explanatory, na.rm = TRUE)
```

```
##                 Dependent: bmi                                Mean (sd)
## 26                    language                          English 25.6 (4.7)
## 27                                                   Fren/Span 26.0 (4.8)
## 39                       ville                          Boston 25.1 (4.6)
## 40                                                     Chicago 25.9 (4.9)
## 41                                                     Détroit 26.7 (5.1)
## 42                                                    Montréal 25.9 (4.7)
## 43                                                    New-York 25.0 (4.5)
## 44                                                Philadelphie 26.0 (5.0)
## 45                                                     Toronto 25.6 (4.5)
## 46                                                   Vancouver 24.9 (4.3)
## 19                      gender                          Female 25.0 (4.9)
## 20                                                        Male 26.4 (4.3)
## 22                      health                       Excellent 24.0 (3.7)
## 23                                                        Good 26.8 (5.0)
## 24                                                   Poor/Fair 28.4 (5.6)
## 25                                                   Very Good 25.1 (4.2)
## 35           physically_active                              No 26.7 (5.3)
```

```
## 36                                                    Yes 25.4 (4.5)
## 37                         q42                      [18,94] 25.6 (4.7)
## 28             marital_status Relationship/Married/Common-Law 25.8 (4.6)
## 29                                                 Single 25.2 (4.8)
## 11               country_born                      Canada 25.7 (4.6)
## 12                                                  Other 24.8 (4.3)
## 13                                           United States 25.9 (4.9)
## 30       motor_vehicle_access                         No 25.2 (4.8)
## 31                                                   Yes 25.8 (4.7)
## 32          occupation_status                  Employed 25.6 (4.6)
## 33                                              Student 24.2 (4.8)
## 34                                           Unemployed 26.4 (4.9)
## 2                bmi_category                normal weight 22.2 (1.7)
## 3                                                  obese 33.6 (2.8)
## 4                                             overweight 27.1 (1.4)
## 5                                            underweight 18.1 (0.3)
## 47                  WalkScore                     [0,100] 25.6 (4.7)
## 38                TransitScore                      [1,80] 25.6 (4.7)
## 1                    BikeScore                     [1,138] 25.6 (4.7)
## 18     DiningandDrinkingScore                     [0,100] 25.6 (4.7)
## 21                GroceryScore                     [0,100] 25.6 (4.7)
## 15  day_per_week_motor_vehicle                       [0,7] 25.6 (4.7)
## 16 day_per_week_public_transit                       [0,7] 25.6 (4.7)
## 17       day_per_week_walking                        [0,7] 25.6 (4.7)
## 14          day_per_week_bike                        [0,7] 25.6 (4.6)
## 7           children_household                           0 25.5 (4.7)
## 8                                                        1 25.9 (4.8)
## 9                                                        2 26.1 (4.7)
## 10                                                       3 26.9 (5.2)
## 6                       <NA>                          <NA>       <NA>
##         Coefficient (univariable)     Coefficient (multivariable)
## 26                              -                               -
## 27   0.43 (0.18 to 0.69, p=0.001)  -0.11 (-0.31 to 0.08, p=0.252)
## 39                              -                               -
## 40   0.83 (0.57 to 1.10, p<0.001)   0.07 (-0.06 to 0.21, p=0.273)
## 41   1.69 (1.41 to 1.97, p<0.001)   0.06 (-0.12 to 0.23, p=0.529)
## 42   0.82 (0.53 to 1.11, p<0.001)   0.03 (-0.23 to 0.29, p=0.843)
## 43  -0.01 (-0.28 to 0.26, p=0.937)  -0.11 (-0.25 to 0.03, p=0.129)
## 44   0.96 (0.63 to 1.29, p<0.001)  -0.04 (-0.20 to 0.13, p=0.678)
## 45   0.54 (0.28 to 0.81, p<0.001)  -0.01 (-0.21 to 0.19, p=0.901)
## 46  -0.18 (-0.47 to 0.11, p=0.213) -0.22 (-0.43 to -0.01, p=0.037)
## 19                              -                               -
## 20   1.39 (1.26 to 1.52, p<0.001)    0.26 (0.19 to 0.33, p<0.001)
## 22                              -                               -
## 23   2.78 (2.60 to 2.95, p<0.001)    0.39 (0.29 to 0.49, p<0.001)
## 24   4.38 (4.15 to 4.62, p<0.001)    0.64 (0.49 to 0.78, p<0.001)
## 25   1.08 (0.91 to 1.24, p<0.001)    0.14 (0.06 to 0.23, p=0.001)
## 35                              -                               -
## 36 -1.27 (-1.44 to -1.10, p<0.001)  -0.03 (-0.13 to 0.06, p=0.520)
## 37   0.06 (0.05 to 0.06, p<0.001)    0.01 (0.01 to 0.01, p<0.001)
## 28                              -                               -
## 29 -0.57 (-0.71 to -0.44, p<0.001)   0.02 (-0.05 to 0.10, p=0.577)
## 11                              -                               -
## 12 -0.91 (-1.11 to -0.71, p<0.001) -0.17 (-0.29 to -0.05, p=0.006)
```

```
## 13    0.18 (0.04 to 0.33, p=0.012)   0.02 (-0.15 to 0.18, p=0.846)
## 30                                 -                               -
## 31    0.63 (0.48 to 0.77, p<0.001)  -0.02 (-0.12 to 0.07, p=0.607)
## 32                                 -                               -
## 33 -1.32 (-1.57 to -1.06, p<0.001)   0.01 (-0.12 to 0.14, p=0.909)
## 34    0.90 (0.74 to 1.06, p<0.001)  -0.06 (-0.16 to 0.03, p=0.205)
## 2                                  -                               -
## 3  11.44 (11.37 to 11.51, p<0.001) 11.12 (11.03 to 11.22, p<0.001)
## 4     4.89 (4.83 to 4.95, p<0.001)    4.68 (4.60 to 4.76, p<0.001)
## 5  -4.11 (-4.30 to -3.92, p<0.001) -3.99 (-4.23 to -3.74, p<0.001)
## 47 -0.02 (-0.02 to -0.02, p<0.001)   0.00 (-0.00 to 0.01, p=0.458)
## 38    0.01 (0.00 to 0.01, p<0.001)   0.00 (-0.00 to 0.00, p=0.585)
## 1     0.00 (0.00 to 0.00, p=0.035)  -0.00 (-0.00 to 0.00, p=0.100)
## 18 -0.02 (-0.02 to -0.02, p<0.001)  -0.01 (-0.01 to 0.00, p=0.050)
## 21 -0.01 (-0.01 to -0.01, p<0.001)   0.00 (-0.00 to 0.00, p=0.264)
## 15    0.21 (0.19 to 0.24, p<0.001)   0.01 (-0.00 to 0.03, p=0.138)
## 16 -0.18 (-0.21 to -0.15, p<0.001)   0.01 (-0.01 to 0.02, p=0.479)
## 17 -0.25 (-0.27 to -0.22, p<0.001) -0.02 (-0.03 to -0.00, p=0.047)
## 14 -0.15 (-0.19 to -0.10, p<0.001)  -0.01 (-0.03 to 0.01, p=0.365)
## 7                                  -                               -
## 8                                  -                               -
## 9                                  -                               -
## 10                                 -                               -
## 6     0.36 (0.27 to 0.44, p<0.001)    0.09 (0.04 to 0.13, p<0.001)
```

```r
# Regressions for variables that won't run in explanatory
educ_reg <- lm(bmi ~ factor(education), data = ibiccs)
summary(educ_reg)
```

```
##
## Call:
## lm(formula = bmi ~ factor(education), data = ibiccs)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -9.275 -3.438 -0.801  2.539 15.409
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         25.2285     0.0525  480.19   <2e-16
## factor(education)Cégep               1.1505     0.1024   11.23   <2e-16
## factor(education)Certificate/Diploma  1.3631     0.1126   12.10   <2e-16
## factor(education)Graduate School     -0.1476     0.0794   -1.86    0.063
## factor(education)High School/Lower    1.6166     0.1153   14.03   <2e-16
##
## (Intercept)                        ***
## factor(education)Cégep              ***
## factor(education)Certificate/Diploma ***
## factor(education)Graduate School    .
## factor(education)High School/Lower  ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.65 on 21002 degrees of freedom
##   (2894 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.021,  Adjusted R-squared:  0.0208
## F-statistic:  112 on 4 and 21002 DF,  p-value: <2e-16
```

```
confint(educ_reg)
```

```
##                                      2.5 %    97.5 %
## (Intercept)                       25.1255 25.331477
## factor(education)Cégep             0.9497  1.351290
## factor(education)Certificate/Diploma  1.1424  1.583923
## factor(education)Graduate School     -0.3032  0.007946
## factor(education)High School/Lower    1.3907  1.842495
```

```
tran_reg <- lm(bmi ~ factor(common_transportation), data = ibiccs)
summary(tran_reg)
```

```
##
## Call:
## lm(formula = bmi ~ factor(common_transportation), data = ibiccs)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.876 -3.374 -0.764  2.619 15.631
##
## Coefficients:
##                                                 Estimate Std. Error
## (Intercept)                                       24.556      0.147
## factor(common_transportation)Car                   1.860      0.155
## factor(common_transportation)Other                 1.723      0.374
## factor(common_transportation)Public Transportation    0.768      0.158
## factor(common_transportation)Walking               0.163      0.164
##                                                 t value  Pr(>|t|)
## (Intercept)                                      166.62   < 2e-16 ***
## factor(common_transportation)Car                  11.97   < 2e-16 ***
## factor(common_transportation)Other                 4.61 0.0000041 ***
## factor(common_transportation)Public Transportation    4.87 0.0000011 ***
## factor(common_transportation)Walking               0.99      0.32
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.65 on 21113 degrees of freedom
##   (2783 observations deleted due to missingness)
## Multiple R-squared:  0.023,  Adjusted R-squared:  0.0228
## F-statistic:  124 on 4 and 21113 DF,  p-value: <2e-16
```

```
confint(tran_reg)
```

```
##                                                  2.5 %  97.5 %
## (Intercept)                                     24.2673 24.8451
## factor(common_transportation)Car                 1.5556  2.1650
## factor(common_transportation)Other               0.9900  2.4565
## factor(common_transportation)Public Transportation  0.4589  1.0764
## factor(common_transportation)Walking            -0.1590  0.4854
```

```
income_reg <- lm(bmi ~ factor(household_income), data = ibiccs)
summary(income_reg)
```

```
##
```

```
## Call:
## lm(formula = bmi ~ factor(household_income), data = ibiccs)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.541 -3.490 -0.801  2.610 15.506
##
## Coefficients:
##                                       Estimate Std. Error t value
## (Intercept)                            26.0414     0.0597  435.99
## factor(household_income)$100000-$149999  -0.4132     0.1016   -4.07
## factor(household_income)$150000+         -0.6987     0.1151   -6.07
## factor(household_income)$50000-$99999    -0.4018     0.0815   -4.93
## factor(household_income)Missing          -1.1772     0.1143  -10.30
##                                       Pr(>|t|)
## (Intercept)                            < 2e-16 ***
## factor(household_income)$100000-$149999  4.7e-05 ***
## factor(household_income)$150000+         1.3e-09 ***
## factor(household_income)$50000-$99999    8.4e-07 ***
## factor(household_income)Missing          < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.69 on 21155 degrees of freedom
##   (2741 observations deleted due to missingness)
## Multiple R-squared:  0.00553,    Adjusted R-squared:  0.00534
## F-statistic: 29.4 on 4 and 21155 DF,  p-value: <2e-16
```

```
confint(income_reg)
```

```
##                                         2.5 %  97.5 %
## (Intercept)                            25.9244 26.1585
## factor(household_income)$100000-$149999 -0.6123 -0.2141
## factor(household_income)$150000+        -0.9244 -0.4730
## factor(household_income)$50000-$99999   -0.5616 -0.2420
## factor(household_income)Missing         -1.4012 -0.9532
```

```
ethn_reg <- lm(bmi ~ factor(ethnicity), data = ibiccs)
summary(ethn_reg)
```

```
##
## Call:
## lm(formula = bmi ~ factor(ethnicity), data = ibiccs)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -10.008  -3.398  -0.758   2.542  16.259
##
## Coefficients:
##                                          Estimate Std. Error t value
## (Intercept)                                27.748      0.127  218.21
## factor(ethnicity)Asian                     -4.067      0.158  -25.76
## factor(ethnicity)Caucasian                 -1.970      0.132  -14.87
## factor(ethnicity)Hispanic                  -1.539      0.212   -7.26
## factor(ethnicity)Native American/Indigenous  -2.131      0.606   -3.52
```

```
## factor(ethnicity)Other                         -2.458      0.217  -11.32
##                                                Pr(>|t|)
## (Intercept)                                     < 2e-16 ***
## factor(ethnicity)Asian                          < 2e-16 ***
## factor(ethnicity)Caucasian                      < 2e-16 ***
## factor(ethnicity)Hispanic                       4.1e-13 ***
## factor(ethnicity)Native American/Indigenous     0.00044 ***
## factor(ethnicity)Other                          < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.63 on 20730 degrees of freedom
##   (3165 observations deleted due to missingness)
## Multiple R-squared:  0.0345, Adjusted R-squared:  0.0343
## F-statistic:  148 on 5 and 20730 DF,  p-value: <2e-16
```

```
confint(ethn_reg)
```

```
##                                                 2.5 %  97.5 %
## (Intercept)                                    27.498 27.9968
## factor(ethnicity)Asian                         -4.376 -3.7575
## factor(ethnicity)Caucasian                     -2.230 -1.7103
## factor(ethnicity)Hispanic                      -1.955 -1.1232
## factor(ethnicity)Native American/Indigenous -3.319 -0.9437
## factor(ethnicity)Other                         -2.883 -2.0325
```

```
pa_lvl_reg <- lm(bmi ~ factor(pa_level), data = ibiccs)
summary(pa_lvl_reg)
```

```
##
## Call:
## lm(formula = bmi ~ factor(pa_level), data = ibiccs)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -9.03  -3.42  -0.75   2.54  15.61
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                  25.030      0.127  197.34  < 2e-16 ***
## factor(pa_level)Moderate      0.780      0.135    5.76  8.5e-09 ***
## factor(pa_level)NA            1.562      0.147   10.63  < 2e-16 ***
## factor(pa_level)Sedentary     2.593      0.923    2.81    0.005 **
## factor(pa_level)Vigorous     -0.153      0.140   -1.09    0.274
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.66 on 21155 degrees of freedom
##   (2741 observations deleted due to missingness)
## Multiple R-squared:  0.0172, Adjusted R-squared:  0.017
## F-statistic: 92.4 on 4 and 21155 DF,  p-value: <2e-16
```

```
confint(pa_lvl_reg)
```

```
##                              2.5 %  97.5 %
## (Intercept)                24.7818 25.2790
```

```
## factor(pa_level)Moderate   0.5147  1.0454
## factor(pa_level)NA         1.2743  1.8504
## factor(pa_level)Sedentary  0.7835  4.4034
## factor(pa_level)Vigorous  -0.4279  0.1214
```

Interpretation: What covariates are we keeping? 'language', 'ville', 'gender', 'health', 'physically_active', 'q42', 'marital_status', 'country_born', 'motor_vehicle_access', 'occupation_status', 'bmi_category', 'WalkScore', 'DiningandDrinkingScore', 'GroceryScore', 'day_per_week_motor_vehicle', 'day_per_week_public_transit', 'day_per_week_walking', 'day_per_week_bike', 'children_household', 'education', 'common_transportation', 'household_income', 'ethnicity', 'pa_level'

# Linear Regression

```
lm1 <- lm(bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore + factor(ville), data = ibiccs)
summary(lm1)
```

```
##
## Call:
## lm(formula = bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore +
##     factor(ville), data = ibiccs)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -9.983 -3.455 -0.787  2.590 15.602
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                26.29791    0.19130  137.47  < 2e-16 ***
## WalkScore                  -0.01675    0.00756   -2.22  0.02662 *
## DiningandDrinkingScore     -0.01317    0.00580   -2.27  0.02325 *
## GroceryScore                0.01474    0.00265    5.57  2.6e-08 ***
## factor(ville)Chicago        0.88916    0.13675    6.50  8.1e-11 ***
## factor(ville)Détroit        1.00145    0.17314    5.78  7.4e-09 ***
## factor(ville)Montréal       0.71927    0.14821    4.85  1.2e-06 ***
## factor(ville)New-York       0.16378    0.13874    1.18  0.23780
## factor(ville)Philadelphie   1.00341    0.17099    5.87  4.5e-09 ***
## factor(ville)Toronto        0.48620    0.13599    3.58  0.00035 ***
## factor(ville)Vancouver     -0.26448    0.15016   -1.76  0.07820 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.66 on 20911 degrees of freedom
##   (2979 observations deleted due to missingness)
## Multiple R-squared:  0.0201, Adjusted R-squared:  0.0197
## F-statistic:   43 on 10 and 20911 DF,  p-value: <2e-16
```

```
confint(lm1)
```

```
##                               2.5 %    97.5 %
## (Intercept)               25.922939 26.672884
## WalkScore                 -0.031561 -0.001943
## DiningandDrinkingScore    -0.024546 -0.001795
## GroceryScore               0.009547  0.019924
```

```
## factor(ville)Chicago       0.621122  1.157201
## factor(ville)Détroit       0.662073  1.340821
## factor(ville)Montréal      0.428758  1.009773
## factor(ville)New-York     -0.108149  0.435718
## factor(ville)Philadelphie  0.668248  1.338564
## factor(ville)Toronto       0.219654  0.752745
## factor(ville)Vancouver    -0.558809  0.029848
```

```
lm2 <- lm(bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore + factor(ville) + education + occupati
summary(lm2)
```

```
##
## Call:
## lm(formula = bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore +
##     factor(ville) + education + occupation_status + household_income,
##     data = ibiccs)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -10.778  -3.325  -0.713   2.529  16.596
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      25.99174    0.20607  126.13  < 2e-16 ***
## WalkScore                        -0.00983    0.00750   -1.31    0.190
## DiningandDrinkingScore           -0.01174    0.00575   -2.04    0.041 *
## GroceryScore                      0.01157    0.00263    4.40  1.1e-05 ***
## factor(ville)Chicago              0.66853    0.13557    4.93  8.2e-07 ***
## factor(ville)Détroit              0.80563    0.17164    4.69  2.7e-06 ***
## factor(ville)Montréal             0.15903    0.14864    1.07    0.285
## factor(ville)New-York            -0.06918    0.13766   -0.50    0.615
## factor(ville)Philadelphie         0.75884    0.16953    4.48  7.6e-06 ***
## factor(ville)Toronto              0.04029    0.13657    0.30    0.768
## factor(ville)Vancouver           -0.72432    0.15113   -4.79  1.7e-06 ***
## educationCégep                    1.19719    0.10425   11.48  < 2e-16 ***
## educationCertificate/Diploma      1.21253    0.11504   10.54  < 2e-16 ***
## educationGraduate School         -0.15236    0.07950   -1.92    0.055 .
## educationHigh School/Lower        1.35470    0.11961   11.33  < 2e-16 ***
## occupation_statusStudent         -1.69600    0.13499  -12.56  < 2e-16 ***
## occupation_statusUnemployed       0.62974    0.08410    7.49  7.3e-14 ***
## household_income$100000-$149999 -0.02180    0.10440   -0.21    0.835
## household_income$150000+         -0.09668    0.11962   -0.81    0.419
## household_income$50000-$99999    -0.18349    0.08341   -2.20    0.028 *
## household_incomeMissing          -0.89151    0.11609   -7.68  1.7e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.58 on 20675 degrees of freedom
##   (3205 observations deleted due to missingness)
## Multiple R-squared:  0.0511, Adjusted R-squared:  0.0502
## F-statistic: 55.7 on 20 and 20675 DF,  p-value: <2e-16
```

```
confint(lm2)
```

```
##                                    2.5 %     97.5 %
```

```
## (Intercept)                      25.587840 26.3956476
## WalkScore                        -0.024533  0.0048823
## DiningandDrinkingScore           -0.023016 -0.0004666
## GroceryScore                      0.006414  0.0167289
## factor(ville)Chicago              0.402795  0.9342657
## factor(ville)Détroit              0.469209  1.1420588
## factor(ville)Montréal            -0.132327  0.4503827
## factor(ville)New-York            -0.339011  0.2006416
## factor(ville)Philadelphie         0.426545  1.0911267
## factor(ville)Toronto             -0.227395  0.3079706
## factor(ville)Vancouver           -1.020539 -0.4280943
## educationCégep                    0.992850  1.4015378
## educationCertificate/Diploma      0.987049  1.4380132
## educationGraduate School         -0.308187  0.0034599
## educationHigh School/Lower        1.120256  1.5891351
## occupation_statusStudent         -1.960597 -1.4314060
## occupation_statusUnemployed       0.464902  0.7945871
## household_income$100000-$149999 -0.226420  0.1828271
## household_income$150000+         -0.331150  0.1377965
## household_income$50000-$99999    -0.346984 -0.0199879
## household_incomeMissing          -1.119041 -0.6639695
```

```
lm3 <- lm(bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore + factor(ville) + education + occupati
summary(lm3)
```

```
##
## Call:
## lm(formula = bmi ~ WalkScore + DiningandDrinkingScore + GroceryScore +
##     factor(ville) + education + occupation_status + household_income +
##     language + gender + marital_status + ethnicity, data = ibiccs)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -11.126  -3.141  -0.821   2.360  17.148
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       27.30407    0.26097  104.63  < 2e-16
## WalkScore                         -0.01643    0.00793   -2.07  0.03834
## DiningandDrinkingScore            -0.00320    0.00609   -0.53  0.59949
## GroceryScore                       0.01110    0.00275    4.03  5.5e-05
## factor(ville)Chicago               0.49302    0.14094    3.50  0.00047
## factor(ville)Détroit               0.62159    0.18022    3.45  0.00056
## factor(ville)Montréal              0.01985    0.19880    0.10  0.92045
## factor(ville)New-York             -0.14329    0.14257   -1.01  0.31490
## factor(ville)Philadelphie          0.57673    0.17592    3.28  0.00105
## factor(ville)Toronto               0.07630    0.14441    0.53  0.59723
## factor(ville)Vancouver            -0.50180    0.16154   -3.11  0.00190
## educationCégep                     0.95751    0.11192    8.56  < 2e-16
## educationCertificate/Diploma       0.99254    0.12359    8.03  1.0e-15
## educationGraduate School          -0.17618    0.08251   -2.14  0.03275
## educationHigh School/Lower         0.98075    0.12989    7.55  4.6e-14
## occupation_statusStudent          -1.23730    0.13869   -8.92  < 2e-16
## occupation_statusUnemployed        0.56095    0.09220    6.08  1.2e-09
## household_income$100000-$149999   -0.22411    0.11350   -1.97  0.04834
```

```
## household_income$150000+            -0.33973    0.12982   -2.62  0.00888
## household_income$50000-$99999       -0.23013    0.09011   -2.55  0.01067
## household_incomeMissing             -0.74197    0.12889   -5.76  8.7e-09
## languageFren/Span                    0.03894    0.20376    0.19  0.84846
## genderMale                           1.45267    0.06859   21.18  < 2e-16
## marital_statusSingle                -0.34171    0.07605   -4.49  7.0e-06
## ethnicityAsian                      -3.23678    0.17403  -18.60  < 2e-16
## ethnicityCaucasian                  -1.67354    0.14714  -11.37  < 2e-16
## ethnicityHispanic                   -1.22842    0.22453   -5.47  4.5e-08
## ethnicityNative American/Indigenous -1.73431    0.64279   -2.70  0.00698
## ethnicityOther                      -2.02624    0.23340   -8.68  < 2e-16
##
## (Intercept)                         ***
## WalkScore                           *
## DiningandDrinkingScore
## GroceryScore                        ***
## factor(ville)Chicago                ***
## factor(ville)Détroit                ***
## factor(ville)Montréal
## factor(ville)New-York
## factor(ville)Philadelphie           **
## factor(ville)Toronto
## factor(ville)Vancouver              **
## educationCégep                      ***
## educationCertificate/Diploma        ***
## educationGraduate School            *
## educationHigh School/Lower          ***
## occupation_statusStudent            ***
## occupation_statusUnemployed         ***
## household_income$100000-$149999     *
## household_income$150000+            **
## household_income$50000-$99999       *
## household_incomeMissing             ***
## languageFren/Span
## genderMale                          ***
## marital_statusSingle                ***
## ethnicityAsian                      ***
## ethnicityCaucasian                  ***
## ethnicityHispanic                   ***
## ethnicityNative American/Indigenous **
## ethnicityOther                      ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.47 on 17820 degrees of freedom
##   (6052 observations deleted due to missingness)
## Multiple R-squared:  0.0927, Adjusted R-squared:  0.0913
## F-statistic:   65 on 28 and 17820 DF,  p-value: <2e-16
```

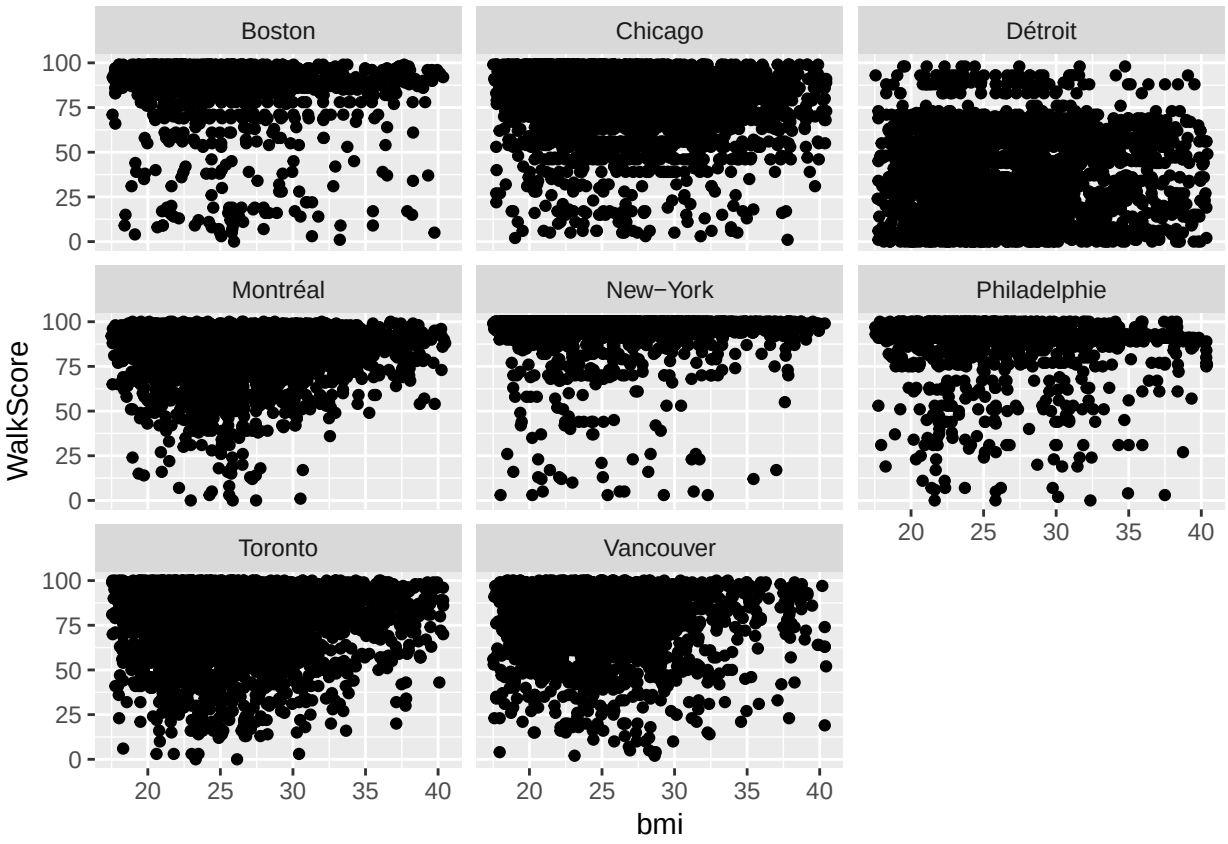
```
confint(lm3)
```

```
##                                       2.5 %     97.5 %
## (Intercept)                       26.792544 27.8155918
## WalkScore                         -0.031970 -0.0008823
## DiningandDrinkingScore            -0.015142  0.0087429
```

```
## GroceryScore                           0.005707  0.0164928
## factor(ville)Chicago                   0.216752  0.7692812
## factor(ville)Détroit                   0.268343  0.9748362
## factor(ville)Montréal                 -0.369811  0.4095176
## factor(ville)New-York                 -0.422745  0.1361683
## factor(ville)Philadelphie              0.231905  0.9215589
## factor(ville)Toronto                  -0.206745  0.3593518
## factor(ville)Vancouver                -0.818441 -0.1851673
## educationCégep                         0.738128  1.1768826
## educationCertificate/Diploma           0.750296  1.2347745
## educationGraduate School              -0.337902 -0.0144561
## educationHigh School/Lower             0.726141  1.2353511
## occupation_statusStudent              -1.509155 -0.9654525
## occupation_statusUnemployed            0.380220  0.7416748
## household_income$100000-$149999       -0.446582 -0.0016357
## household_income$150000+              -0.594179 -0.0852755
## household_income$50000-$99999         -0.406762 -0.0534958
## household_incomeMissing               -0.994620 -0.4893275
## languageFren/Span                     -0.360446  0.4383183
## genderMale                             1.318228  1.5871178
## marital_statusSingle                  -0.490772 -0.1926575
## ethnicityAsian                        -3.577904 -2.8956639
## ethnicityCaucasian                    -1.961941 -1.3851394
## ethnicityHispanic                     -1.668516 -0.7883207
## ethnicityNative American/Indigenous -2.994243 -0.4743765
## ethnicityOther                        -2.483733 -1.5687506
```

## Scatter Plots for BMI & Variables

```
#BMI & WalkScore
ggplot(ibiccs, aes(x = bmi, y = WalkScore)) +
  geom_point() +
  facet_wrap(~ ville)
```




## Complete cases

```
ibiccs_cc <- ibiccs %>%
              drop_na("bmi", "GroceryScore", "WalkScore", "DiningandDrinkingScore")
```

We remove missing data for all variables. We go from 23901 observations to 20922 observations.

## Causal Mediation

## GroceryScore

```
med.fit <- glm(GroceryScore ~ WalkScore, family = gaussian(link = "identity"), data = ibiccs_cc)
summary(med.fit)
```

```
##
## Call:
## glm(formula = GroceryScore ~ WalkScore, family = gaussian(link = "identity"),
##     data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -66.59   -3.83   -0.08    5.60   63.41
```

```
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.96590    0.30735   -3.14   0.0017 **
## WalkScore    1.04793    0.00375  279.45   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 180.5)
##
##     Null deviance: 17875112  on 20921  degrees of freedom
## Residual deviance:  3776883  on 20920  degrees of freedom
## AIC: 168088
##
## Number of Fisher Scoring iterations: 2
```

```
out.fit <- glm(bmi ~ WalkScore * GroceryScore, family = gaussian(link = "identity"), data = ibiccs_cc)
summary(out.fit)
```

```
##
## Call:
## glm(formula = bmi ~ WalkScore * GroceryScore, family = gaussian(link = "identity"),
##     data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -9.844  -3.458  -0.797   2.567  15.301
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)            26.5684245  0.1547173  171.72  < 2e-16 ***
## WalkScore              -0.0202338  0.0040430   -5.00  5.6e-07 ***
## GroceryScore            0.0290941  0.0033992    8.56  < 2e-16 ***
## WalkScore:GroceryScore -0.0002451  0.0000442   -5.55  2.9e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 21.83)
##
##     Null deviance: 463192  on 20921  degrees of freedom
## Residual deviance: 456602  on 20918  degrees of freedom
## AIC: 123887
##
## Number of Fisher Scoring iterations: 2
```

```
med.out <- mediate(med.fit, out.fit, treat = "WalkScore", mediator = "GroceryScore", sims = 100)
summary(med.out)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                          Estimate 95% CI Lower 95% CI Upper p-value
## ACME (control)           0.030738     0.024893         0.04  <2e-16 ***
```

```
## ACME (treated)            0.030478     0.024677         0.04  <2e-16 ***
## ADE (control)            -0.019982    -0.028575        -0.01  <2e-16 ***
## ADE (treated)            -0.020242    -0.028805        -0.01  <2e-16 ***
## Total Effect              0.010496     0.000724         0.02    0.04 *
## Prop. Mediated (control)  2.710278     1.599247        16.62    0.04 *
## Prop. Mediated (treated)  2.686551     1.583944        16.50    0.04 *
## ACME (average)            0.030608     0.024785         0.04  <2e-16 ***
## ADE (average)            -0.020112    -0.028690        -0.01  <2e-16 ***
## Prop. Mediated (average)  2.698415     1.591596        16.56    0.04 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 20922
##
##
## Simulations: 100
```

## Step 2: Add all covariates *Focus*

```
med.fit <- glm(GroceryScore ~ WalkScore + ville + gender + health + physically_active + q42 + marital_s
summary(med.fit)
```

```
##
## Call:
## glm(formula = GroceryScore ~ WalkScore + ville + gender + health +
##     physically_active + q42 + marital_status + day_per_week_motor_vehicle +
##     day_per_week_public_transit + day_per_week_walking + day_per_week_bike +
##     children_household + common_transportation + ethnicity +
##     pa_level, family = gaussian(link = "identity"), data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -62.42   -4.19   -0.03    5.77   64.91
##
## Coefficients:
##                                        Estimate Std. Error t value
## (Intercept)                            -2.03606    1.60125   -1.27
## WalkScore                               1.10960    0.00714  155.42
## villeChicago                           -5.26472    0.48525  -10.85
## villeDétroit                            4.20804    0.63107    6.67
## villeMontréal                           5.19837    0.54304    9.57
## villeNew-York                          -1.47891    0.50618   -2.92
## villePhiladelphie                       0.66852    0.61399    1.09
## villeToronto                            1.35832    0.50924    2.67
## villeVancouver                          2.93633    0.56379    5.21
## genderMale                              0.05285    0.24984    0.21
## healthGood                              1.03684    0.35356    2.93
## healthPoor/Fair                         1.58766    0.51120    3.11
## healthVery Good                         0.35585    0.31514    1.13
## physically_activeYes                   -1.53172    0.88539   -1.73
## q42                                    -0.00381    0.01050   -0.36
## marital_statusSingle                    0.30554    0.27847    1.10
```

```
## day_per_week_motor_vehicle                   0.19731    0.06642    2.97
## day_per_week_public_transit                   0.01767    0.07817    0.23
## day_per_week_walking                         -0.16560    0.06017   -2.75
## day_per_week_bike                             0.13071    0.09290    1.41
## children_household                            0.60600    0.17497    3.46
## common_transportationCar                     -0.20703    0.67860   -0.31
## common_transportationOther                   -0.11057    1.49468   -0.07
## common_transportationPublic Transportation -0.56948    0.66703   -0.85
## common_transportationWalking                 -0.89135    0.65753   -1.36
## ethnicityAsian                               -3.65495    0.64422   -5.67
## ethnicityCaucasian                           -4.03778    0.54736   -7.38
## ethnicityHispanic                            -2.00917    0.83280   -2.41
## ethnicityNative American/Indigenous          -0.67417    2.25998   -0.30
## ethnicityOther                               -4.25760    0.87012   -4.89
## pa_levelModerate                              0.21310    0.49775    0.43
## pa_levelNA                                   -0.74982    0.94585   -0.79
## pa_levelSedentary                             1.65715    3.55151    0.47
## pa_levelVigorous                             -0.27657    0.50931   -0.54
##                                             Pr(>|t|)
## (Intercept)                                  0.20356
## WalkScore                                    < 2e-16 ***
## villeChicago                                 < 2e-16 ***
## villeDétroit                                 2.7e-11 ***
## villeMontréal                                < 2e-16 ***
## villeNew-York                                0.00349 **
## villePhiladelphie                            0.27626
## villeToronto                                 0.00766 **
## villeVancouver                               1.9e-07 ***
## genderMale                                   0.83247
## healthGood                                   0.00337 **
## healthPoor/Fair                              0.00190 **
## healthVery Good                              0.25884
## physically_activeYes                         0.08366 .
## q42                                          0.71712
## marital_statusSingle                         0.27258
## day_per_week_motor_vehicle                   0.00298 **
## day_per_week_public_transit                  0.82119
## day_per_week_walking                         0.00593 **
## day_per_week_bike                            0.15945
## children_household                           0.00054 ***
## common_transportationCar                     0.76031
## common_transportationOther                   0.94103
## common_transportationPublic Transportation  0.39325
## common_transportationWalking                 0.17525
## ethnicityAsian                               1.4e-08 ***
## ethnicityCaucasian                           1.7e-13 ***
## ethnicityHispanic                            0.01586 *
## ethnicityNative American/Indigenous          0.76547
## ethnicityOther                               1.0e-06 ***
## pa_levelModerate                             0.66856
## pa_levelNA                                   0.42794
## pa_levelSedentary                            0.64079
## pa_levelVigorous                             0.58712
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 172.8)
##
##     Null deviance: 10515687  on 12231  degrees of freedom
## Residual deviance:  2108402  on 12198  degrees of freedom
##   (8690 observations deleted due to missingness)
## AIC: 97773
##
## Number of Fisher Scoring iterations: 2
```

```
out.fit <- glm(bmi ~ WalkScore * GroceryScore + ville + gender + health + physically_active + q42 + mari
summary(out.fit)
```

```
##
## Call:
## glm(formula = bmi ~ WalkScore * GroceryScore + ville + gender +
##     health + physically_active + q42 + marital_status + day_per_week_motor_vehicle +
##     day_per_week_public_transit + day_per_week_walking + day_per_week_bike +
##     children_household + common_transportation + ethnicity +
##     pa_level, family = gaussian(link = "identity"), data = ibiccs_cc)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -11.972   -2.855   -0.608    2.141   17.593
##
## Coefficients:
##                                              Estimate Std. Error t value
## (Intercept)                                 22.2641750  0.5246506   42.44
## WalkScore                                   -0.0095479  0.0051525   -1.85
## GroceryScore                                 0.0171813  0.0042736    4.02
## villeChicago                                 0.3211243  0.1562272    2.06
## villeDétroit                                 0.2195619  0.2012180    1.09
## villeMontréal                               -0.4138707  0.1737665   -2.38
## villeNew-York                               -0.0277660  0.1623542   -0.17
## villePhiladelphie                            0.4169788  0.1954018    2.13
## villeToronto                                -0.2999863  0.1625453   -1.85
## villeVancouver                              -0.8963295  0.1799889   -4.98
## genderMale                                   1.3503195  0.0794868   16.99
## healthGood                                   2.5916722  0.1125020   23.04
## healthPoor/Fair                              4.0801239  0.1626854   25.08
## healthVery Good                              0.9746545  0.1002516    9.72
## physically_activeYes                        -0.1342122  0.2816550   -0.48
## q42                                          0.0517281  0.0033411   15.48
## marital_statusSingle                         0.2120547  0.0885805    2.39
## day_per_week_motor_vehicle                   0.0598396  0.0211683    2.83
## day_per_week_public_transit                 -0.0226448  0.0248632   -0.91
## day_per_week_walking                        -0.0664917  0.0191535   -3.47
## day_per_week_bike                           -0.0289107  0.0295544   -0.98
## children_household                           0.3285687  0.0556898    5.90
## common_transportationCar                     0.5233395  0.2159322    2.42
## common_transportationOther                   0.3525731  0.4754329    0.74
## common_transportationPublic Transportation   0.5139321  0.2121792    2.42
## common_transportationWalking                 0.1158420  0.2092267    0.55
## ethnicityAsian                              -3.0633145  0.2053521  -14.92
```

```
## ethnicityCaucasian                          -1.4440697  0.1747277   -8.26
## ethnicityHispanic                           -0.7734630  0.2650995   -2.92
## ethnicityNative American/Indigenous         -1.4654113  0.7190937   -2.04
## ethnicityOther                              -1.6945561  0.2771437   -6.11
## pa_levelModerate                             0.3856558  0.1583209    2.44
## pa_levelNA                                   0.4683318  0.3008611    1.56
## pa_levelSedentary                            1.3108716  1.1297077    1.16
## pa_levelVigorous                             0.0363756  0.1620093    0.22
## WalkScore:GroceryScore                      -0.0000906  0.0000558   -1.62
##                                             Pr(>|t|)
## (Intercept)                                  < 2e-16 ***
## WalkScore                                    0.06390 .
## GroceryScore                                 5.8e-05 ***
## villeChicago                                 0.03985 *
## villeDétroit                                 0.27522
## villeMontréal                                0.01725 *
## villeNew-York                                0.86421
## villePhiladelphie                            0.03287 *
## villeToronto                                 0.06498 .
## villeVancouver                               6.4e-07 ***
## genderMale                                   < 2e-16 ***
## healthGood                                   < 2e-16 ***
## healthPoor/Fair                              < 2e-16 ***
## healthVery Good                              < 2e-16 ***
## physically_activeYes                         0.63372
## q42                                          < 2e-16 ***
## marital_statusSingle                         0.01668 *
## day_per_week_motor_vehicle                   0.00471 **
## day_per_week_public_transit                  0.36243
## day_per_week_walking                         0.00052 ***
## day_per_week_bike                            0.32798
## children_household                           3.7e-09 ***
## common_transportationCar                     0.01538 *
## common_transportationOther                   0.45835
## common_transportationPublic Transportation   0.01544 *
## common_transportationWalking                 0.57982
## ethnicityAsian                               < 2e-16 ***
## ethnicityCaucasian                           < 2e-16 ***
## ethnicityHispanic                            0.00353 **
## ethnicityNative American/Indigenous          0.04159 *
## ethnicityOther                               1.0e-09 ***
## pa_levelModerate                             0.01487 *
## pa_levelNA                                   0.11958
## pa_levelSedentary                            0.24592
## pa_levelVigorous                             0.82235
## WalkScore:GroceryScore                       0.10479
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 17.49)
##
##     Null deviance: 260861  on 12231  degrees of freedom
## Residual deviance: 213274  on 12196  degrees of freedom
##   (8690 observations deleted due to missingness)
```

```
## AIC: 69752
##
## Number of Fisher Scoring iterations: 2
```

```
med.out <- mediate(med.fit, out.fit, treat = "WalkScore", mediator = "GroceryScore", sims = 100)
summary(med.out)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                          Estimate 95% CI Lower 95% CI Upper p-value
## ACME (control)            0.01906      0.00916         0.03  <2e-16 ***
## ACME (treated)            0.01896      0.00915         0.03  <2e-16 ***
## ADE (control)            -0.00874     -0.02220         0.00    0.10 .
## ADE (treated)            -0.00884     -0.02214         0.00    0.10 .
## Total Effect              0.01022     -0.00755         0.02    0.18
## Prop. Mediated (control)  1.64249     -2.59397         7.29    0.18
## Prop. Mediated (treated)  1.63167     -2.59824         7.27    0.18
## ACME (average)            0.01901      0.00916         0.03  <2e-16 ***
## ADE (average)            -0.00879     -0.02217         0.00    0.10 .
## Prop. Mediated (average)  1.63708     -2.59611         7.28    0.18
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 12232
##
##
## Simulations: 100
```

## DiningandDrinkingScore

```
med.fit <- glm(DiningandDrinkingScore ~ WalkScore, family = gaussian(link = "identity"), data = ibiccs_
summary(med.fit)
```

```
##
## Call:
## glm(formula = DiningandDrinkingScore ~ WalkScore, family = gaussian(link = "identity"),
##     data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -46.43   -2.30   -0.15    2.20   51.14
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.69628    0.13849    33.9   <2e-16 ***
## WalkScore    0.96181    0.00169   569.2   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 36.66)
##
```

```
##     Null deviance: 12643236  on 20921  degrees of freedom
## Residual deviance:   766854  on 20920  degrees of freedom
## AIC: 134731
##
## Number of Fisher Scoring iterations: 2
```

```
out.fit <- glm(bmi ~ WalkScore * DiningandDrinkingScore, family = gaussian(link = "identity"), data = ib
summary(out.fit)
```

```
##
## Call:
## glm(formula = bmi ~ WalkScore * DiningandDrinkingScore, family = gaussian(link = "identity"),
##     data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -9.052  -3.437  -0.773   2.539  15.392
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      25.9238288  0.1673918  154.87  < 2e-16
## WalkScore                         0.0407126  0.0064922    6.27  3.7e-10
## DiningandDrinkingScore           -0.0001460  0.0056775   -0.03     0.98
## WalkScore:DiningandDrinkingScore -0.0005065  0.0000475  -10.66  < 2e-16
##
## (Intercept)                      ***
## WalkScore                        ***
## DiningandDrinkingScore
## WalkScore:DiningandDrinkingScore ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 21.77)
##
##     Null deviance: 463192  on 20921  degrees of freedom
## Residual deviance: 455398  on 20918  degrees of freedom
## AIC: 123832
##
## Number of Fisher Scoring iterations: 2
```

```
med.out <- mediate(med.fit, out.fit, treat = "WalkScore", mediator = "DiningandDrinkingScore", sims = 10
summary(med.out)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                             Estimate 95% CI Lower 95% CI Upper p-value
## ACME (control)           -0.0000167   -0.0099706         0.01    0.94
## ACME (treated)           -0.0005029   -0.0104558         0.01    0.84
## ADE (control)             0.0382083    0.0254589         0.05  <2e-16 ***
## ADE (treated)             0.0377222    0.0250133         0.05  <2e-16 ***
## Total Effect              0.0377055    0.0269357         0.05  <2e-16 ***
## Prop. Mediated (control) -0.0062384   -0.3129620         0.23    0.94
```

```
## Prop. Mediated (treated) -0.0190664   -0.3273799         0.22    0.84
## ACME (average)           -0.0002598   -0.0102132         0.01    0.92
## ADE (average)             0.0379652    0.0252361         0.05  <2e-16 ***
## Prop. Mediated (average) -0.0126524   -0.3201709         0.22    0.92
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 20922
##
##
## Simulations: 100
```

## Step 2: Add all covariates *Focus*

```
med.fit <- glm(DiningandDrinkingScore ~ WalkScore + ville + gender + health + physically_active + q42 +
summary(med.fit)
```

```
##
## Call:
## glm(formula = DiningandDrinkingScore ~ WalkScore + ville + gender +
##     health + physically_active + q42 + marital_status + day_per_week_motor_vehicle +
##     day_per_week_public_transit + day_per_week_walking + day_per_week_bike +
##     children_household + common_transportation + ethnicity +
##     pa_level, family = gaussian(link = "identity"), data = ibiccs_cc)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -43.69   -2.20   -0.30    1.94   49.51
##
## Coefficients:
##                                          Estimate Std. Error t value
## (Intercept)                              -0.03762    0.71122   -0.05
## WalkScore                                 0.99074    0.00317  312.44
## villeChicago                              2.38884    0.21553   11.08
## villeDétroit                              4.43658    0.28030   15.83
## villeMontréal                             0.41079    0.24120    1.70
## villeNew-York                             0.19733    0.22483    0.88
## villePhiladelphie                         1.49760    0.27272    5.49
## villeToronto                              1.97616    0.22619    8.74
## villeVancouver                            2.12289    0.25042    8.48
## genderMale                               -0.06918    0.11097   -0.62
## healthGood                               -0.26165    0.15704   -1.67
## healthPoor/Fair                           0.14426    0.22706    0.64
## healthVery Good                          -0.22549    0.13997   -1.61
## physically_activeYes                      0.02698    0.39326    0.07
## q42                                      -0.02362    0.00467   -5.06
## marital_statusSingle                     -0.19618    0.12369   -1.59
## day_per_week_motor_vehicle               -0.03979    0.02950   -1.35
## day_per_week_public_transit              -0.01697    0.03472   -0.49
## day_per_week_walking                     -0.00712    0.02673   -0.27
## day_per_week_bike                        -0.00800    0.04126   -0.19
## children_household                       -0.30141    0.07772   -3.88
```

```
## common_transportationCar                   -0.00204    0.30141   -0.01
## common_transportationOther                 -0.16017    0.66389   -0.24
## common_transportationPublic Transportation  0.34185    0.29627    1.15
## common_transportationWalking                0.02380    0.29206    0.08
## ethnicityAsian                              2.74359    0.28614    9.59
## ethnicityCaucasian                          2.36625    0.24312    9.73
## ethnicityHispanic                           1.96747    0.36990    5.32
## ethnicityNative American/Indigenous         3.37670    1.00381    3.36
## ethnicityOther                              2.76221    0.38648    7.15
## pa_levelModerate                           -0.09570    0.22108   -0.43
## pa_levelNA                                 -0.02652    0.42012   -0.06
## pa_levelSedentary                          -0.55193    1.57747   -0.35
## pa_levelVigorous                           -0.00288    0.22622   -0.01
##                                            Pr(>|t|)
## (Intercept)                                 0.95782
## WalkScore                                  < 2e-16 ***
## villeChicago                               < 2e-16 ***
## villeDétroit                               < 2e-16 ***
## villeMontréal                               0.08857 .
## villeNew-York                               0.38013
## villePhiladelphie                          4.1e-08 ***
## villeToronto                               < 2e-16 ***
## villeVancouver                             < 2e-16 ***
## genderMale                                  0.53303
## healthGood                                  0.09572 .
## healthPoor/Fair                             0.52523
## healthVery Good                             0.10722
## physically_activeYes                        0.94531
## q42                                        4.2e-07 ***
## marital_statusSingle                        0.11274
## day_per_week_motor_vehicle                  0.17749
## day_per_week_public_transit                 0.62504
## day_per_week_walking                        0.78987
## day_per_week_bike                           0.84624
## children_household                         0.00011 ***
## common_transportationCar                    0.99461
## common_transportationOther                  0.80936
## common_transportationPublic Transportation  0.24859
## common_transportationWalking                0.93505
## ethnicityAsian                             < 2e-16 ***
## ethnicityCaucasian                         < 2e-16 ***
## ethnicityHispanic                          1.1e-07 ***
## ethnicityNative American/Indigenous        0.00077 ***
## ethnicityOther                             9.4e-13 ***
## pa_levelModerate                            0.66510
## pa_levelNA                                  0.94967
## pa_levelSedentary                           0.72643
## pa_levelVigorous                            0.98985
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 34.1)
##
##     Null deviance: 7447212  on 12231  degrees of freedom
```

```
## Residual deviance:  415956  on 12198  degrees of freedom
##   (8690 observations deleted due to missingness)
## AIC: 77919
##
## Number of Fisher Scoring iterations: 2
```

```
out.fit <- glm(bmi ~ WalkScore * DiningandDrinkingScore + ville + gender + health + physically_active +
summary(out.fit)
```

```
##
## Call:
## glm(formula = bmi ~ WalkScore * DiningandDrinkingScore + ville +
##     gender + health + physically_active + q42 + marital_status +
##     day_per_week_motor_vehicle + day_per_week_public_transit +
##     day_per_week_walking + day_per_week_bike + children_household +
##     common_transportation + ethnicity + pa_level, family = gaussian(link = "identity"),
##     data = ibiccs_cc)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -11.849   -2.858   -0.615    2.134   17.638
##
## Coefficients:
##                                              Estimate Std. Error t value
## (Intercept)                                 21.8651080  0.5359572   40.80
## WalkScore                                    0.0229981  0.0083463    2.76
## DiningandDrinkingScore                       0.0007473  0.0069495    0.11
## villeChicago                                 0.2888759  0.1552512    1.86
## villeDétroit                                 0.3682405  0.2039568    1.81
## villeMontréal                               -0.3728092  0.1732538   -2.15
## villeNew-York                                0.0082895  0.1629227    0.05
## villePhiladelphie                            0.4537656  0.1957420    2.32
## villeToronto                                -0.2763245  0.1627472   -1.70
## villeVancouver                              -0.8465175  0.1800289   -4.70
## genderMale                                   1.3527104  0.0795035   17.01
## healthGood                                   2.5954334  0.1125264   23.07
## healthPoor/Fair                              4.0865021  0.1627307   25.11
## healthVery Good                              0.9714643  0.1003007    9.69
## physically_activeYes                        -0.1476019  0.2817011   -0.52
## q42                                          0.0512740  0.0033462   15.32
## marital_statusSingle                         0.2120541  0.0886119    2.39
## day_per_week_motor_vehicle                   0.0585527  0.0211893    2.76
## day_per_week_public_transit                 -0.0223937  0.0248697   -0.90
## day_per_week_walking                        -0.0661093  0.0191688   -3.45
## day_per_week_bike                           -0.0290911  0.0295651   -0.98
## children_household                           0.3283574  0.0557367    5.89
## common_transportationCar                     0.5054851  0.2160252    2.34
## common_transportationOther                   0.3630890  0.4755799    0.76
## common_transportationPublic Transportation   0.5089534  0.2122360    2.40
## common_transportationWalking                 0.1204584  0.2093123    0.58
## ethnicityAsian                              -3.0315261  0.2066587  -14.67
## ethnicityCaucasian                          -1.4173581  0.1760292   -8.05
## ethnicityHispanic                           -0.7402349  0.2657609   -2.79
## ethnicityNative American/Indigenous         -1.3705358  0.7200274   -1.90
## ethnicityOther                              -1.6746712  0.2779898   -6.02
```

```
## pa_levelModerate                               0.3862290  0.1583640    2.44
## pa_levelNA                                     0.4654172  0.3009417    1.55
## pa_levelSedentary                              1.3225545  1.1299697    1.17
## pa_levelVigorous                               0.0392605  0.1620632    0.24
## WalkScore:DiningandDrinkingScore              -0.0002147  0.0000618   -3.47
##                                               Pr(>|t|)
## (Intercept)                                    < 2e-16 ***
## WalkScore                                      0.00587 **
## DiningandDrinkingScore                         0.91436
## villeChicago                                   0.06281 .
## villeDétroit                                   0.07102 .
## villeMontréal                                  0.03143 *
## villeNew-York                                  0.95942
## villePhiladelphie                              0.02046 *
## villeToronto                                   0.08956 .
## villeVancouver                                 2.6e-06 ***
## genderMale                                     < 2e-16 ***
## healthGood                                     < 2e-16 ***
## healthPoor/Fair                                < 2e-16 ***
## healthVery Good                                < 2e-16 ***
## physically_activeYes                           0.60031
## q42                                            < 2e-16 ***
## marital_statusSingle                           0.01672 *
## day_per_week_motor_vehicle                     0.00573 **
## day_per_week_public_transit                    0.36790
## day_per_week_walking                           0.00056 ***
## day_per_week_bike                              0.32515
## children_household                             3.9e-09 ***
## common_transportationCar                       0.01930 *
## common_transportationOther                     0.44520
## common_transportationPublic Transportation     0.01650 *
## common_transportationWalking                   0.56497
## ethnicityAsian                                 < 2e-16 ***
## ethnicityCaucasian                             8.9e-16 ***
## ethnicityHispanic                              0.00536 **
## ethnicityNative American/Indigenous            0.05701 .
## ethnicityOther                                 1.7e-09 ***
## pa_levelModerate                               0.01475 *
## pa_levelNA                                     0.12200
## pa_levelSedentary                              0.24185
## pa_levelVigorous                               0.80859
## WalkScore:DiningandDrinkingScore               0.00051 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 17.5)
##
##     Null deviance: 260861  on 12231  degrees of freedom
## Residual deviance: 213389  on 12196  degrees of freedom
##   (8690 observations deleted due to missingness)
## AIC: 69759
##
## Number of Fisher Scoring iterations: 2
```

```r
med.out <- mediate(med.fit, out.fit, treat = "WalkScore", mediator = "DiningandDrinkingScore", sims = 1
summary(med.out)
```

```
##
## Causal Mediation Analysis
##
## Quasi-Bayesian Confidence Intervals
##
##                            Estimate 95% CI Lower 95% CI Upper p-value
## ACME (control)             0.000612    -0.011790         0.01    0.94
## ACME (treated)             0.000402    -0.011958         0.01    0.96
## ADE (control)              0.022205     0.004622         0.04  <2e-16 ***
## ADE (treated)              0.021996     0.004474         0.04  <2e-16 ***
## Total Effect               0.022607     0.006406         0.04    0.02 *
## Prop. Mediated (control)   0.037019    -0.967764         0.65    0.92
## Prop. Mediated (treated)   0.027902    -0.979982         0.64    0.94
## ACME (average)             0.000507    -0.011874         0.01    0.94
## ADE (average)              0.022100     0.004548         0.04  <2e-16 ***
## Prop. Mediated (average)   0.032460    -0.973873         0.64    0.92
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 12232
##
##
## Simulations: 100
```

**List of next steps**

- Add in the city level model with glmer and interpretation
- Income stratified model
  - Rerun the model for categories of income
  - Create a new dataframe with only one level of income

# Area-Level Analysis

med.fit <- lm(smorale ~ free + #area-covariates, data = school)

out.fit <- lmer(late ~ free + smorale + #area-covariates + #covariates + (1 | SCH_ID), data = student)

med.out <- mediate(med.fit, out.fit, treat = “free”, mediator = “smorale”, + control.value = 3, treat.value = 4, sims = 100) summary(med.out) “‘