MA615FinalProject

Living on Long Island, Working in the City? Jobs, Commuting, and Family Life on Long Island

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1. Introduction

Long Island has two large suburban counties - Nassau County and Suffolk County - which are closely linked to the New York City. Although many residents live and raise families on Long Island, their jobs, commuting patterns, and economic opportunities are influenced by both the local employment market and the regional labor market. This project aims to study the lifestyles and work patterns of Long Island residents. Its research scope covers Nassau County and Suffolk County. By analyzing aspects such as population structure, family composition, employment in various industries, commuting behavior, and income differences at the community level, it aims to gain a deeper understanding of the living conditions of local residents.

```
library(tidycensus)
library(tidyverse)
```

```
-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.1     v stringr   1.5.2
v ggplot2   4.0.0     v tibble    3.3.0
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.1.0
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to beco
```

```r
library(dplyr)
library(stringr)
library(scales)
```

```
Attaching package: 'scales'

The following object is masked from 'package:purrr':

    discard

The following object is masked from 'package:readr':

    col_factor
```

```r
year <- 2023
state_li <- "NY"
li_counties <- c("Nassau County, New York", "Suffolk County, New York")
```

2. Demographic Structure

This part of the chart compares the age composition of the population in Nassau County and Suffolk County.

```r
age_li <- get_acs(
  geography = "county",
  state     = "NY",
  year      = year,
  survey    = "acs5",
  table     = "S0101",
  dataset   = "acs5/subject",
  output    = "wide"
) %>%
  filter(NAME %in% li_counties) %>%
  transmute(
    county       = str_remove(NAME, ", New York"),
    pct_under18  = S0101_C02_022E,
    pct_65plus   = S0101_C02_030E,
    pct_18to64   = 100 - pct_under18 - pct_65plus
  )
```

```
Getting data from the 2019-2023 5-year ACS

Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
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Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
```
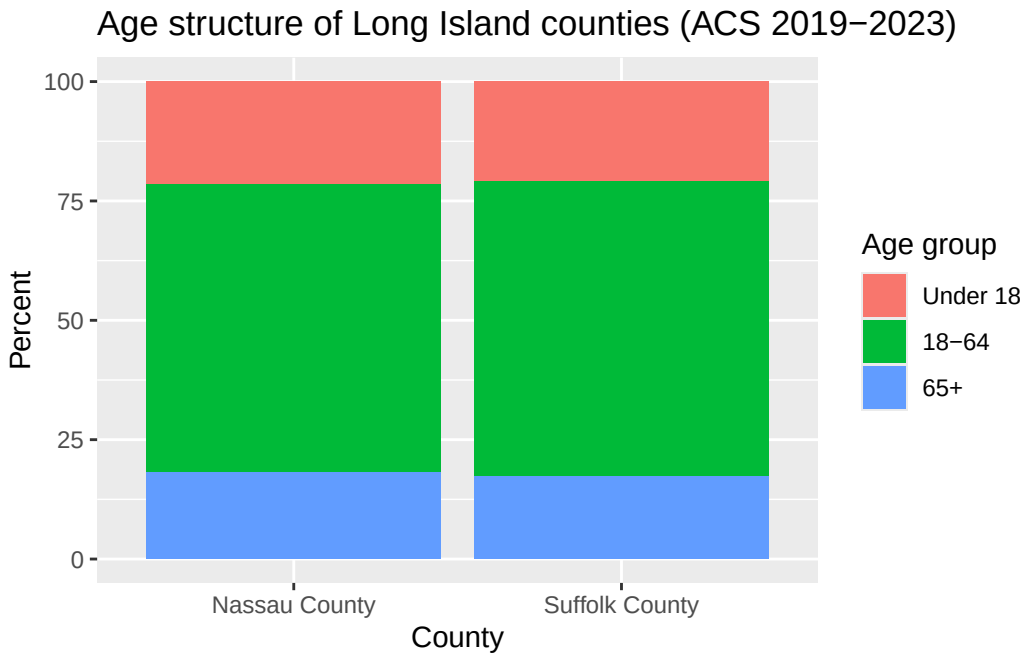

```
age_li
```

```
# A tibble: 2 x 4
  county         pct_under18 pct_65plus pct_18to64
  <chr>                <dbl>      <dbl>      <dbl>
1 Nassau County         21.6       18.2       60.2
2 Suffolk County        20.9       17.5       61.6
```

```
age_li %>%
  tidyr::pivot_longer(
    cols = starts_with("pct_"),
    names_to = "age_group",
    values_to = "percent"
  ) %>%
  dplyr::mutate(
    age_group = factor(age_group,
                       levels = c("pct_under18", "pct_18to64", "pct_65plus"),
                       labels = c("Under 18", "18-64", "65+"))
  ) %>%
  ggplot(aes(x = county, y = percent, fill = age_group)) +
  geom_col(position = "stack") +
  labs(
    title = "Age structure of Long Island counties (ACS 2019-2023)",
    x = "County",
    y = "Percent",
    fill = "Age group"
  )
```



In both counties,the majority of residents are in the working age group (18 to 64 years old), accounting for approximately 60% of the total population. The proportions of children under 18 and adults over 65 are roughly the same in both counties, but the proportion of working-age residents in Suffolk County is slightly higher. Overall, the age distribution indicates that the residents of these two counties are mainly suburban residents in the working age group, which has a significant impact on employment demands and commuting patterns.

3. Family and Household Characteristics

Household composition differs modestly between Nassau and Suffolk Counties.

```
family_li_raw <- get_acs(
  geography = "county",
  state     = "NY",
  year      = year,
  survey    = "acs5",
  table     = "S1101",
  dataset   = "acs5/subject",
  output    = "wide"
) %>%
  dplyr::filter(NAME %in% li_counties)
```

```
Getting data from the 2019-2023 5-year ACS

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Using the ACS Subject Tables
Using the ACS Subject Tables
```
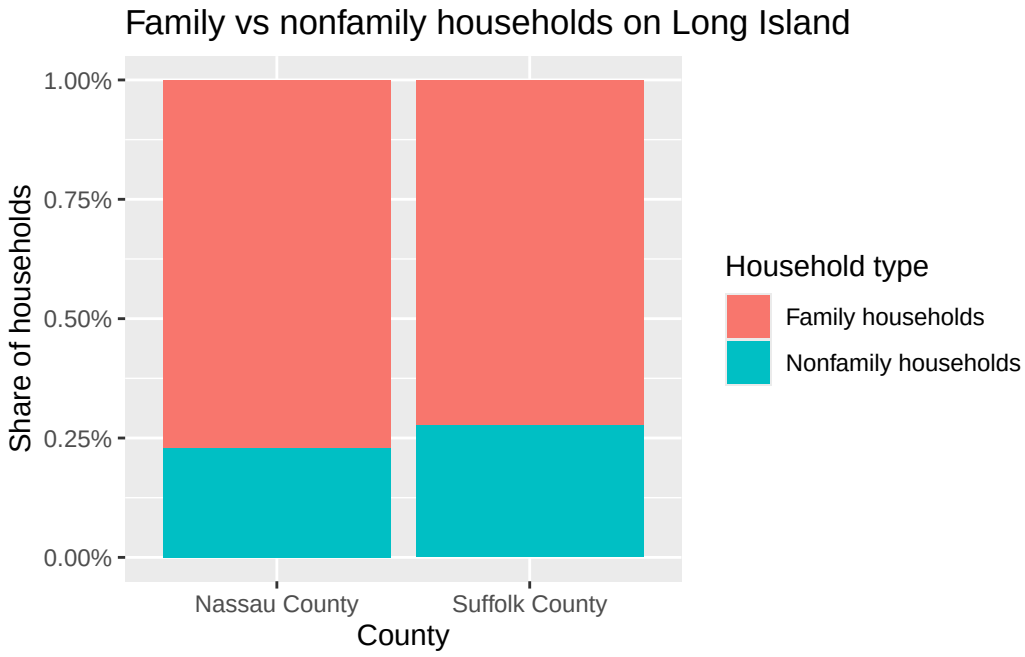

```r
family_li <- family_li_raw %>%
  dplyr::transmute(
    county          = stringr::str_remove(NAME, ", New York"),
    hh_total        = S1101_C01_001E,
    fam_total       = S1101_C01_003E,
    pct_hh_children_u18 = S1101_C01_010E,
    pct_family_hh       = 100 * fam_total / hh_total,
    pct_nonfamily_hh    = 100 - pct_family_hh
  )

family_li
```

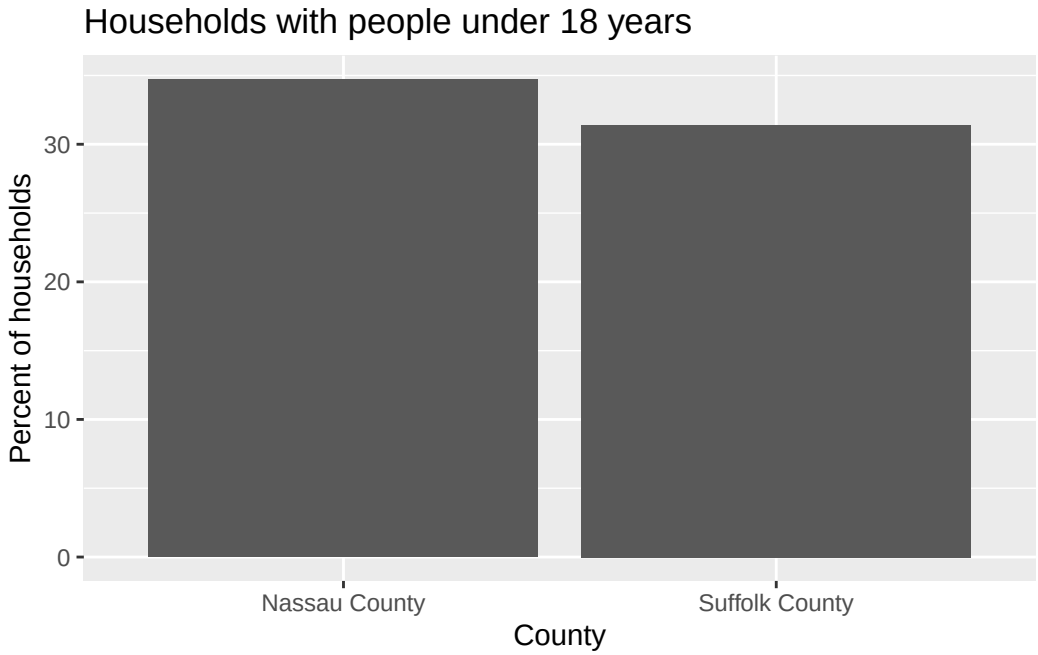
```
# A tibble: 2 x 6
  county   hh_total fam_total pct_hh_children_u18 pct_family_hh pct_nonfamily_hh
  <chr>       <dbl>     <dbl>               <dbl>         <dbl>            <dbl>
1 Nassau ~   456076    351798                34.7          77.1             22.9
2 Suffolk~   512280    370809                31.4          72.4             27.6
```

```r
family_long <- family_li %>%
  dplyr::select(county, pct_family_hh, pct_nonfamily_hh) %>%
  tidyr::pivot_longer(
    cols = starts_with("pct_"),
    names_to = "hh_type",
    values_to = "percent"
  ) %>%
  dplyr::mutate(
    hh_type = dplyr::recode(
      hh_type,
      pct_family_hh    = "Family households",
      pct_nonfamily_hh = "Nonfamily households"
    )
  )

ggplot(family_long, aes(x = county, y = percent, fill = hh_type)) +
```

```
  geom_col(position = "fill") +
  scale_y_continuous(labels = scales::percent_format(scale = 1)) +
  labs(
    title = "Family vs nonfamily households on Long Island",
    x = "County",
    y = "Share of households",
    fill = "Household type"
  )
```




```
ggplot(family_li, aes(x = county, y = pct_hh_children_u18)) +
  geom_col() +
  labs(
    title = "Households with people under 18 years",
    x = "County",
    y = "Percent of households"
  )
```



In Nassau County, the proportion of households among the total number of families is relatively higher. While in Suffolk County, the proportion of non-household families is slightly higher.In both counties, approximately one-third of the families have children under the age of 18. These phenomena indicate that Long Island still places great emphasis on families, especially in Nassau County. This further consolidates its status as a residential area for working families.

4. Employment and Industry Structure

```
vars_s2405 <- load_variables(
  year    = year,
  dataset = "acs5/subject",
  cache   = TRUE
) %>%
  dplyr::filter(stringr::str_starts(name, "S2405"))
industry_patterns <- tibble::tibble(
  industry = c(
    "Ag & mining",
    "Construction",
    "Manufacturing",
    "Retail trade",
    "Finance & real estate",
```

```
    "Prof/management services",
    "Education & health"
  ),
  pattern = c(
    "Agriculture, forestry, fishing and hunting, and mining",
    "Construction",
    "Manufacturing",
    "Retail trade",
    "Finance and insurance, and real estate and rental and leasing",
    "Professional, scientific, and management, and administrative and waste management servic
    "Educational services, and health care and social assistance"
  )
)

industry_codes <- industry_patterns %>%
  dplyr::rowwise() %>%
  dplyr::mutate(
    var  = vars_s2405$name[which(stringr::str_detect(vars_s2405$label, pattern))[1]],
    varE = paste0(var, "E")
  ) %>%
  dplyr::ungroup()

industry_codes
```

```
# A tibble: 7 x 4
  industry                pattern                                  var   varE
  <chr>                   <chr>                                    <chr> <chr>
1 Ag & mining             Agriculture, forestry, fishing and hunti~ S240~ S240~
2 Construction            Construction                             S240~ S240~
3 Manufacturing           Manufacturing                            S240~ S240~
4 Retail trade            Retail trade                             S240~ S240~
5 Finance & real estate   Finance and insurance, and real estate a~ S240~ S240~
6 Prof/management services Professional, scientific, and management~ S240~ S240~
7 Education & health      Educational services, and health care an~ S240~ S240~
```

```
ind_li_raw <- get_acs(
  geography = "county",
  state     = "NY",
  year      = year,
  survey    = "acs5",
  table     = "S2405",
```

```
  dataset   = "acs5/subject",
  output    = "wide"
) %>%
  dplyr::filter(NAME %in% li_counties)
```

```
Getting data from the 2019-2023 5-year ACS
```

```
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Using the ACS Subject Tables
```

```
total_emp <- ind_li_raw %>%
  dplyr::transmute(
    NAME,
    total_emp = S2405_C01_001E
  )

ind_li_long <- ind_li_raw %>%
  dplyr::select(NAME, dplyr::all_of(industry_codes$varE)) %>%
  tidyr::pivot_longer(
    cols      = -NAME,
    names_to  = "varE",
    values_to = "n_emp"
  ) %>%
  dplyr::left_join(industry_codes, by = "varE") %>%
  dplyr::left_join(total_emp,      by = "NAME") %>%
  dplyr::mutate(
    county  = stringr::str_remove(NAME, ", New York"),
    percent = 100 * n_emp / total_emp
  ) %>%
  dplyr::select(county, industry, percent)

ind_li_long
```

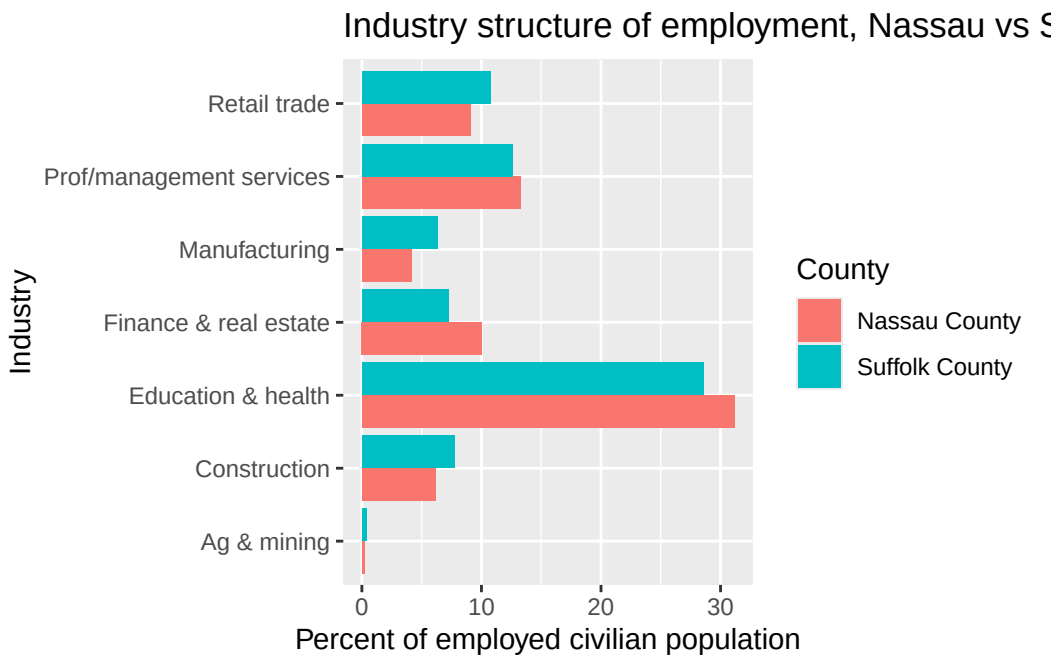
```
# A tibble: 14 x 3
   county         industry                percent
   <chr>          <chr>                     <dbl>
 1 Nassau County  Ag & mining               0.196
 2 Nassau County  Construction              6.13
```

```
 3 Nassau County  Manufacturing              4.16
 4 Nassau County  Retail trade               9.11
 5 Nassau County  Finance & real estate     10.1
 6 Nassau County  Prof/management services  13.3
 7 Nassau County  Education & health        31.1
 8 Suffolk County Ag & mining                0.377
 9 Suffolk County Construction               7.75
10 Suffolk County Manufacturing              6.35
11 Suffolk County Retail trade              10.8
12 Suffolk County Finance & real estate      7.26
13 Suffolk County Prof/management services  12.6
14 Suffolk County Education & health        28.6
```

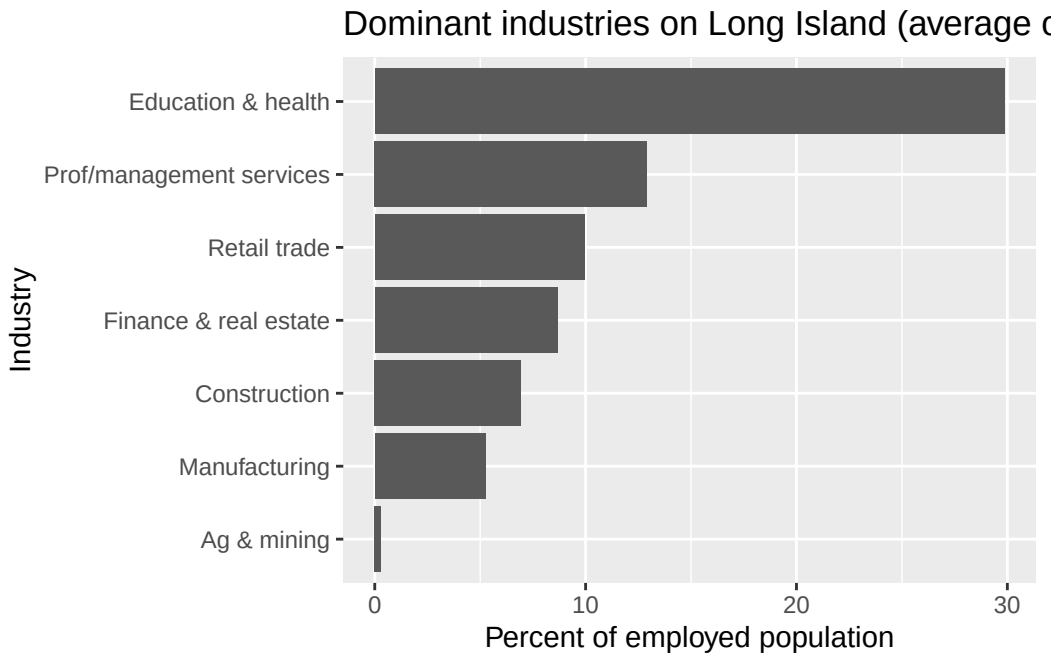
```r
ind_li_overall <- ind_li_long %>%
  dplyr::group_by(industry) %>%
  dplyr::summarise(
    percent_li = mean(percent, na.rm = TRUE),
    .groups = "drop"
  )
ind_li_overall
```

```
# A tibble: 7 x 2
  industry                 percent_li
  <chr>                         <dbl>
1 Ag & mining                   0.286
2 Construction                  6.94
3 Education & health           29.9
4 Finance & real estate         8.66
5 Manufacturing                 5.26
6 Prof/management services     12.9
7 Retail trade                  9.94
```

```r
ggplot(ind_li_long, aes(x = industry, y = percent, fill = county)) +
  geom_col(position = "dodge") +
  coord_flip() +
  labs(
    title = "Industry structure of employment, Nassau vs Suffolk (ACS 2019-2023)",
    x = "Industry",
    y = "Percent of employed civilian population",
    fill = "County"
  )
```




```
ggplot(ind_li_overall,
       aes(x = reorder(industry, percent_li), y = percent_li)) +
  geom_col() +
  coord_flip() +
  labs(
    title = "Dominant industries on Long Island (average of Nassau & Suffolk)",
    x = "Industry",
    y = "Percent of employed population"
  )
```



Employment in Long Island is mainly concentrated in service-oriented industries. In Nassau County and Suffolk County, education and medical services are the largest employment sectors, followed by professional and management services, retail, finance and real estate industries. Although the roles of manufacturing and construction are smaller, they are still of great significance, especially in Suffolk County. The industrial structures of these two counties are similar, indicating that the labor market conditions faced by residents are roughly the same, although the commuting methods may differ.

5. Commuting Patterns

The commuting patterns highlight the close connection between Long Island and the surrounding labor markets.

```
year <- 2023

vars_s0801_pct <- load_variables(
  year    = year,
  dataset = "acs5/subject",
  cache   = TRUE
) %>%
  filter(str_starts(name, "S0801_C02_"))
vars_s0801_pct %>%
  filter(str_detect(label, "PLACE OF WORK")) %>%
```

```
  select(name, label) %>%
  print(n = 20)
```

```
# A tibble: 12 x 2
   name          label
   <chr>         <chr>
 1 S0801_C02_014 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Work~
 2 S0801_C02_015 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Work~
 3 S0801_C02_016 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Work~
 4 S0801_C02_017 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Work~
 5 S0801_C02_018 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
 6 S0801_C02_019 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
 7 S0801_C02_020 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
 8 S0801_C02_021 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Not ~
 9 S0801_C02_022 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
10 S0801_C02_023 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
11 S0801_C02_024 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Livi~
12 S0801_C02_025 Estimate!!Male!!Workers 16 years and over!!PLACE OF WORK!!Not ~
```

```
vars_s0801_total <- load_variables(
  year    = year,
  dataset = "acs5/subject",
  cache   = TRUE
) %>%
  filter(str_starts(name, "S0801_C01_"))
commute_codes <- tibble(
  metric = c(
    "work_in_county",
    "work_outside_county",
    "work_outside_state",
    "work_at_home",
    "car_alone",
    "public_transit"
  ),
  var = c(
    "S0801_C01_001",
    "S0801_C01_002",
    "S0801_C01_003",
    "S0801_C01_013",
    "S0801_C01_031",
    "S0801_C01_041"
```

```
  )
) %>%
  mutate(varE = paste0(var, "E"))

commute_codes_labeled <- commute_codes %>%
  left_join(vars_s0801_total, by = c("var" = "name")) %>%
  select(metric, var, label)

commute_codes_labeled
```

```
# A tibble: 6 x 3
  metric              var           label
  <chr>               <chr>         <chr>
1 work_in_county      S0801_C01_001 Estimate!!Total!!Workers 16 years and over
2 work_outside_county S0801_C01_002 Estimate!!Total!!Workers 16 years and over!~
3 work_outside_state  S0801_C01_003 Estimate!!Total!!Workers 16 years and over!~
4 work_at_home        S0801_C01_013 Estimate!!Total!!Workers 16 years and over!~
5 car_alone           S0801_C01_031 Estimate!!Total!!Workers 16 years and over ~
6 public_transit      S0801_C01_041 Estimate!!Total!!Workers 16 years and over ~
```

```
year <- 2023
state_li <- "NY"
li_counties <- c("Nassau County, New York", "Suffolk County, New York")

li_raw <- get_acs(
  geography = "county",
  state     = state_li,
  year      = year,
  survey    = "acs5",
  table     = "S0801",
  dataset   = "acs5/subject",
  output    = "wide"
) |>
  dplyr::filter(NAME %in% li_counties)
```

```
Getting data from the 2019-2023 5-year ACS

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```
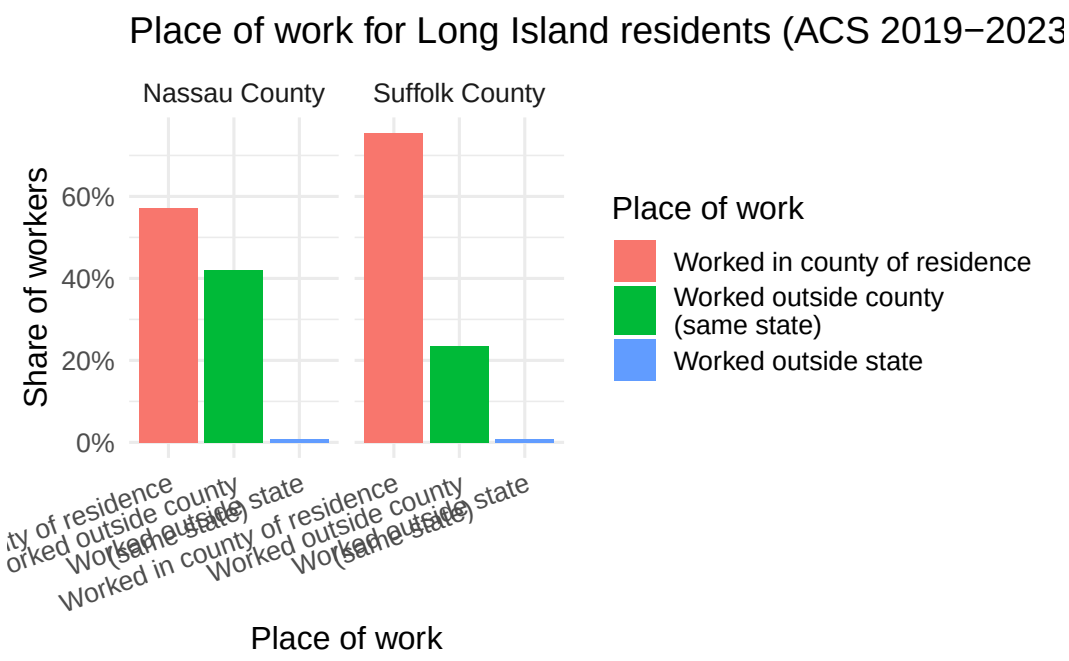

```
Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
Using the ACS Subject Tables
```

```
comm_clean <- li_raw |>
  dplyr::transmute(
    county = stringr::str_remove(NAME, ", New York"),
    workers_total = S0801_C01_001E,
  Drive_alone   = S0801_C02_002E / 100,
  public_transit = S0801_C02_009E / 100,
  work_at_home   = S0801_C02_013E / 100,

    work_in_county  = S0801_C02_015E / 100,
   work_out_county    = S0801_C02_016E / 100,
    work_out_state  = S0801_C02_017E / 100
  ) |>
  dplyr::mutate(
    work_away_from_home = work_in_county +
                          work_out_county +
                          work_out_state,

    pct_work_in_county  = work_in_county  / work_away_from_home,
    pct_work_out_cty    = work_out_county    / work_away_from_home,
    pct_work_out_state  = work_out_state  / work_away_from_home
  )

comm_clean
```

```
# A tibble: 2 x 12
  county    workers_total Drive_alone public_transit work_at_home work_in_county
  <chr>             <dbl>       <dbl>          <dbl>        <dbl>          <dbl>
1 Nassau C~        682723       0.69           0.143        0.132          0.571
2 Suffolk ~        768320       0.811          0.06         0.099          0.755
# i 6 more variables: work_out_county <dbl>, work_out_state <dbl>,
#   work_away_from_home <dbl>, pct_work_in_county <dbl>,
#   pct_work_out_cty <dbl>, pct_work_out_state <dbl>
```

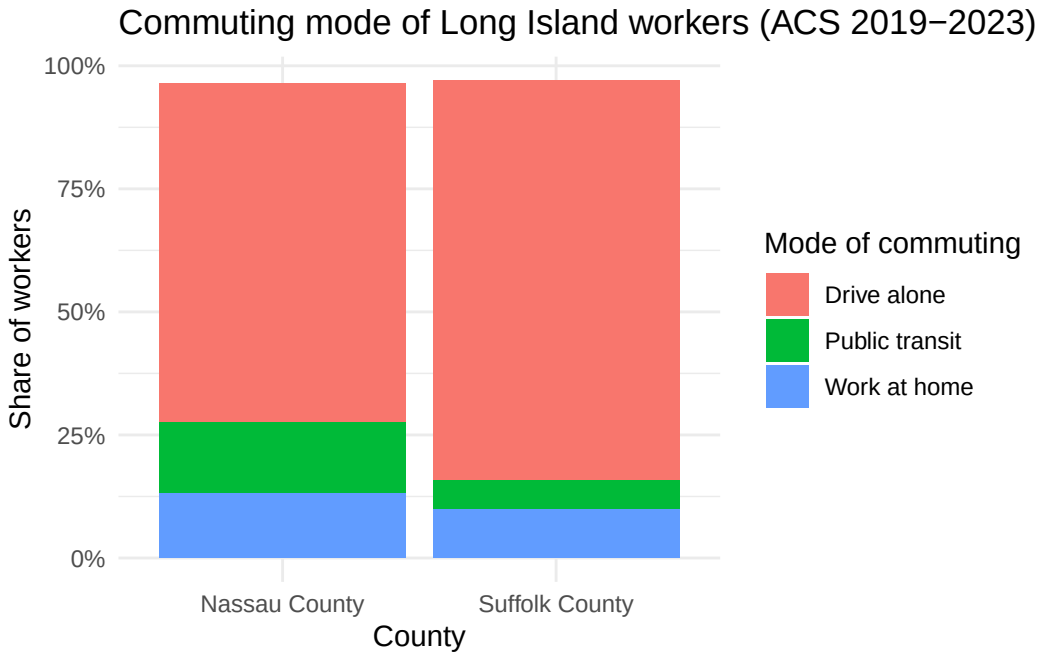
```
place_long <- comm_clean |>
  dplyr::select(
    county,
    pct_work_in_county,
```

```
    pct_work_out_cty,
    pct_work_out_state
  ) |>
  tidyr::pivot_longer(
    cols      = dplyr::starts_with("pct_work_"),
    names_to  = "place",
    values_to = "share"
  ) |>
  dplyr::mutate(
    place = dplyr::recode(
      place,
      pct_work_in_county = "Worked in county of residence",
      pct_work_out_cty   = "Worked outside county\n(same state)",
      pct_work_out_state = "Worked outside state"
    )
  )

ggplot(place_long,
       aes(x = place, y = share, fill = place)) +
  geom_col(position = "dodge") +
  facet_wrap(~ county) +
  scale_y_continuous(labels = scales::percent_format(accuracy = 1)) +
  labs(
    title = "Place of work for Long Island residents (ACS 2019-2023)",
    x = "Place of work",
    y = "Share of workers",
    fill = "Place of work"
  ) +
  theme_minimal(base_size = 12) +
  theme(axis.text.x = element_text(angle = 20, hjust = 1))
```




```
comm_mode_long <- comm_clean |>
  dplyr::select(
    county,
    Drive_alone,
    public_transit,
    work_at_home
  ) |>
  tidyr::pivot_longer(
    cols      = c(Drive_alone, public_transit, work_at_home),
    names_to  = "mode",
    values_to = "percent"
  ) |>
  dplyr::mutate(
    mode = dplyr::recode(
      mode,
      Drive_alone    = "Drive alone",
      public_transit = "Public transit",
      work_at_home   = "Work at home"
    )
  )

ggplot(comm_mode_long,
       aes(x = county, y = percent, fill = mode)) +
```

```r
  geom_col(position = "stack") +
  scale_y_continuous(labels = scales::percent_format(accuracy = 1)) +
  labs(
    title = "Commuting mode of Long Island workers (ACS 2019-2023)",
    x     = "County",
    y     = "Share of workers",
    fill  = "Mode of commuting"
  ) +
  theme_minimal()
```



A significant portion of the residents work outside their county of residence, and a considerable number of people leave their state to work in other places, reflecting the close ties between them and the employment centers in New York City and other regions. In both counties, driving alone remains the main commuting method, while the proportion of public transportation is much smaller. A considerable number of employees choose to work from home, indicating that remote work is becoming increasingly important in the suburban areas.

6. Income Variation Across Neighborhoods

In Nassau County and Suffolk County, the income levels of various communities vary significantly.

```r
state_li <- "NY"
li_counties       <- c("Nassau County, New York", "Suffolk County, New York")
li_counties_short <- c("Nassau", "Suffolk")
income_var <- "B19013A_001"
```

```r
income_li <- get_acs(geography = "tract",
  state     = state_li,
  county    = li_counties_short,
  year      = year,
  survey    = "acs5",
  variables = income_var,
  geometry  = TRUE
) %>%
  mutate(
    median_hh_income = estimate,
    county = str_extract(NAME, "Nassau County|Suffolk County")
  )
```

```
Getting data from the 2019-2023 5-year ACS

Downloading feature geometry from the Census website.  To cache shapefiles for use in future

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income_li
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```
Simple feature collection with 657 features and 7 fields (with 6 geometries empty)
Geometry type: MULTIPOLYGON
Dimension:     XY
```

```
Bounding box:  xmin: -73.76876 ymin: 40.57826 xmax: -71.85648 ymax: 41.29234
Geodetic CRS:  NAD83
First 10 features:
         GEOID                                          NAME    variable
1  36059520001 Census Tract 5200.01; Nassau County; New York B19013A_001
2  36059519802 Census Tract 5198.02; Nassau County; New York B19013A_001
3  36059414800    Census Tract 4148; Nassau County; New York B19013A_001
4  36059408900    Census Tract 4089; Nassau County; New York B19013A_001
5  36059519200    Census Tract 5192; Nassau County; New York B19013A_001
6  36059407401 Census Tract 4074.01; Nassau County; New York B19013A_001
7  36059415201 Census Tract 4152.01; Nassau County; New York B19013A_001
8  36059406900    Census Tract 4069; Nassau County; New York B19013A_001
9  36059520900    Census Tract 5209; Nassau County; New York B19013A_001
10 36059407802 Census Tract 4078.02; Nassau County; New York B19013A_001
   estimate   moe                       geometry median_hh_income        county
1    111667 13010 MULTIPOLYGON (((-73.50533 4...           111667 Nassau County
2    180658 44852 MULTIPOLYGON (((-73.48127 4...           180658 Nassau County
3    149647 78736 MULTIPOLYGON (((-73.54902 4...           149647 Nassau County
4    141301 22942 MULTIPOLYGON (((-73.54275 4...           141301 Nassau County
5    151250 45489 MULTIPOLYGON (((-73.52376 4...           151250 Nassau County
6    120885 41024 MULTIPOLYGON (((-73.60135 4...           120885 Nassau County
7    188920 41673 MULTIPOLYGON (((-73.55752 4...           188920 Nassau County
8        NA    NA MULTIPOLYGON (((-73.62085 4...               NA Nassau County
9    138773 20431 MULTIPOLYGON (((-73.48425 4...           138773 Nassau County
10    37132  6729 MULTIPOLYGON (((-73.55694 4...            37132 Nassau County
```

```r
ggplot(income_li) +
  geom_sf(aes(fill = median_hh_income), color = NA, size = 0) +
  scale_fill_viridis_c(
    option = "C",
    trans  = "log",
    labels = scales::dollar_format()
  ) +
  labs(
    title   = "Median household income by census tract\nLong Island (ACS 2019-2023)",
    fill    = "Median household income",
    caption = "Source: ACS 2019-2023, table B19013"
  ) +
  theme_minimal(base_size = 11) +
  theme(
    panel.grid  = element_blank(),
    axis.text   = element_blank(),
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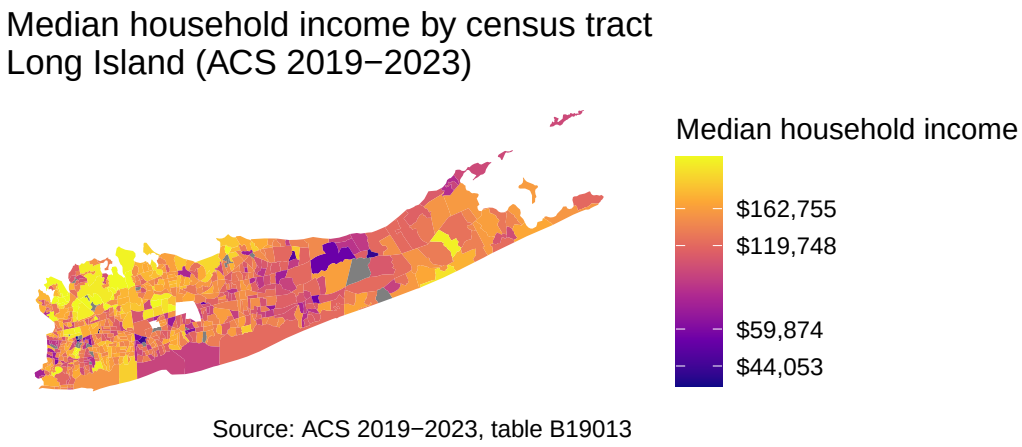
```
    axis.title  = element_blank(),
    axis.ticks  = element_blank()
  )
```



This income distribution map clearly shows the spatial distribution pattern. High-income communities are concentrated in certain areas, while low-income communities are distributed in other places. This visualization does not focus on specific administrative boundaries but highlights the broader regional inequality within Long Island. These patterns highlight the economic diversity that exists within what is often regarded as a single type of suburban county.

7. Conclusion

This analysis indicates that Nassau County and Suffolk County share many similarities in terms of population structure and employment composition, but differ in terms of family characteristics and commuting behaviors. Both counties serve as residences for a large number of people of working age and have a close connection with the local labor market. Overall, these results suggest that the lives of residents in the Long Island region are shaped by the interaction between suburban family life and urban employment opportunities. Understand these patterns are of vital importance for transportation planning, housing policies, and regional economic development.