

R Notebook

This is an R Markdown Notebook. When you execute code within the notebook, the results appear beneath the code.

Try executing this chunk by clicking the *Run* button within the chunk or by placing your cursor inside it and pressing *Cmd+Shift+Enter*.

```
#Show NYC map by community (using NYC shapefile data)
library(sp)
library(rgdal)

## Please note that rgdal will be retired by the end of 2023,
## plan transition to sf/stars/terra functions using GDAL and PROJ
## at your earliest convenience.

##
## rgdal: version: 1.5-30, (SVN revision 1171)
## Geospatial Data Abstraction Library extensions to R successfully loaded
## Loaded GDAL runtime: GDAL 3.4.2, released 2022/03/08
## Path to GDAL shared files: /Library/Frameworks/R.framework/Versions/4.1/Resources/library/rgdal/gdal
## GDAL binary built with GEOS: FALSE
## Loaded PROJ runtime: Rel. 8.2.1, January 1st, 2022, [PJ_VERSION: 821]
## Path to PROJ shared files: /Library/Frameworks/R.framework/Versions/4.1/Resources/library/rgdal/proj
## PROJ CDN enabled: FALSE
## Linking to sp version:1.4-6
## To mute warnings of possible GDAL/OSR exportToProj4() degradation,
## use options("rgdal_show_exportToProj4_warnings"="none") before loading sp or rgdal.

library(rgeos)

## rgeos version: 0.5-9, (SVN revision 684)
## GEOS runtime version: 3.8.1-CAPI-1.13.3
## Please note that rgeos will be retired by the end of 2023,
## plan transition to sf functions using GEOS at your earliest convenience.
## Linking to sp version: 1.4-6
## Polygon checking: TRUE

library(ggplot2)
library(ggthemes)
library(sf)

## Linking to GEOS 3.9.1, GDAL 3.4.0, PROJ 8.1.1; sf_use_s2() is TRUE

library(leaflet)
#library(tmap)
#library(tmaptools)
library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:rgeos':
```

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##      intersect, setdiff, union
## The following objects are masked from 'package:stats':
##      filter, lag
## The following objects are masked from 'package:base':
##      intersect, setdiff, setequal, union
library(cartography)

## This project is in maintenance mode.
## Core functionalities of `cartography` can be found in `mapsf` .
## https://riatelab.github.io/mapsf/
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.2 --
## v tibble  3.1.6     v purrr   0.3.4
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     vforcats 0.5.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

#Stop Scientific Notation
options(scipen=999)

#Import Excel Data
library(readxl)
NeighborhoodData <- read_excel("Downloads/Neighborhood_Indicator_(Sub-Borough_.xlsx")
head(NeighborhoodData)

## # A tibble: 6 x 121
##   RegionID `Region Display` Neighborhood      `Region Type` Year adlt_incar_rt
##       <dbl> <lgl>           <chr>            <chr>        <chr> <lgl>
## 1       101 NA             Greenwich Village~ Sub-Borough ~ 2000  NA
## 2       101 NA             Greenwich Village~ Sub-Borough ~ 2001  NA
## 3       101 NA             Greenwich Village~ Sub-Borough ~ 2002  NA
## 4       101 NA             Greenwich Village~ Sub-Borough ~ 2003  NA
## 5       101 NA             Greenwich Village~ Sub-Borough ~ 2004  NA
## 6       101 NA             Greenwich Village~ Sub-Borough ~ 2005  NA
## # ... with 115 more variables: afford_le030_rct <dbl>, afford_le080_rct <dbl>,
## #   afford_le120_rct <dbl>, crime_all_rt <lgl>, crime_prop_rt <lgl>,
## #   crime_viol_rt <lgl>, gross_rent_0_1beds <dbl>, gross_rent_2_3beds <dbl>,
## #   hh_alone_pct <dbl>, hh_inc_med_adj <dbl>, hh_inc_own_med_adj <dbl>,
## #   hh_inc_rent_med_adj <dbl>, hh_u18_pct <dbl>, hp_first_fhava_pct <dbl>,
## #   hp_first_hi_pct <dbl>, hp_first_orig <dbl>,
## #   hp_first_orig_lmi_app_pct <dbl>, hp_first_orig_lmi_nbhd_pct <dbl>, ...
#Shapefile(Community Boards)
mymap <- st_read("Downloads/nycd_21a/nycd.shp")

## Reading layer `nycd` from data source
##   `/Users/templeanyasi/Downloads/nycd_21a/nycd.shp` using driver `ESRI Shapefile'
```

```

## Simple feature collection with 71 features and 3 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 913175.1 ymin: 120121.9 xmax: 1067383 ymax: 272844.3
## Projected CRS: NAD83 / New York Long Island (ftUS)

#Join files. They need a common variable so add Region ID variable to shapefile
mymap$RegionID <- c(101,101,102,103,103,104,105,106,107,108,109,110,0,201,201,203,204,202,205,206,208,209)
#mapdata <- merge(NeighborhoodData, mymap, by="RegionID")
mapdata <- inner_join(mymap, NeighborhoodData)

## Joining, by = "RegionID"
head(mapdata)

## Simple feature collection with 6 features and 124 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 971013.5 ymin: 188082.3 xmax: 984473.3 ymax: 203989.4
## Projected CRS: NAD83 / New York Long Island (ftUS)
##   BoroCD Shape_Leng Shape_Area RegionID Region Display
## 1 101 74168.59 42689119 101 NA
## 2 101 74168.59 42689119 101 NA
## 3 101 74168.59 42689119 101 NA
## 4 101 74168.59 42689119 101 NA
## 5 101 74168.59 42689119 101 NA
## 6 101 74168.59 42689119 101 NA
##               Neighborhood Region Type Year adlt_incar_rt
## 1 Greenwich Village/Financial District Sub-Borough Area 2000 NA
## 2 Greenwich Village/Financial District Sub-Borough Area 2001 NA
## 3 Greenwich Village/Financial District Sub-Borough Area 2002 NA
## 4 Greenwich Village/Financial District Sub-Borough Area 2003 NA
## 5 Greenwich Village/Financial District Sub-Borough Area 2004 NA
## 6 Greenwich Village/Financial District Sub-Borough Area 2005 NA
##   afford_le030_rct afford_le080_rct afford_le120_rct crime_all_rt crime_prop_rt
## 1 NA NA NA NA NA
## 2 NA NA NA NA NA
## 3 NA NA NA NA NA
## 4 NA NA NA NA NA
## 5 NA NA NA NA NA
## 6 NA NA NA NA NA
##   crime_viol_rt gross_rent_0_1beds gross_rent_2_3beds hh_alone_pct
## 1 NA NA NA NA
## 2 NA NA NA NA
## 3 NA NA NA NA
## 4 NA NA NA NA
## 5 NA NA NA NA
## 6 NA NA NA 0.545
##   hh_inc_med_adj hh_inc_own_med_adj hh_inc_rent_med_adj hh_u18_pct
## 1 108750 NA NA 0.114
## 2 NA NA NA NA
## 3 NA NA NA NA
## 4 NA NA NA NA
## 5 NA NA NA NA
## 6 115100 170450 95960 0.118

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##   hp_first_fhava_pct hp_first_hi_pct hp_first_orig hp_first_orig_lmi_app_pct
## 1                 NA                 NA                 NA                 NA
## 2                 NA                 NA                 NA                 NA
## 3                 NA                 NA                 NA                 NA
## 4                 NA                 NA                 NA                 NA
## 5                 NA                 NA                 NA                 NA
## 6                   0                  0                1544               0.004
##   hp_first_orig_lmi_nbhd_pct hp_first_orig_rt hpi_1f hpi_4f hpi_al hpi_cn
## 1                         NA                 NA                 NA                 NA                 NA
## 2                         NA                 NA                 NA                 NA                 NA
## 3                         NA                 NA                 NA                 NA                 NA
## 4                         NA                 NA                 NA                 NA                 NA
## 5                         NA                 NA                 NA                 NA                 NA
## 6                   0.028              46.6                NA                 NA                 NA
##   hpi_ot income_diversity_ratio lp_all lp_fam14condo_initial lp_fam14condo_rate
## 1     NA                      NA      8                  6                2.0
## 2     NA                      NA     18                 10                2.9
## 3     NA                      NA     71                 60                9.4
## 4     NA                      NA     14                  8                1.8
## 5     NA                      NA     17                 13                1.6
## 6     NA                      5.1    19                 10                1.5
##   lp_fam14condo_repeat med_r_1f med_r_4f med_r_cn med_r_ot nb_permit_res_units
## 1                   2       NA      NA      NA      NA                 NA
## 2                   2       NA      NA      NA      NA                 NA
## 3                   6       NA      NA      NA      NA                 NA
## 4                   5       NA      NA      NA      NA                 NA
## 5                   3       NA      NA      NA      NA                 NA
## 6                   7       NA      NA      NA      NA                 NA
##   pct_prof_elas pct_prof_math pfn_fam14condo pfn_fam14condo_rate pop_65p_pct
## 1      NA          NA          NA                 NA               0.105
## 2      NA          NA          NA                 NA                 NA
## 3      NA          NA          NA                 NA                 NA
## 4      NA          NA          NA                 NA                 NA
## 5      NA          NA          NA                 NA                 NA
## 6      NA          NA          NA                 NA               0.098
##   pop_bornstate_pct pop_commute_carfree_pct pop_commute_time_avg
## 1             NA                  0.859              24.4
## 2             NA                  NA                  NA
## 3             NA                  NA                  NA
## 4             NA                  NA                  NA
## 5             NA                  NA                  NA
## 6             0.378              0.837              23.5
##   pop_disabled_pct pop_discon_youth_pct pop_edu_collp_pct pop_edu_nohs_pct
## 1             NA                  NA                  0.690                 NA
## 2             NA                  NA                  NA                  NA
## 3             NA                  NA                  NA                  NA
## 4             NA                  NA                  NA                  NA
## 5             NA                  NA                  NA                  NA
## 6             NA                  NA                  0.771               0.046
##   pop_foreign_pct pop_num pop_pov_65p_pct pop_pov_pct pop_pov_u18_pct
## 1           0.233 125567                 NA               0.099                 NA
## 2             NA      NA                 NA                 NA                 NA
## 3             NA      NA                 NA                 NA                 NA
## 4             NA      NA                 NA                 NA                 NA

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## 5          NA      NA          NA      NA          NA
## 6          0.221 126659        0.142     0.092       0.076
##   pop_race_asian_pct pop_race_black_pct pop_race_div_idx pop_race_hisp_pct
## 1          0.145        0.031       0.43       0.059
## 2          NA          NA          NA          NA
## 3          NA          NA          NA          NA
## 4          NA          NA          NA          NA
## 5          NA          NA          NA          NA
## 6          0.171        0.029       0.45       0.057
##   pop_race_white_pct pop16_laborforce_pct pop16_unemp_pct population_density
## 1          0.736        NA         0.0578      NA
## 2          NA          NA          NA          NA
## 3          NA          NA          NA          NA
## 4          NA          NA          NA          NA
## 5          NA          NA          NA          NA
## 6          0.721        0.777       0.0328      NA
##   priv_evic_amt_sought_med_adj priv_evic_filing_rt priv_evic_filings
## 1          NA          NA          NA          NA
## 2          NA          NA          NA          NA
## 3          NA          NA          NA          NA
## 4          NA          NA          NA          NA
## 5          NA          NA          NA          NA
## 6          NA          NA          NA          NA
##   prox_park_pct prox_subway_pct rburden_mod_ami_81_120 rburden_mod_ami_le80
## 1          NA          NA          NA          NA
## 2          NA          NA          NA          NA
## 3          NA          NA          NA          NA
## 4          NA          NA          NA          NA
## 5          NA          NA          NA          NA
## 6          NA          NA          NA          NA
##   rburden_sev_ami_81_120 rburden_sev_ami_le80 refi_hi_pct refi_orig
## 1          NA          NA          NA          NA
## 2          NA          NA          NA          NA
## 3          NA          NA          NA          NA
## 4          NA          NA          NA          NA
## 5          NA          NA          NA          NA
## 6          NA          NA          0          733
##   refi_orig_rt rent.asking.med rent_burden_med rent_burden_mod_pct
## 1          NA          NA        0.232       NA
## 2          NA          NA          NA       NA
## 3          NA          NA          NA       NA
## 4          NA          NA          NA       NA
## 5          NA          NA          NA       NA
## 6          22.1        NA        0.254       0.216
##   rent_burden_sev_pct rent_gross_med_adj rent_gross_recent_med_adj
## 1          0.193        1770       NA
## 2          NA          NA          NA
## 3          NA          NA          NA
## 4          NA          NA          NA
## 5          NA          NA          NA
## 6          NA          2260       NA
##   rent_pct_nycha reo serious_viol_rate shd_420c_props shd_420c_units
## 1          NA      NA          NA          NA          NA
## 2          NA      NA          NA          NA          NA

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## 3      NA  NA      NA      NA      NA
## 4      NA  NA      NA      NA      NA
## 5      NA  NA      NA      NA      NA
## 6      NA  NA      NA      NA      NA
##   shd_421a_props shd_421a_units shd_all_sub_props shd_all_sub_units
## 1      NA      NA      NA      NA
## 2      NA      NA      NA      NA
## 3      NA      NA      NA      NA
## 4      NA      NA      NA      NA
## 5      NA      NA      NA      NA
## 6      NA      NA      NA      NA
##   shd_ex_2020_2025_props shd_ex_2020_2025_units shd_ex_2026_2035_props
## 1      NA      NA      NA      NA
## 2      NA      NA      NA      NA
## 3      NA      NA      NA      NA
## 4      NA      NA      NA      NA
## 5      NA      NA      NA      NA
## 6      NA      NA      NA      NA
##   shd_ex_2026_2035_units shd_ex_2036_later_props shd_ex_2036_later_units
## 1      NA      NA      NA      NA
## 2      NA      NA      NA      NA
## 3      NA      NA      NA      NA
## 4      NA      NA      NA      NA
## 5      NA      NA      NA      NA
## 6      NA      NA      NA      NA
##   shd_hud_finins_props shd_hud_finins_units shd_hud_pbrap_props
## 1      NA      NA      NA      NA
## 2      NA      NA      NA      NA
## 3      NA      NA      NA      NA
## 4      NA      NA      NA      NA
## 5      NA      NA      NA      NA
## 6      NA      NA      NA      NA
##   shd_hud_pbrap_units shd_lihtc_props shd_lihtc_units shd_ml_props shd_ml_units
## 1      NA      NA      NA      NA      NA
## 2      NA      NA      NA      NA      NA
## 3      NA      NA      NA      NA      NA
## 4      NA      NA      NA      NA      NA
## 5      NA      NA      NA      NA      NA
## 6      NA      NA      NA      NA      NA
##   shd_nyc_prog_props shd_ph_props shd_ph_units total_viol_rate unit_num
## 1      NA      NA      NA      NA      NA
## 2      NA      NA      NA      NA      NA
## 3      NA      NA      NA      NA      NA
## 4      NA      NA      NA      NA      NA
## 5      NA      NA      NA      NA      NA
## 6      NA      NA      NA      NA      79065
##   unit_occ_own_pct unit_occ_rent_sevcrowd_pct unit_vac_rent_pct units_cert
## 1      0.259      NA      NA      NA
## 2      NA      NA      NA      NA
## 3      NA      NA      NA      NA
## 4      NA      NA      NA      NA
## 5      NA      NA      NA      NA
## 6      0.261      NA      NA      NA
##   volume_1f volume_4f volume_al volume_cn volume_ot voucher_pct

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## 1      NA      NA      NA      NA      NA      NA
## 2      NA      NA      NA      NA      NA      NA
## 3      NA      NA      NA      NA      NA      NA
## 4      NA      NA      NA      NA      NA      NA
## 5      NA      NA      NA      NA      NA      NA
## 6      NA      NA      NA      NA      NA      NA
##           geometry
## 1 MULTIPOLYGON (((972081.8 19...
## 2 MULTIPOLYGON (((972081.8 19...
## 3 MULTIPOLYGON (((972081.8 19...
## 4 MULTIPOLYGON (((972081.8 19...
## 5 MULTIPOLYGON (((972081.8 19...
## 6 MULTIPOLYGON (((972081.8 19...

#Map of Communities
plot(st_geometry(mapdata$geometry))

```



```

#view(mapdata)

#Testing out mapping

#Organize pop_commute_carfree_pct by RegionID
#aggregate(pop_commute_carfree_pct ~ RegionID + Year , mapdata ,mean, na.rm = TRUE)

pop_commute_carfree_pct_data <- mapdata %>%
  select(pop_commute_carfree_pct, RegionID) %>%
  group_by(RegionID) %>%
  summarize(mean_pop_commute_carfree_pct = mean(pop_commute_carfree_pct, na.rm = TRUE))

pop_commute_carfree_pct_data$geometry = NULL
pop_commute_carfree_pct_data

## # A tibble: 55 x 2
##       RegionID mean_pop_commute_carfree_pct
## *     <dbl>                <dbl>
## 1        101            0.877
## 2        102            0.884
## 3        103            0.886
## 4        104            0.876
## 5        105            0.862

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##   6      106          0.816
##   7      107          0.890
##   8      108          0.863
##   9      109          0.892
##  10     110          0.830
## # ... with 45 more rows
mapdata <- merge(x = mapdata, y = pop_commute_carfree_pct_data, by = "RegionID", all = TRUE)
summary(pop_commute_carfree_pct_data)

##      RegionID    mean_pop_commute_carfree_pct
##  Min.   :101.0   Min.   :0.2619
##  1st Qu.:204.5   1st Qu.:0.5930
##  Median :308.0   Median :0.7443
##  Mean   :288.9   Mean   :0.6926
##  3rd Qu.:403.5   3rd Qu.:0.8208
##  Max.   :503.0   Max.   :0.8919

summary(mapdata)

##      RegionID        BoroCD       Shape_Leng       Shape_Area
##  Min.   :101.0   Min.   :101.0   Min.   : 29443   Min.   : 37689206
##  1st Qu.:202.0   1st Qu.:203.0   1st Qu.: 37018   1st Qu.: 53152839
##  Median :306.0   Median :306.0   Median : 52246   Median : 85497571
##  Mean   :279.6   Mean   :280.3   Mean   : 71910   Mean   :128536384
##  3rd Qu.:403.0   3rd Qu.:403.0   3rd Qu.: 82130   3rd Qu.:155482299
##  Max.   :503.0   Max.   :503.0   Max.   :277895   Max.   :599053419
##
##      Region Display Neighborhood      Region Type          Year
##  Mode:logical Length:1711           Length:1711 Length:1711
##  NA's:1711      Class :character Class :character Class :character
##                  Mode  :character  Mode  :character Mode  :character
##
##      adlt_incar_rt afford_le030_rct afford_le080_rct afford_le120_rct
##  Mode:logical   Min.   :0.0000   Min.   :0.0680   Min.   :0.1590
##  NA's:1711      1st Qu.:0.0290   1st Qu.:0.3365   1st Qu.:0.8030
##                  Median :0.0560   Median :0.5770   Median :0.9630
##                  Mean   :0.0767   Mean   :0.5418   Mean   :0.8347
##                  3rd Qu.:0.1010   3rd Qu.:0.7618   3rd Qu.:0.9880
##                  Max.   :0.3110   Max.   :0.9380   Max.   :1.0000
##  NA's   :1189      NA's   :1189      NA's   :1189      NA's   :1189
##
##      crime_all_rt crime_prop_rt crime_viol_rt gross_rent_0_1beds
##  Mode:logical   Mode:logical   Mode:logical   Min.   : 610
##  NA's:1711      NA's:1711      NA's:1711      1st Qu.:1060
##                  Median :1175      Median :1175
##                  Mean   :1279      Mean   :1279
##                  3rd Qu.:1320      3rd Qu.:1320
##                  Max.   :2690      Max.   :2690
##  NA's   :1121      NA's   :1121      NA's   :1121
##
##      gross_rent_2_3beds hh_alone_pct   hh_inc_med_adj   hh_inc_own_med_adj
##  Min.   : 730      Min.   :0.1360      Min.   : 17210      Min.   : 36640
##  1st Qu.:1220     1st Qu.:0.2520     1st Qu.: 42710     1st Qu.: 75365

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## Median :1430      Median :0.2975      Median : 55310      Median : 87035
## Mean   :1492      Mean   :0.3217      Mean   : 61005      Mean   : 96707
## 3rd Qu.:1650      3rd Qu.:0.3608      3rd Qu.: 73600      3rd Qu.:101830
## Max.   :2980      Max.   :0.6400      Max.   :150600      Max.   :231060
## NA's   :1121      NA's   :885       NA's   :826       NA's   :885
## hh_inc_rent_med_adj hh_u18_pct      hp_first_fhava_pct hp_first_hi_pct
## Min.   : 14380     Min.   :0.0730      Min.   :0.0000     Min.   :0.0000
## 1st Qu.: 34985     1st Qu.:0.2600     1st Qu.:0.0020     1st Qu.:0.0030
## Median : 43545     Median :0.3340      Median :0.0300     Median :0.0150
## Mean   : 49418     Mean   :0.3208      Mean   :0.1501     Mean   :0.0396
## 3rd Qu.: 55938     3rd Qu.:0.3990     3rd Qu.:0.2500     3rd Qu.:0.0445
## Max.   :140090     Max.   :0.5540      Max.   :0.9060     Max.   :0.4440
## NA's   :885       NA's   :826       NA's   :885       NA's   :944
## hp_first_orig    hp_first_orig_lmi_app_pct hp_first_orig_lmi_nbhd_pct
## Min.   : 22.0      Min.   :0.0000      Min.   :0.0000
## 1st Qu.: 269.0     1st Qu.:0.0360      1st Qu.:0.0400
## Median : 481.0     Median :0.0840      Median :0.2630
## Mean   : 598.9     Mean   :0.1163      Mean   :0.3731
## 3rd Qu.: 837.5     3rd Qu.:0.1400      3rd Qu.:0.6422
## Max.   :2814.0     Max.   :1.0000      Max.   :1.0000
## NA's   :885       NA's   :885       NA's   :885
## hp_first_orig_rt hpi_1f          hpi_4f          hpi_al          hpi_cn
## Min.   : 7.30      Mode:logical    Mode:logical    Mode:logical    Mode:logical
## 1st Qu.:16.40      NA's:1711       NA's:1711       NA's:1711       NA's:1711
## Median :20.80
## Mean   :24.70
## 3rd Qu.:28.98
## Max.   :95.60
## NA's   :885
## hpi_ot          income_diversity_ratio lp_all          lp_fam14condo_initial
## Mode:logical    Min.   : 2.80        Min.   : 1.0        Min.   : 0.0
## NA's:1711       1st Qu.: 4.70        1st Qu.: 51.0      1st Qu.: 27.0
## Median : 5.40        Median :105.0      Median : 60.0
## Mean   : 5.57        Mean   :202.2       Mean   :125.1
## 3rd Qu.: 6.30        3rd Qu.:260.0      3rd Qu.:161.0
## Max.   :10.30        Max.   :2098.0     Max.   :1662.0
## NA's   :885         NA's   :590       NA's   :590
## lp_fam14condo_rate lp_fam14condo_repeat med_r_1f      med_r_4f
## Min.   : 0.50      Min.   : 0.00      Mode:logical    Mode:logical
## 1st Qu.: 4.40      1st Qu.: 12.00     NA's:1711       NA's:1711
## Median :10.60      Median : 30.00
## Mean   :14.54      Mean   : 64.93
## 3rd Qu.:21.60      3rd Qu.: 75.00
## Max.   :59.40      Max.   :731.00
## NA's   :590        NA's   :590
## med_r_cn          med_r_ot          nb_permit_res_units pct_prof_elas
## Mode:logical    Mode:logical    Mode:logical      Mode:logical
## NA's:1711        NA's:1711       NA's:1711       NA's:1711
##
## 
## 
## 
## 
## pct_prof_math  pfn_fam14condo pfn_fam14condo_rate  pop_65p_pct

```

```

##  Mode:logical    Mode:logical    Mode:logical      Min.   :0.0490
##  NA's:1711       NA's:1711       NA's:1711      1st Qu.:0.0980
##                                         Median  :0.1180
##                                         Mean   :0.1251
##                                         3rd Qu.:0.1470
##                                         Max.   :0.2910
##                                         NA's   :826
##  pop_bornstate_pct pop_commute_carfree_pct pop_commute_time_avg
##  Min.   :0.2630   Min.   :0.2300   Min.   :23.40
##  1st Qu.:0.4150   1st Qu.:0.5962   1st Qu.:37.20
##  Median :0.4850   Median :0.7475   Median :41.50
##  Mean   :0.4879   Mean   :0.7012   Mean   :39.99
##  3rd Qu.:0.5450   3rd Qu.:0.8320   3rd Qu.:44.20
##  Max.   :0.8280   Max.   :0.9280   Max.   :63.30
##  NA's   :885     NA's   :833     NA's   :833
##  pop_disabled_pct pop_discon_youth_pct pop_edu_collp_pct pop_edu_nohts_pct
##  Min.   :0.0170   Min.   :0.0040   Min.   :0.0480   Min.   :0.0140
##  1st Qu.:0.0570   1st Qu.:0.0440   1st Qu.:0.2010   1st Qu.:0.1320
##  Median :0.0710   Median :0.0620   Median :0.2850   Median :0.1975
##  Mean   :0.0823   Mean   :0.0691   Mean   :0.3349   Mean   :0.2084
##  3rd Qu.:0.1000   3rd Qu.:0.0850   3rd Qu.:0.3990   3rd Qu.:0.2758
##  Max.   :0.2190   Max.   :0.2260   Max.   :0.8370   Max.   :0.4990
##  NA's   :1062    NA's   :1121    NA's   :826     NA's   :885
##  pop_foreign_pct   pop_num      pop_pov_65p_pct   pop_pov_pct
##  Min.   :0.1160   Min.   : 98174   Min.   :0.0250   Min.   :0.0220
##  1st Qu.:0.2530   1st Qu.:128079  1st Qu.:0.1270   1st Qu.:0.1190
##  Median :0.3510   Median :145155  Median :0.1810   Median :0.1810
##  Mean   :0.3578   Mean   :151509  Mean   :0.2069   Mean   :0.2044
##  3rd Qu.:0.4460   3rd Qu.:166492  3rd Qu.:0.2848   3rd Qu.:0.2780
##  Max.   :0.7040   Max.   :264586  Max.   :0.6140   Max.   :0.5220
##  NA's   :826     NA's   :826     NA's   :885     NA's   :826
##  pop_pov_u18_pct   pop_race_asian_pct   pop_race_black_pct   pop_race_div_idx
##  Min.   :0.0000   Min.   :0.0020   Min.   :0.0010   Min.   :0.1700
##  1st Qu.:0.1530   1st Qu.:0.0310   1st Qu.:0.0360   1st Qu.:0.4800
##  Median :0.2515   Median :0.0810   Median :0.1300   Median :0.5700
##  Mean   :0.2689   Mean   :0.1192   Mean   :0.2279   Mean   :0.5611
##  3rd Qu.:0.3840   3rd Qu.:0.1610   3rd Qu.:0.3220   3rd Qu.:0.6600
##  Max.   :0.6310   Max.   :0.5620   Max.   :0.9070   Max.   :0.8300
##  NA's   :885     NA's   :826     NA's   :826     NA's   :826
##  pop_race_hisp_pct   pop_race_white_pct   pop16_laborforce_pct   pop16_unemp_pct
##  Min.   :0.0480   Min.   :0.0040   Min.   :0.4590   Min.   :0.0210
##  1st Qu.:0.1280   1st Qu.:0.0950   1st Qu.:0.5860   1st Qu.:0.0595
##  Median :0.2070   Median :0.2880   Median :0.6270   Median :0.0820
##  Mean   :0.2918   Mean   :0.3347   Mean   :0.6292   Mean   :0.0896
##  3rd Qu.:0.4240   3rd Qu.:0.5800   3rd Qu.:0.6650   3rd Qu.:0.1128
##  Max.   :0.7430   Max.   :0.8910   Max.   :0.7790   Max.   :0.2363
##  NA's   :826     NA's   :826     NA's   :888     NA's   :829
##  population_density priv_evic_amt_sought_med_adj priv_evic_filing_rt
##  Min.   : 5.40   Min.   : 928     Min.   : 14.30
##  1st Qu.: 26.00  1st Qu.:3015    1st Qu.: 39.35
##  Median : 38.90  Median :3459    Median : 81.30
##  Mean   : 43.04  Mean   :3645    Mean   :102.52
##  3rd Qu.: 54.60  3rd Qu.:4049    3rd Qu.:156.25
##  Max.   :117.80  Max.   :7049    Max.   :267.10

```

```

##  NA's   :944      NA's   :1241      NA's   :1239
## priv_evic_filings prox_park_pct prox_subway_pct rburden_mod_ami_81_120
## Min.   : 312      Mode:logical  Mode:logical  Min.   :0.0000
## 1st Qu.: 1495     NA's:1711     NA's:1711     1st Qu.:0.0950
## Median : 2426    NA's:1711     NA's:1711     Median :0.1570
## Mean   : 3541    NA's:1711     NA's:1711     Mean   :0.1893
## 3rd Qu.: 4861    NA's:1711     NA's:1711     3rd Qu.:0.2640
## Max.   :11621    NA's:1711     NA's:1711     Max.   :0.5570
## NA's   :1239    NA's:1711     NA's:1711     NA's   :1121
## rburden_mod_ami_le80 rburden_sev_ami_81_120 rburden_sev_ami_le80
## Min.   :0.1690    Min.   :0.0000    Min.   :0.2800
## 1st Qu.:0.2750    1st Qu.:0.0000    1st Qu.:0.4220
## Median :0.3025    Median :0.0060    Median :0.4610
## Mean   :0.2997    Mean   :0.0353    Mean   :0.4639
## 3rd Qu.:0.3230    3rd Qu.:0.0260    3rd Qu.:0.4950
## Max.   :0.4140    Max.   :0.3160    Max.   :0.6610
## NA's   :1121    NA's:1711     NA's:1711     NA's   :1121
## refi_hi_pct      refi_orig     refi_orig_rt   rent.asking.med
## Min.   :0.0000    Min.   : 9.0     Min.   : 2.90  Mode:logical
## 1st Qu.:0.0040    1st Qu.:175.2   1st Qu.:10.00  NA's:1711
## Median :0.0190    Median :329.5   Median :15.70
## Mean   :0.0457    Mean   :509.3   Mean   :20.89
## 3rd Qu.:0.0565    3rd Qu.:630.5   3rd Qu.:23.20
## Max.   :0.4030    Max.   :4799.0  Max.   :120.40
## NA's   :944      NA's:885     NA's:885
## rent_burden_med  rent_burden_mod_pct rent_burden_sev_pct rent_gross_med_adj
## Min.   :0.2070    Min.   :0.1110    Min.   :0.1650    Min.   : 580
## 1st Qu.:0.2860    1st Qu.:0.2180    1st Qu.:0.2450    1st Qu.:1120
## Median :0.3190    Median :0.2405    Median :0.2970    Median :1290
## Mean   :0.3172    Mean   :0.2403    Mean   :0.2889    Mean   :1367
## 3rd Qu.:0.3460    3rd Qu.:0.2630    3rd Qu.:0.3280    3rd Qu.:1490
## Max.   :0.5000    Max.   :0.3450    Max.   :0.4560    Max.   :2830
## NA's   :826      NA's:885     NA's:1062    NA's   :826
## rent_gross_recent_med_adj rent_pct_nycha      reo          serious_viol_rate
## Min.   : 930       Min.   :0.0000  Mode:logical  Mode:logical
## 1st Qu.:1330       1st Qu.:0.0005  NA's:1711     NA's:1711
## Median :1520       Median :0.0540
## Mean   :1651       Mean   :0.0749
## 3rd Qu.:1760       3rd Qu.:0.1210
## Max.   :3040       Max.   :0.3370
## NA's   :1121       NA's   :1652
## shd_420c_props  shd_420c_units shd_421a_props shd_421a_units shd_all_sub_props
## Mode:logical    Mode:logical  Mode:logical  Mode:logical  Mode:logical
## NA's:1711       NA's:1711     NA's:1711     NA's:1711     NA's:1711
##
##
##
##
##
## shd_all_sub_units shd_ex_2020_2025_props shd_ex_2020_2025_units
## Mode:logical    Mode:logical  Mode:logical
## NA's:1711       NA's:1711     NA's:1711
##
##

```

```

##
##
##
##  shd_ex_2026_2035_props shd_ex_2026_2035_units shd_ex_2036_later_props
##  Mode:logical           Mode:logical           Mode:logical
##  NA's:1711              NA's:1711              NA's:1711
##
##
##
##
##  shd_ex_2036_later_units shd_hud_finins_props shd_hud_finins_units
##  Mode:logical           Mode:logical           Mode:logical
##  NA's:1711              NA's:1711              NA's:1711
##
##
##
##
##  shd_hud_pbrap_props shd_hud_pbrap_units shd_lihtc_props shd_lihtc_units
##  Mode:logical           Mode:logical           Mode:logical   Mode:logical
##  NA's:1711              NA's:1711              NA's:1711      NA's:1711
##
##
##
##
##  shd_ml_props    shd_ml_units    shd_nyc_prog_props shd_ph_props    shd_ph_units
##  Mode:logical     Mode:logical     Mode:logical     Mode:logical     Mode:logical
##  NA's:1711        NA's:1711       NA's:1711        NA's:1711       NA's:1711
##
##
##
##
##  total_viol_rate    unit_num      unit_occ_own_pct unit_occ_rent_sevcrowd_pct
##  Mode:logical      Min. : 39682   Min. :0.0280     Min. :0.0040
##  NA's:1711         1st Qu.: 49316  1st Qu.:0.1690   1st Qu.:0.0270
##                      Median : 56184  Median :0.2930   Median :0.0360
##                      Mean   : 62603  Mean   :0.3105   Mean   :0.0409
##                      3rd Qu.: 68121  3rd Qu.:0.4150   3rd Qu.:0.0510
##                      Max.   :148515  Max.   :0.8570   Max.   :0.1260
##                      NA's   :885    NA's   :826     NA's   :1121
##  unit_vac_rent_pct units_cert    volume_1f      volume_4f      volume_al
##  Min.   :0.0120     Mode:logical   Mode:logical   Mode:logical   Mode:logical
##  1st Qu.:0.0270    NA's:1711     NA's:1711     NA's:1711     NA's:1711
##  Median :0.0350
##  Mean   :0.0371
##  3rd Qu.:0.0460
##  Max.   :0.0990
##  NA's   :1121
##  volume_cn      volume_ot      voucher_pct   mean_pop_commute_carfree_pct
##  Mode:logical   Mode:logical   Min.   :0.0000   Min.   :0.2619
##  NA's:1711      NA's:1711     1st Qu.:0.0190  1st Qu.:0.5973

```

```

##                               Median : 0.0465   Median : 0.7606
##                               Mean  : 0.0667   Mean  : 0.7020
##                               3rd Qu.: 0.1080  3rd Qu.: 0.8288
##                               Max.  : 0.2210  Max.  : 0.8919
##                               NA's   : 1121

##           geometry
##  MULTIPOLYGON :1711
##  epsg:2263     :  0
##  +proj=lcc ...:  0
##
##
##
##
```

`view(mapdata)`

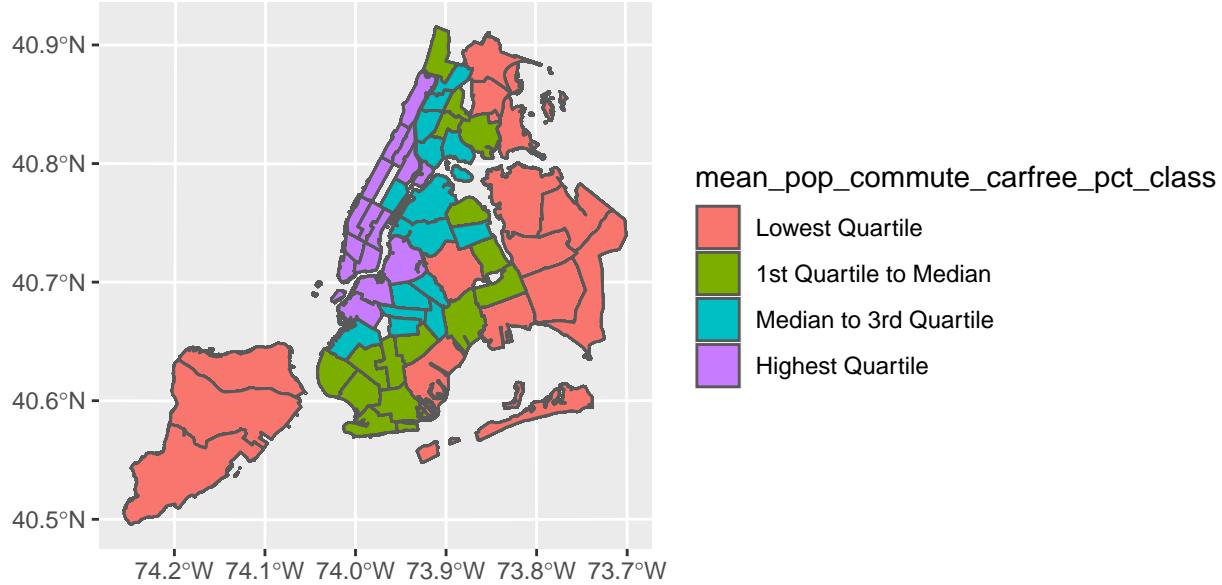
#Setting classes

```

mapdata$mean_pop_commute_carfree_pct_class <- cut(mapdata$mean_pop_commute_carfree_pct, breaks = c(.0, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1.0))

ggplot() +
  geom_sf(aes(fill=mean_pop_commute_carfree_pct_class), data=mapdata)

```



```
#choroLayer(x=mapdata$geometry & mapdata$Year==2010, var="pop_commute_carfree_pct")
```

#By Race

```

pop_race_black_pct_data <- mapdata %>%
  select(pop_race_black_pct, RegionID) %>%
  group_by(RegionID) %>%
  summarize(mean_pop_race_black_pct = mean(pop_race_black_pct, na.rm = TRUE))

```

```

pop_race_black_pct_data$geometry = NULL
pop_race_black_pct_data

```

```

## # A tibble: 55 x 2
##       RegionID mean_pop_race_black_pct
## *      <dbl>                  <dbl>
## 1        101          0.0227

```

```

## 2      102          0.0755
## 3      103          0.0558
## 4      104          0.0324
## 5      105          0.0635
## 6      106          0.0279
## 7      107          0.236
## 8      108          0.613
## 9      109          0.304
## 10     110          0.0816
## # ... with 45 more rows

```

```

mapdata <- merge(x = mapdata, y = pop_race_black_pct_data, by = "RegionID", all = TRUE)
summary(pop_race_black_pct_data) #Shows that 3rd quartile up is where most black neighborhoods are

```

```

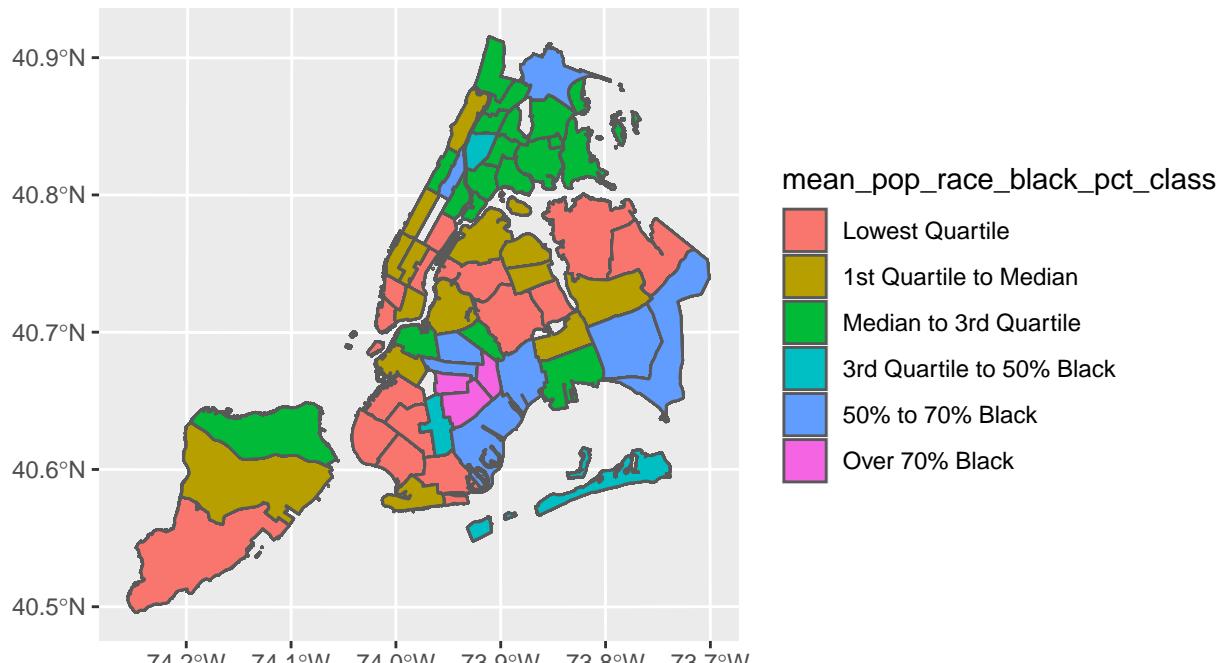
##      RegionID    mean_pop_race_black_pct
##  Min.   :101.0   Min.   :0.008267
##  1st Qu.:204.5  1st Qu.:0.035600
##  Median :308.0  Median :0.128733
##  Mean   :288.9  Mean   :0.232330
##  3rd Qu.:403.5  3rd Qu.:0.316633
##  Max.   :503.0  Max.   :0.884200

```

#Setting classes

```
mapdata$mean_pop_race_black_pct_class <- cut(mapdata$mean_pop_race_black_pct, breaks = c(0,0.035600 ,0.
```

```
ggplot() +
  geom_sf(aes(fill=mean_pop_race_black_pct_class), data=mapdata)
```



```
#ggplot() +
#geom_sf(aes(fill=mean_pop_commute_carfree_pct), data=mapdata) +
#scale_fill_gradient()
```

#Make data only show individual years not ranges of years

```

mapdata<-arrange(mapdata, RegionID, BoroCD, Year)

mapdatayr <- filter(mapdata, mapdata$Year == "2000" | Year == "2001" | Year == "2002" | Year == "2003"

#Make data only show individual years not ranges of years
mapdatarange <- filter(mapdata, mapdata$Year == "2005-2009" | Year == "2006-2010" | Year == "2007-2011"
view(mapdata)

#Use single-year data set (Does not include values shown by range of dates)
#mapdata
#Add Gentrification Index
mapdatayr <- mapdatayr %>%
  dplyr::mutate(Percentage_Change_black = case_when(mapdatayr$Year>2000 ~pop_race_black_pct/lag(pop_
view(mapdatayr$Percentage_Change_black)
view(mapdatayr)

Gentrification_Black <- mapdatayr$Percentage_Change_black

#Regression Analysis (Year only)
Gentrificationyr <- lm(Gentrification_Black ~ Year + pop_commute_carfree_pct + hh_inc_own_med_adj + hh_
summary(Gentrificationyr)

## 
## Call:
## lm(formula = Gentrification_Black ~ Year + pop_commute_carfree_pct +
##     hh_inc_own_med_adj + hh_inc_rent_med_adj + pop_race_asian_pct +
##     pop_race_white_pct + pop_race_hisp_pct + pop_race_div_idx +
##     pop_commute_time_avg + population_density + voucher_pct +
##     unit_occ_own_pct + priv_evic_amt_sought_med_adj + lp_fam14condo_rate +
##     rent_gross_med_adj + hh_u18_pct + hp_first_hi_pct + income_diversity_ratio +
##     hp_first_orig_lmi_nbhd_pct + lp_fam14condo_rate + pop_pov_65p_pct +
##     pop_disabled_pct + pop_edu_collp_pct + pop_foreign_pct +
##     priv_evic_filing_rt + priv_evic_amt_sought_med_adj + refi_orig_rt,
##     data = mapdatayr)
## 
## Residuals:
##      Min        1Q    Median        3Q       Max
## -155.47   -19.92    -1.88    12.83  1210.67
## 
## Coefficients:
## (Intercept)          Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -105.1016955 104.7487535 -1.003 0.3162    
## Year2011           28.3305989 13.2380989  2.140 0.0329 *  
## Year2012            4.7905338 13.5753581  0.353 0.7243    
## Year2013            4.1088689 12.9433910  0.317 0.7511    
## Year2014            3.4029587 17.6854500  0.192 0.8475    
## Year2015            0.7811561 15.2681528  0.051 0.9592    
## Year2016           -8.2392116 15.7686437 -0.523 0.6016    
## Year2017            0.5792455 17.2686647  0.034 0.9733    
## pop_commute_carfree_pct 69.5773662 77.4733687  0.898 0.3696    
## hh_inc_own_med_adj  0.0001028 0.0002630  0.391 0.6960    
## hh_inc_rent_med_adj 0.0010570 0.0007540  1.402 0.1617

```

```

## pop_race_asian_pct          107.7061161   57.3946542   1.877   0.0612 .
## pop_race_white_pct         56.1972831   37.7980355   1.487   0.1378
## pop_race_hisp_pct        -16.0338824   29.5597392  -0.542   0.5878
## pop_race_div_idx           -1.7831209   39.2411492  -0.045   0.9638
## pop_commute_time_avg       2.1172503    1.3156098   1.609   0.1083
## population_density          0.1894810    0.2159415   0.877   0.3807
## voucher_pct                 166.6787206   148.7078020   1.121   0.2630
## unit_occ_own_pct            24.7263850   73.5778500   0.336   0.7370
## priv_evic_amt_sought_med_adj -0.0069982   0.0072856  -0.961   0.3373
## lp_fam14condo_rate          -0.0509913   0.5683660  -0.090   0.9286
## rent_gross_med_adj          -0.0080195   0.0381049  -0.210   0.8334
## hh_u18_pct                  -109.0148981   91.8225864  -1.187   0.2358
## hp_first_hi_pct              5.1658246    78.9201852   0.065   0.9478
## income_diversity_ratio      2.5643474    4.5657961   0.562   0.5746
## hp_first_orig_lmi_nbhd_pct -3.3214301    29.1052055  -0.114   0.9092
## pop_pov_65p_pct              -14.8713159   75.3118998  -0.197   0.8436
## pop_disabled_pct             -80.8334732   185.0900039  -0.437   0.6625
## pop_edu_collp_pct            -188.3194037   96.9876039  -1.942   0.0528 .
## pop_foreign_pct                -20.3410550   54.9947313  -0.370   0.7117
## priv_evic_filing_rt          -0.0230252   0.1311888  -0.176   0.8608
## refi_orig_rt                  0.0479862    0.6728535   0.071   0.9432
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 67.11 on 437 degrees of freedom
##   (652 observations deleted due to missingness)
## Multiple R-squared:  0.06007,   Adjusted R-squared:  -0.006604
## F-statistic: 0.9009 on 31 and 437 DF,  p-value: 0.6232

#Join dataframes together
Gentrificationrange <- lm(afford_le030_rct ~ gross_rent_0_1beds + gross_rent_2_3beds + pop_discon_youth

summary(Gentrificationrange)

##
## Call:
## lm(formula = afford_le030_rct ~ gross_rent_0_1beds + gross_rent_2_3beds +
##     pop_discon_youth_pct + rburden_mod_ami_81_120 + rburden_mod_ami_le80 +
##     unit_vac_rent_pct + unit_occ_rent_sevcrowd_pct + rent_burden_sev_pct +
##     rent_gross_recent_med_adj, data = mapdatarange)
##
## Residuals:
##      Min      1Q      Median      3Q      Max 
## -0.08989 -0.02406 -0.00171  0.02025  0.12998 
##
## Coefficients:
##                               Estimate Std. Error t value
## (Intercept)               0.439539459  0.039495243 11.129
## gross_rent_0_1beds        -0.000065684  0.000020591 -3.190
## gross_rent_2_3beds        -0.000026291  0.000012014 -2.188
## pop_discon_youth_pct      0.588270541  0.062444042  9.421
## rburden_mod_ami_81_120    -0.117352945  0.027761112 -4.227
## rburden_mod_ami_le80      -0.698680647  0.062867155 -11.114
## unit_vac_rent_pct          0.153908345  0.147110525  1.046
## unit_occ_rent_sevcrowd_pct -0.107737317  0.112454367 -0.958

```

```

## rent_burden_sev_pct      -0.215563619  0.056292268  -3.829
## rent_gross_recent_med_adj 0.000007036  0.000013127   0.536
##
## (Intercept) < 0.0000000000000002 ***
## gross_rent_0_1beds          0.001511 **
## gross_rent_2_3beds          0.029094 *
## pop_discon_youth_pct       < 0.0000000000000002 ***
## rburden_mod_ami_81_120        0.000028 ***
## rburden_mod_ami_le80        < 0.0000000000000002 ***
## unit_vac_rent_pct           0.295958
## unit_occ_rent_sevcrowd_pct  0.338488
## rent_burden_sev_pct         0.000144 ***
## rent_gross_recent_med_adj    0.592203
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0384 on 512 degrees of freedom
##   (68 observations deleted due to missingness)
## Multiple R-squared:  0.6759, Adjusted R-squared:  0.6702
## F-statistic: 118.6 on 9 and 512 DF,  p-value: < 0.0000000000000022

library(readxl)
PublicData <- read_excel("Downloads/Public - Neighborhood Profiles 2018.xlsx")

## New names:
## * `` -> `...77`

summary(PublicData$`% Change Black`)

##      Length     Class      Mode
##       62 character character

summary(PublicData$`% Change Bachelor's Degree or Higher`)

##      Length     Class      Mode
##       62 character character

PublicData$`% Change Black`<-as.numeric(PublicData$`% Change Black`)

## Warning: NAs introduced by coercion
PublicData$`% Change Bachelor's Degree or Higher`<-as.numeric(PublicData$`% Change Bachelor's Degree or Higher`)

## Warning: NAs introduced by coercion
PublicData$`2016 Median Household Income`<-as.numeric(PublicData$`2016 Median Household Income`)

## Warning: NAs introduced by coercion
PublicData$`% Change Individual Income $75,001+`<-as.numeric(PublicData$`% Change Individual Income $75,001+`)

## Warning: NAs introduced by coercion
PublicData$`% Change Individual Income $50,001 - $75,000`<-as.numeric(PublicData$`% Change Individual Income $50,001 - $75,000`)

## Warning: NAs introduced by coercion
PublicData$`% Change Individual Income $25,000 or less`<-as.numeric(PublicData$`% Change Individual Income $25,000 or less`)

## Warning: NAs introduced by coercion

```

```

PublicData$`% Change Individual Income $25,001 - $50,000`<-as.numeric(PublicData$`% Change Individual Income $25,001 - $50,000`)

## Warning: NAs introduced by coercion
PublicData$`% Change Individual Income $50,001 - $75,000`<-as.numeric(PublicData$`% Change Individual Income $50,001 - $75,000`)
PublicData$`% Change Commute via Public Transit`<-as.numeric(PublicData$`% Change Commute via Public Transit`)

## Warning: NAs introduced by coercion
PublicData$`% Change Commute via Private Car or Taxi`<-as.numeric(PublicData$`% Change Commute via Private Car or Taxi`)

## Warning: NAs introduced by coercion
PublicData$`% Change Commute Time`<-as.numeric(PublicData$`% Change Commute Time`)

## Warning: NAs introduced by coercion
PublicData$`% Change Commute via Walk or Bike`<-as.numeric(PublicData$`% Change Commute via Walk or Bike`)

## Warning: NAs introduced by coercion
PublicData$`% Change Unemployed`<-as.numeric(PublicData$`% Change Unemployed`)

## Warning: NAs introduced by coercion
PublicData$`% Change Tax lots devoted to Mixed-Use Residential/Commercial`<-as.numeric(PublicData$`% Change Tax lots devoted to Mixed-Use Residential/Commercial`)

## Warning: NAs introduced by coercion
PublicData$`% Change Number of Businesses`<-as.numeric(PublicData$`% Change Number of Businesses`)

## Warning: NAs introduced by coercion
PublicData$`% Change Performing Arts Companies`<-as.numeric(PublicData$`% Change Performing Arts Companies`)

## Warning: NAs introduced by coercion
PublicData$`% Change Food Services and Drinking Places`<-as.numeric(PublicData$`% Change Food Services and Drinking Places`)

## Warning: NAs introduced by coercion
PublicData$`% Change Supermarkets`<-as.numeric(PublicData$`% Change Supermarkets`)

## Warning: NAs introduced by coercion
PublicData$`% Change Work at Home`<-as.numeric(PublicData$`% Change Work at Home`)

## Warning: NAs introduced by coercion
Public_Gentrification_Black <- lm(PublicData$`% Change Black` ~ `% Change Bachelor's Degree or Higher` +
summary(Public_Gentrification_Black)

## Call:
## lm(formula = PublicData$`% Change Black` ~ `% Change Bachelor's Degree or Higher` +
##     `% Change Individual Income $75,001+` + `% Change Individual Income $50,001 - $75,000` +
##     `% Change Individual Income $25,000 or less` + `% Change Individual Income $25,001 - $50,000` +
##     `% Change Individual Income $50,001 - $75,000` + `% Change Commute via Public Transit` +
##     `% Change Commute via Private Car or Taxi` + `% Change Commute Time` +
##     `% Change Commute via Walk or Bike` + `% Change Unemployed` +
##     `% Change Tax lots devoted to Mixed-Use Residential/Commercial` +
##     `% Change Number of Businesses` + `% Change Performing Arts Companies` +

```

```

## `~% Change Food Services and Drinking Places` + `~% Change Supermarkets` +
## `~% Change Work at Home`, data = PublicData)
##
## Residuals:
##      Min     1Q   Median     3Q    Max
## -0.39037 -0.05461 -0.00209  0.04255  0.44703
##
## Coefficients:
##                               Estimate
## (Intercept)                -0.250513
## `~% Change Bachelor's Degree or Higher`          0.492201
## `~% Change Individual Income $75,001+`        -0.271444
## `~% Change Individual Income $50,001 - $75,000`  0.359188
## `~% Change Individual Income $25,000 or less`   0.165981
## `~% Change Individual Income $25,001 - $50,000` -1.207722
## `~% Change Commute via Public Transit`           0.310232
## `~% Change Commute via Private Car or Taxi`      0.245850
## `~% Change Commute Time`                         2.168717
## `~% Change Commute via Walk or Bike`             0.208509
## `~% Change Unemployed`                          0.042551
## `~% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.333427
## `~% Change Number of Businesses`                 0.343632
## `~% Change Performing Arts Companies`            -0.003874
## `~% Change Food Services and Drinking Places`    -0.198046
## `~% Change Supermarkets`                        -0.038200
## `~% Change Work at Home`                       -0.034661
##
## Std. Error
## (Intercept)                      0.100527
## `~% Change Bachelor's Degree or Higher` 0.294868
## `~% Change Individual Income $75,001+` 0.289651
## `~% Change Individual Income $50,001 - $75,000` 0.394255
## `~% Change Individual Income $25,000 or less` 0.536287
## `~% Change Individual Income $25,001 - $50,000` 0.497192
## `~% Change Commute via Public Transit`       0.612931
## `~% Change Commute via Private Car or Taxi` 0.331947
## `~% Change Commute Time`                  0.879387
## `~% Change Commute via Walk or Bike`       0.164402
## `~% Change Unemployed`                  0.097159
## `~% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.333611
## `~% Change Number of Businesses`         0.559508
## `~% Change Performing Arts Companies`    0.022749
## `~% Change Food Services and Drinking Places` 0.364330
## `~% Change Supermarkets`                0.078745
## `~% Change Work at Home`                0.093859
##
## t value
## (Intercept)                   -2.492
## `~% Change Bachelor's Degree or Higher` 1.669
## `~% Change Individual Income $75,001+` -0.937
## `~% Change Individual Income $50,001 - $75,000` 0.911
## `~% Change Individual Income $25,000 or less` 0.310
## `~% Change Individual Income $25,001 - $50,000` -2.429
## `~% Change Commute via Public Transit`    0.506
## `~% Change Commute via Private Car or Taxi` 0.741
## `~% Change Commute Time`               2.466

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## `% Change Commute via Walk or Bike`           1.268
## `% Change Unemployed`                      0.438
## `% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.999
## `% Change Number of Businesses`            0.614
## `% Change Performing Arts Companies`       -0.170
## `% Change Food Services and Drinking Places` -0.544
## `% Change Supermarkets`                  -0.485
## `% Change Work at Home`                  -0.369
## Pr(>|t|)
## (Intercept)                                0.0177 *
## `% Change Bachelor's Degree or Higher`      0.1043
## `% Change Individual Income $75,001+`        0.3553
## `% Change Individual Income $50,001 - $75,000` 0.3687
## `% Change Individual Income $25,000 or less` 0.7588
## `% Change Individual Income $25,001 - $50,000` 0.0206 *
## `% Change Commute via Public Transit`       0.6160
## `% Change Commute via Private Car or Taxi`   0.4640
## `% Change Commute Time`                     0.0189 *
## `% Change Commute via Walk or Bike`          0.2133
## `% Change Unemployed`                      0.6642
## `% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.3246
## `% Change Number of Businesses`            0.5432
## `% Change Performing Arts Companies`       0.8658
## `% Change Food Services and Drinking Places` 0.5903
## `% Change Supermarkets`                  0.6307
## `% Change Work at Home`                  0.7142
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1545 on 34 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.4331, Adjusted R-squared:  0.1663
## F-statistic: 1.623 on 16 and 34 DF,  p-value: 0.1154
Public_Gentrification_Asian <- lm(PublicData$`% Change Asian` ~ `% Change Bachelor's Degree or Higher` +
summary(Public_Gentrification_Asian)

##
## Call:
## lm(formula = PublicData$`% Change Asian` ~ `% Change Bachelor's Degree or Higher` +
##     `% Change Individual Income $75,001+` + `% Change Individual Income $50,001 - $75,000` +
##     `% Change Individual Income $25,000 or less` + `% Change Individual Income $25,001 - $50,000` +
##     `% Change Individual Income $50,001 - $75,000` + `% Change Commute via Public Transit` +
##     `% Change Commute via Private Car or Taxi` + `% Change Commute Time` +
##     `% Change Commute via Walk or Bike` + `% Change Unemployed` +
##     `% Change Tax lots devoted to Mixed-Use Residential/Commercial` +
##     `% Change Number of Businesses` + `% Change Performing Arts Companies` +
##     `% Change Food Services and Drinking Places` + `% Change Supermarkets` +
##     `% Change Work at Home`, data = PublicData)
##
## Residuals:
##      Min      1Q Median      3Q      Max
## -0.78293 -0.15218 -0.02488  0.15601  1.61885
##
## Coefficients:

```

	Estimate
## (Intercept)	0.13278
## ^% Change Bachelor's Degree or Higher`	0.52151
## ^% Change Individual Income \$75,001+`	0.16381
## ^% Change Individual Income \$50,001 - \$75,000`	0.76659
## ^% Change Individual Income \$25,000 or less`	1.55065
## ^% Change Individual Income \$25,001 - \$50,000`	1.49376
## ^% Change Commute via Public Transit`	-2.05248
## ^% Change Commute via Private Car or Taxi`	0.12928
## ^% Change Commute Time`	0.19818
## ^% Change Commute via Walk or Bike`	-0.68453
## ^% Change Unemployed`	0.48537
## ^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	1.30964
## ^% Change Number of Businesses`	-2.46426
## ^% Change Performing Arts Companies`	0.02876
## ^% Change Food Services and Drinking Places`	1.45398
## ^% Change Supermarkets`	0.16986
## ^% Change Work at Home`	-0.13737
##	Std. Error
## (Intercept)	0.25340
## ^% Change Bachelor's Degree or Higher`	0.74329
## ^% Change Individual Income \$75,001+`	0.73014
## ^% Change Individual Income \$50,001 - \$75,000`	0.99382
## ^% Change Individual Income \$25,000 or less`	1.35185
## ^% Change Individual Income \$25,001 - \$50,000`	1.25330
## ^% Change Commute via Public Transit`	1.54505
## ^% Change Commute via Private Car or Taxi`	0.83676
## ^% Change Commute Time`	2.21672
## ^% Change Commute via Walk or Bike`	0.41442
## ^% Change Unemployed`	0.24491
## ^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	0.84095
## ^% Change Number of Businesses`	1.41038
## ^% Change Performing Arts Companies`	0.05735
## ^% Change Food Services and Drinking Places`	0.91839
## ^% Change Supermarkets`	0.19850
## ^% Change Work at Home`	0.23660
##	t value
## (Intercept)	0.524
## ^% Change Bachelor's Degree or Higher`	0.702
## ^% Change Individual Income \$75,001+`	0.224
## ^% Change Individual Income \$50,001 - \$75,000`	0.771
## ^% Change Individual Income \$25,000 or less`	1.147
## ^% Change Individual Income \$25,001 - \$50,000`	1.192
## ^% Change Commute via Public Transit`	-1.328
## ^% Change Commute via Private Car or Taxi`	0.154
## ^% Change Commute Time`	0.089
## ^% Change Commute via Walk or Bike`	-1.652
## ^% Change Unemployed`	1.982
## ^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	1.557
## ^% Change Number of Businesses`	-1.747
## ^% Change Performing Arts Companies`	0.501
## ^% Change Food Services and Drinking Places`	1.583
## ^% Change Supermarkets`	0.856
## ^% Change Work at Home`	-0.581

```

##                                     Pr(>|t|)

## (Intercept)                      0.6037
## `% Change Bachelor's Degree or Higher`      0.4877
## `% Change Individual Income $75,001+`        0.8238
## `% Change Individual Income $50,001 - $75,000` 0.4458
## `% Change Individual Income $25,000 or less`   0.2594
## `% Change Individual Income $25,001 - $50,000` 0.2416
## `% Change Commute via Public Transit`       0.1929
## `% Change Commute via Private Car or Taxi`    0.8781
## `% Change Commute Time`                  0.9293
## `% Change Commute via Walk or Bike`       0.1078
## `% Change Unemployed`                   0.0556 .
## `% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.1287
## `% Change Number of Businesses`          0.0896 .
## `% Change Performing Arts Companies`     0.6193
## `% Change Food Services and Drinking Places` 0.1226
## `% Change Supermarkets`                 0.3981
## `% Change Work at Home`                0.5653
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3894 on 34 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.4247, Adjusted R-squared:  0.154
## F-statistic: 1.569 on 16 and 34 DF,  p-value: 0.1323
Public_Gentrification_Hispanic <- lm(PublicData$`% Change Hispanic` ~ `% Change Bachelor's Degree or Hi
summary(Public_Gentrification_Hispanic)

## 
## Call:
## lm(formula = PublicData$`% Change Hispanic` ~ `% Change Bachelor's Degree or Higher` +
##     `% Change Individual Income $75,001+` + `% Change Individual Income $50,001 - $75,000` +
##     `% Change Individual Income $25,000 or less` + `% Change Individual Income $25,001 - $50,000` +
##     `% Change Individual Income $50,001 - $75,000` + `% Change Commute via Public Transit` +
##     `% Change Commute via Private Car or Taxi` + `% Change Commute Time` +
##     `% Change Commute via Walk or Bike` + `% Change Unemployed` +
##     `% Change Tax lots devoted to Mixed-Use Residential/Commercial` +
##     `% Change Number of Businesses` + `% Change Performing Arts Companies` +
##     `% Change Food Services and Drinking Places` + `% Change Supermarkets` +
##     `% Change Work at Home`, data = PublicData)
##
## Residuals:
##      Min      1Q      Median      3Q      Max
## -0.13436 -0.05931 -0.01607  0.04345  0.19789
##
## Coefficients:
##                                     Estimate
## (Intercept)                      0.072856
## `% Change Bachelor's Degree or Higher`      0.051334
## `% Change Individual Income $75,001+`        0.125890
## `% Change Individual Income $50,001 - $75,000` 0.280171
## `% Change Individual Income $25,000 or less`   0.667631
## `% Change Individual Income $25,001 - $50,000` 0.018208
## `% Change Commute via Public Transit`       -0.409902

```

## `^% Change Commute via Private Car or Taxi`	-0.139304
## `^% Change Commute Time`	1.051798
## `^% Change Commute via Walk or Bike`	0.099796
## `^% Change Unemployed`	-0.061037
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	-0.179402
## `^% Change Number of Businesses`	0.102109
## `^% Change Performing Arts Companies`	0.009069
## `^% Change Food Services and Drinking Places`	-0.328938
## `^% Change Supermarkets`	0.023055
## `^% Change Work at Home`	0.013879
##	Std. Error
## (Intercept)	0.067141
## `^% Change Bachelor's Degree or Higher`	0.196939
## `^% Change Individual Income \$75,001+`	0.193455
## `^% Change Individual Income \$50,001 - \$75,000`	0.263319
## `^% Change Individual Income \$25,000 or less`	0.358181
## `^% Change Individual Income \$25,001 - \$50,000`	0.332070
## `^% Change Commute via Public Transit`	0.409370
## `^% Change Commute via Private Car or Taxi`	0.221704
## `^% Change Commute Time`	0.587334
## `^% Change Commute via Walk or Bike`	0.109802
## `^% Change Unemployed`	0.064892
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	0.222816
## `^% Change Number of Businesses`	0.373689
## `^% Change Performing Arts Companies`	0.015194
## `^% Change Food Services and Drinking Places`	0.243332
## `^% Change Supermarkets`	0.052593
## `^% Change Work at Home`	0.062687
##	t value
## (Intercept)	1.085
## `^% Change Bachelor's Degree or Higher`	0.261
## `^% Change Individual Income \$75,001+`	0.651
## `^% Change Individual Income \$50,001 - \$75,000`	1.064
## `^% Change Individual Income \$25,000 or less`	1.864
## `^% Change Individual Income \$25,001 - \$50,000`	0.055
## `^% Change Commute via Public Transit`	-1.001
## `^% Change Commute via Private Car or Taxi`	-0.628
## `^% Change Commute Time`	1.791
## `^% Change Commute via Walk or Bike`	0.909
## `^% Change Unemployed`	-0.941
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	-0.805
## `^% Change Number of Businesses`	0.273
## `^% Change Performing Arts Companies`	0.597
## `^% Change Food Services and Drinking Places`	-1.352
## `^% Change Supermarkets`	0.438
## `^% Change Work at Home`	0.221
##	Pr(> t)
## (Intercept)	0.2855
## `^% Change Bachelor's Degree or Higher`	0.7959
## `^% Change Individual Income \$75,001+`	0.5196
## `^% Change Individual Income \$50,001 - \$75,000`	0.2948
## `^% Change Individual Income \$25,000 or less`	0.0710 .
## `^% Change Individual Income \$25,001 - \$50,000`	0.9566
## `^% Change Commute via Public Transit`	0.3238

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## `% Change Commute via Private Car or Taxi`          0.5340
## `% Change Commute Time`                           0.0822 .
## `% Change Commute via Walk or Bike`              0.3698
## `% Change Unemployed`                           0.3535
## `% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.4263
## `% Change Number of Businesses`                  0.7863
## `% Change Performing Arts Companies`            0.5546
## `% Change Food Services and Drinking Places`    0.1854
## `% Change Supermarkets`                         0.6639
## `% Change Work at Home`                        0.8261
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1032 on 34 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.3365, Adjusted R-squared:  0.02433
## F-statistic: 1.078 on 16 and 34 DF,  p-value: 0.4107
Public_Gentrification_White <- lm(PublicData$`% Change White` ~ `% Change Bachelor's Degree or Higher` +
summary(Public_Gentrification_White)

##
## Call:
## lm(formula = PublicData$`% Change White` ~ `% Change Bachelor's Degree or Higher` +
##     `% Change Individual Income $75,001+` + `% Change Individual Income $50,001 - $75,000` +
##     `% Change Individual Income $25,000 or less` + `% Change Individual Income $25,001 - $50,000` +
##     `% Change Individual Income $50,001 - $75,000` + `% Change Commute via Public Transit` +
##     `% Change Commute via Private Car or Taxi` + `% Change Commute Time` +
##     `% Change Commute via Walk or Bike` + `% Change Unemployed` +
##     `% Change Tax lots devoted to Mixed-Use Residential/Commercial` +
##     `% Change Number of Businesses` + `% Change Performing Arts Companies` +
##     `% Change Food Services and Drinking Places` + `% Change Supermarkets` +
##     `% Change Work at Home` , data = PublicData)
##
## Residuals:
##      Min      1Q      Median      3Q      Max
## -0.38181 -0.07077  0.00997  0.06678  0.42893
##
## Coefficients:
##                               Estimate
## (Intercept)                   -0.05539
## `% Change Bachelor's Degree or Higher` 0.99481
## `% Change Individual Income $75,001+` 0.04675
## `% Change Individual Income $50,001 - $75,000` 0.11853
## `% Change Individual Income $25,000 or less` 0.31205
## `% Change Individual Income $25,001 - $50,000` 0.85581
## `% Change Commute via Public Transit` -0.68503
## `% Change Commute via Private Car or Taxi` -0.39732
## `% Change Commute Time` -1.95603
## `% Change Commute via Walk or Bike` -0.26977
## `% Change Unemployed` 0.04114
## `% Change Tax lots devoted to Mixed-Use Residential/Commercial` 0.44374
## `% Change Number of Businesses` 0.80440
## `% Change Performing Arts Companies` 0.01994
## `% Change Food Services and Drinking Places` -0.42974

```

## `^% Change Supermarkets`	-0.03655
## `^% Change Work at Home`	0.16022
##	Std. Error
## (Intercept)	0.11201
## `^% Change Bachelor's Degree or Higher`	0.32855
## `^% Change Individual Income \$75,001+`	0.32274
## `^% Change Individual Income \$50,001 - \$75,000`	0.43930
## `^% Change Individual Income \$25,000 or less`	0.59755
## `^% Change Individual Income \$25,001 - \$50,000`	0.55399
## `^% Change Commute via Public Transit`	0.68295
## `^% Change Commute via Private Car or Taxi`	0.36987
## `^% Change Commute Time`	0.97985
## `^% Change Commute via Walk or Bike`	0.18318
## `^% Change Unemployed`	0.10826
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	0.37172
## `^% Change Number of Businesses`	0.62343
## `^% Change Performing Arts Companies`	0.02535
## `^% Change Food Services and Drinking Places`	0.40595
## `^% Change Supermarkets`	0.08774
## `^% Change Work at Home`	0.10458
##	t value
## (Intercept)	-0.494
## `^% Change Bachelor's Degree or Higher`	3.028
## `^% Change Individual Income \$75,001+`	0.145
## `^% Change Individual Income \$50,001 - \$75,000`	0.270
## `^% Change Individual Income \$25,000 or less`	0.522
## `^% Change Individual Income \$25,001 - \$50,000`	1.545
## `^% Change Commute via Public Transit`	-1.003
## `^% Change Commute via Private Car or Taxi`	-1.074
## `^% Change Commute Time`	-1.996
## `^% Change Commute via Walk or Bike`	-1.473
## `^% Change Unemployed`	0.380
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	1.194
## `^% Change Number of Businesses`	1.290
## `^% Change Performing Arts Companies`	0.787
## `^% Change Food Services and Drinking Places`	-1.059
## `^% Change Supermarkets`	-0.417
## `^% Change Work at Home`	1.532
##	Pr(> t)
## (Intercept)	0.62414
## `^% Change Bachelor's Degree or Higher`	0.00468 **
## `^% Change Individual Income \$75,001+`	0.88569
## `^% Change Individual Income \$50,001 - \$75,000`	0.78894
## `^% Change Individual Income \$25,000 or less`	0.60491
## `^% Change Individual Income \$25,001 - \$50,000`	0.13165
## `^% Change Commute via Public Transit`	0.32293
## `^% Change Commute via Private Car or Taxi`	0.29029
## `^% Change Commute Time`	0.05396 .
## `^% Change Commute via Walk or Bike`	0.15004
## `^% Change Unemployed`	0.70628
## `^% Change Tax lots devoted to Mixed-Use Residential/Commercial`	0.24085
## `^% Change Number of Businesses`	0.20566
## `^% Change Performing Arts Companies`	0.43682
## `^% Change Food Services and Drinking Places`	0.29724

```
## `% Change Supermarkets`          0.67960
## `% Change Work at Home`         0.13476
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1721 on 34 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.6728, Adjusted R-squared:  0.5188
## F-statistic: 4.369 on 16 and 34 DF,  p-value: 0.0001491
```