Assignment 3

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Summary

Seattle is the largest city in Washington state and one of the fastest growing cities in the United States. Below, I analyze a handful of aspects of the Emerald City's population growth. My analysis draws on data taken from the U.S. Decennial Census. The census is a highly accurate accounting of every person in the United States, and is therefore extremely useful for urban planning. Plots were completed using RStudio, and the code for each can be found in the Appendix.

Seattles's rapid population growth, as seen in Figure 1, has been very linear between 1990 and 2010. In this period, the population increased from 516,259 to 608,660, an almost 18% increase over two decades. This growth indicates an ongoing need for housing and services to support the increasing population.

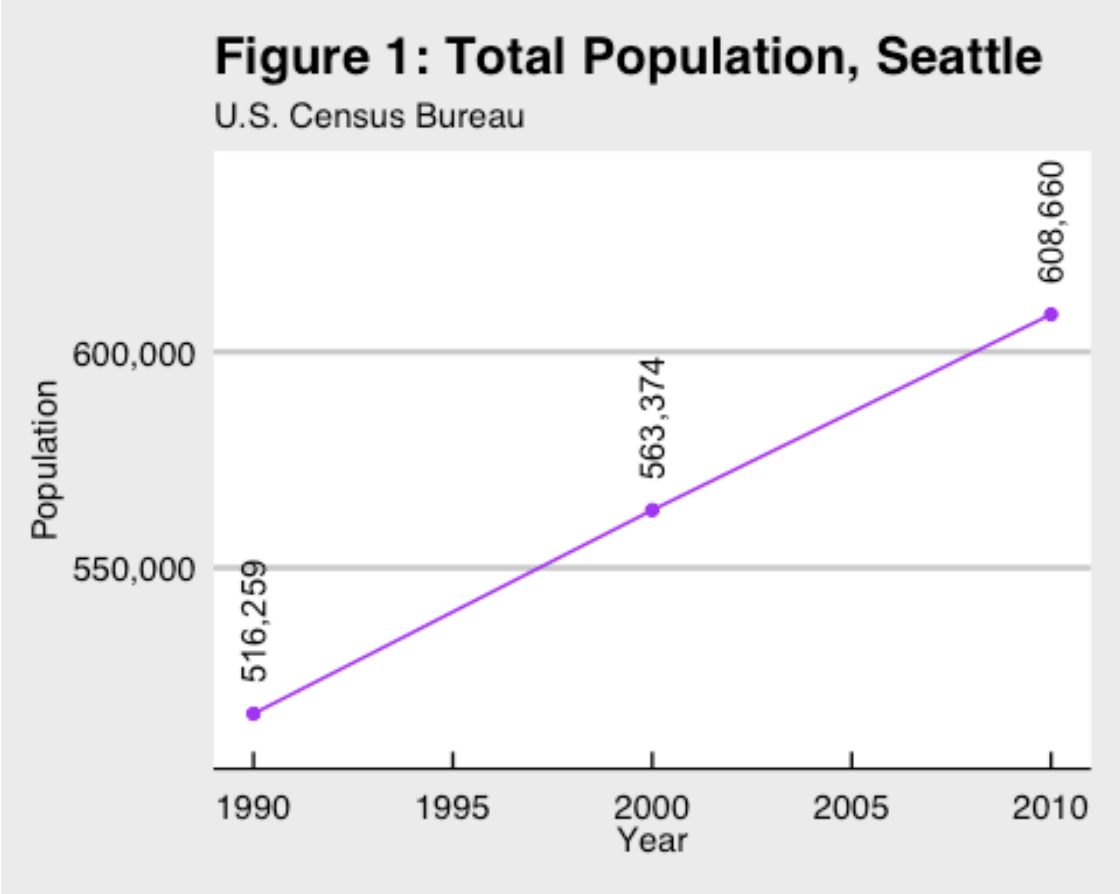


Figure 2 shows the median age of Seattle's population, which has increased over time, following the general trend across the nation as Baby Boomers age. Overall, however, the increase has been relatively small, and the median age is reasonably low, indicating a somewhat young population. This observation is confirmed in Figure 3.

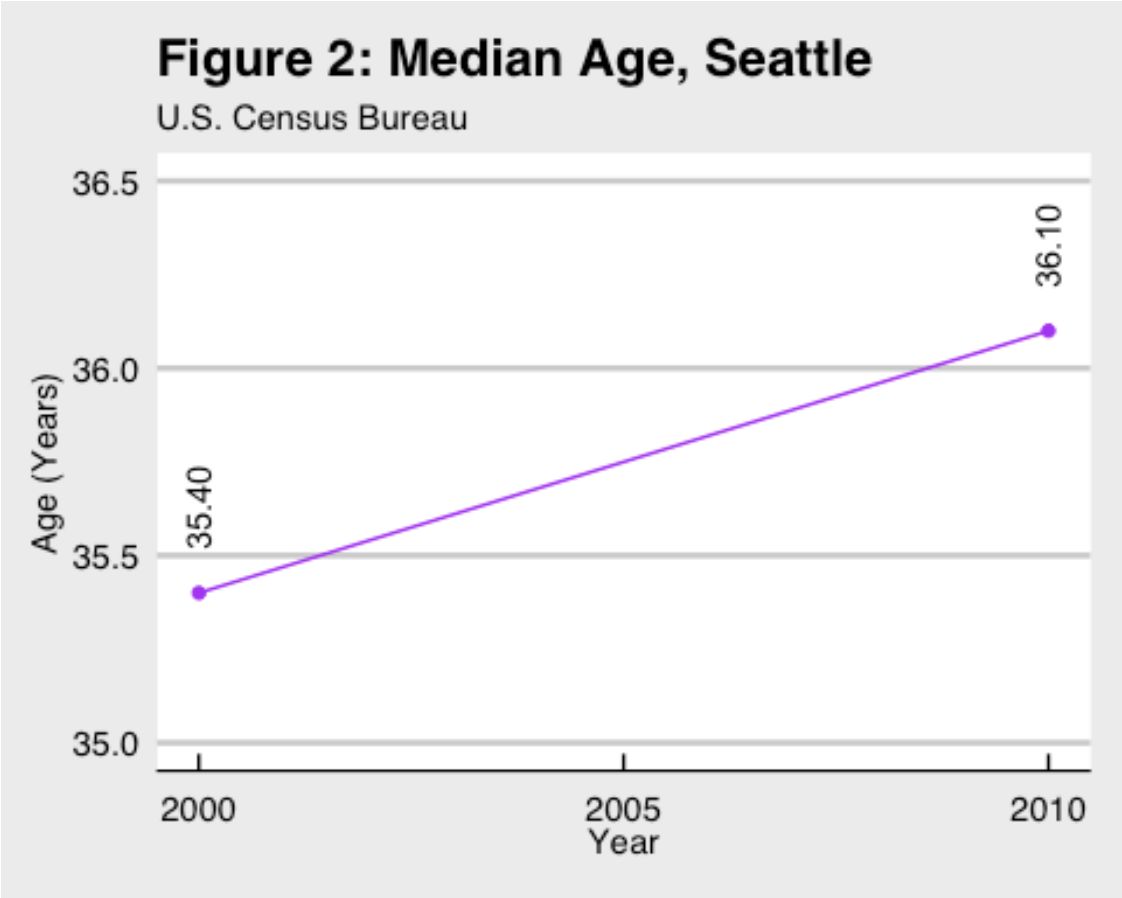


Figure 3 shows the population of Seattle in 2010 divided by gender and age. The city is largely populated by young adults, with very few children or older adults. This is likely because the growing population is due to young professionals moving into the city for work and not having children until later, or moving out to the suburbs when they do. This may indicate a need to retain of a older adults and parents, but this likely requires further research. The Gender distribution shows a slightly higher percentage of men in the young adult groups, but this difference is too small to make any meaningful assumptions. Figure 4 shows the same information for the entire state of Washington, which has a much more even distribution, further emphasizing the youth of Seattle's populace.

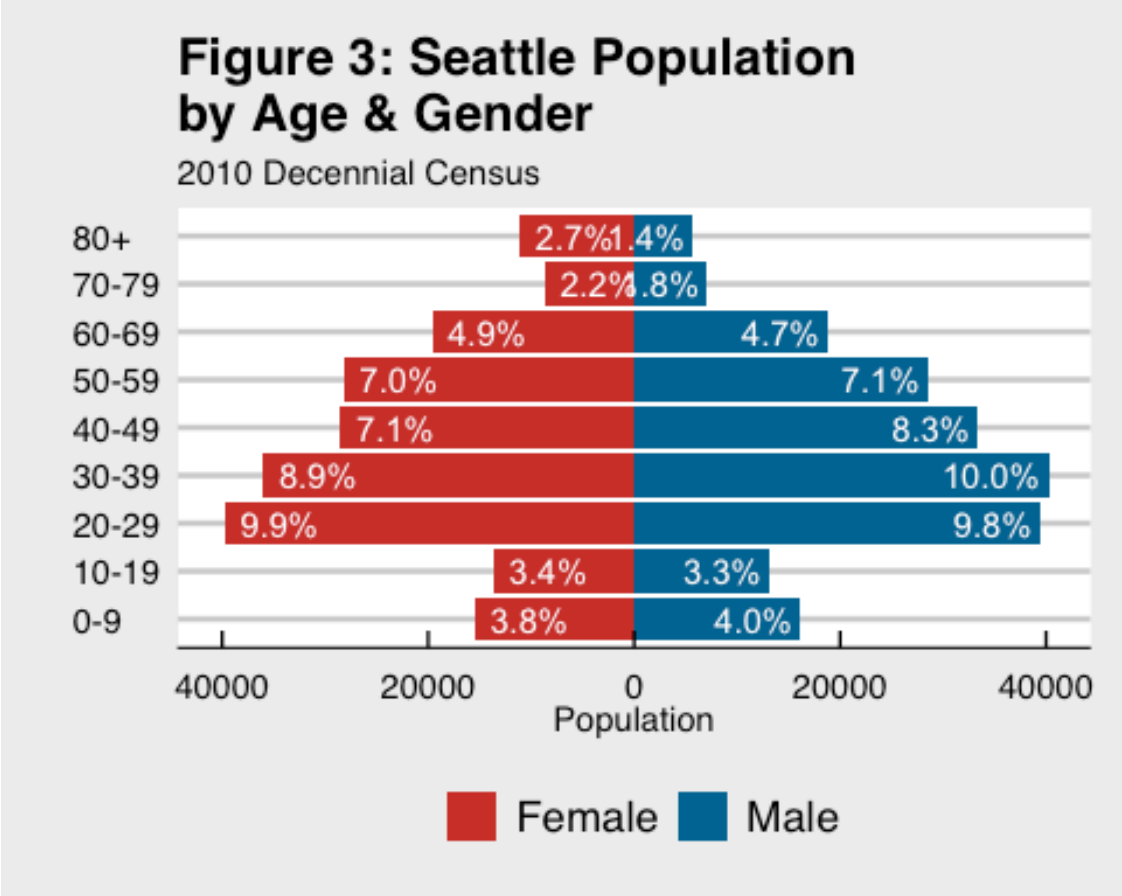
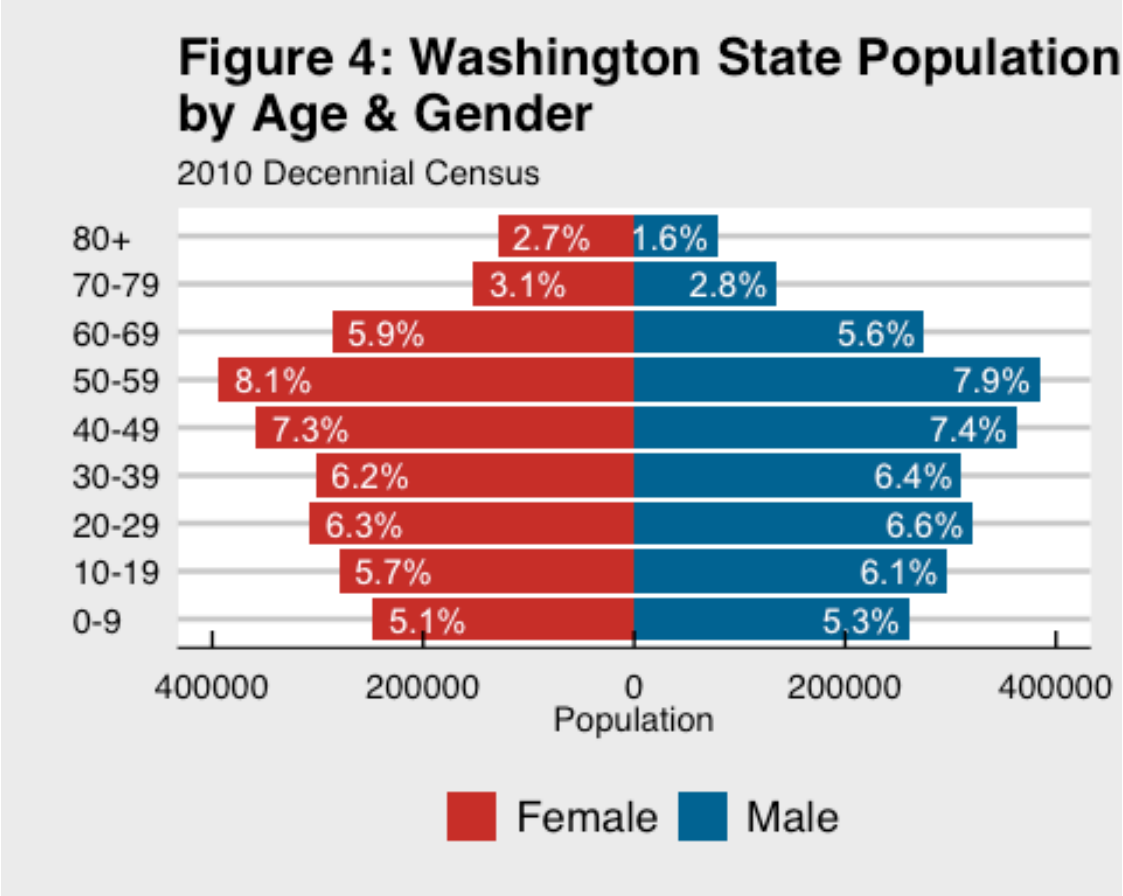


Figure 3: Seattle Population by Age & Gender
2010 Decennial Census
80+
70-79
60-69
50-59
40-49
30-39
20-29
10-19
0-9
2.7%
1.4%
2.2%
1.8%
4.9%
4.7%
7.0%
7.1%
7.1%
8.3%
8.9%
10.0%
9.9%
9.8%
3.4%
3.3%
3.8%
4.0%
40000
20000
0
20000
40000
Population
Female
Male



Overall, the Census data shows that Seattle is a rapidly growing city with a slowly aging population. The city is relatively young and childless, as compared to the rest of Washington. The Emerald City is clearly on the rise, and with careful planning can stay that way.

Code Appendix

Total Population Line Graph:

```
total90 <- get_decennial(year = 1990,
                         variable = "P0010001",
                         state = "WA",
                         geography = "place") %>%
  filter(NAME == "Seattle city") %>%
  mutate(year = 1990)
total00 <- get_decennial(year = 2000,
                         variable = "P001001",
                         state = "WA",
                         geography = "place") %>%
  filter(NAME == "Seattle city") %>%
  mutate(year = 2000)
total10 <- get_decennial(year = 2010,
                         variable = "P001001",
```

```
                          state = "WA",
                          geography = "place") %>%
  filter(NAME == "Seattle city, Washington") %>%
  mutate(year = 2010)
bind_rows(total90, total00, total10) %>%
  ggplot(aes(x = year, y = value)) +
  geom_line(color = "purple") +
  geom_point(color = "purple") +
  geom_text(aes(label = comma(value)), hjust = -0.25, angle = 90) +
  labs(title = "Figure 1: Total Population, Seattle", subtitle = "U.S.
Census Bureau", x = "Year", y = "Population") +
  scale_y_continuous(limits = c(510000, 640000), labels = comma) +
  theme_economist_white()
```

Median Age Line Graph:

```
age00 <- get_decennial(year = 2000,
                          variable = "P013001",
                          state = "WA",
                          geography = "place") %>%
  filter(NAME == "Seattle city") %>%
  mutate(year = 2000)
age10 <- get_decennial(year = 2010,
                          variable = "P013001",
                          state = "WA",
                          geography = "place") %>%
  filter(NAME == "Seattle city, Washington") %>%
  mutate(year = 2010)
bind_rows(age00, age10) %>%
  ggplot(aes(x = year, y = value)) +
  geom_line(color = "purple") +
  geom_point(color = "purple") +
  geom_text(aes(label = comma(value)), hjust = -0.5, angle = 90) +
  labs(title = "Figure 2: Median Age, Seattle", subtitle = "U.S. Census
Bureau", x = "Year", y = "Age (Years)") +
  scale_y_continuous(limits = c(35, 36.5)) +
  scale_x_continuous(breaks = c(2000, 2005, 2010)) +
  theme_economist_white()
```

City Pyramid Chart:

```
age_male_vector <- c(age0to4 = "P012I003",
                        age5to9 = "P012I004",
                        age10to14 = "P012I005",
                        age15to17 = "P012I006",
                        age18to19 = "P012I007",
                        age20 = "P012I008",
                        age21 = "P012I009",
                        age22to24 = "P012I010",
                        age25to29 = "P012I011",
                        age30to34 = "P012I012",
```

```
                       age35to39 = "P012I013",
                       age40to44 = "P012I014",
                       age45to49 = "P012I015",
                       age50to54 = "P012I016",
                       age55to59 = "P012I017",
                       age60to61 = "P012I018",
                       age62to64 = "P012I019",
                       age65to66 = "P012I020",
                       age67to69 = "P012I021",
                       age70to74 = "P012I022",
                       age75to79 = "P012I023",
                       age80to84 = "P012I024",
                       ageover84 = "P012I025")
agegroups_male <- get_decennial(year = 2010,
                                variable = age_male_vector,
                                state = "WA",
                                geography = "place",
                                output = "wide") %>%
  filter(NAME == "Seattle city, Washington")

agegroups_male <- agegroups_male %>%
  mutate(age0to9 = age0to4 + age5to9,
         age10to19 = age10to14 + age15to17 + age18to19,
         age20to29 = age20 + age21 + age22to24 + age25to29,
         age30to39 = age30to34 + age35to39,
         age40to49 = age40to44 + age45to49,
         age50to59 = age50to54 + age55to59,
         age60to69 = age60to61 + age62to64 + age65to66 + age67to69,
         age70to79 = age70to74 + age75to79,
         age80plus = age80to84 + ageover84) %>%
  select(NAME, GEOID, age0to9:age80plus) %>%
  pivot_longer(-c(NAME, GEOID), names_to = "agegroup", values_to =
"count") %>%
  mutate(sex = "Male")

age_female_vector <- c(age0to4 = "P012I027",
                       age5to9 = "P012I028",
                       age10to14 = "P012I029",
                       age15to17 = "P012I030",
                       age18to19 = "P012I031",
                       age20 = "P012I032",
                       age21 = "P012I033",
                       age22to24 = "P012I034",
                       age25to29 = "P012I035",
                       age30to34 = "P012I036",
                       age35to39 = "P012I037",
                       age40to44 = "P012I038",
                       age45to49 = "P012I039",
                       age50to54 = "P012I040",
                       age55to59 = "P012I041",
```

```
                        age60to61 = "P012I042",
                        age62to64 = "P012I043",
                        age65to66 = "P012I044",
                        age67to69 = "P012I045",
                        age70to74 = "P012I046",
                        age75to79 = "P012I047",
                        age80to84 = "P012I048",
                        ageover84 = "P012I049")
agegroups_female <- get_decennial(year = 2010,
                                  variable = age_female_vector,
                                  state = "WA",
                                  geography = "place",
                                  output = "wide") %>%
  filter(NAME == "Seattle city, Washington")

agegroups_female <- agegroups_female %>%
  mutate(age0to9 = age0to4 + age5to9,
         age10to19 = age10to14 + age15to17 + age18to19,
         age20to29 = age20 + age21 + age22to24 + age25to29,
         age30to39 = age30to34 + age35to39,
         age40to49 = age40to44 + age45to49,
         age50to59 = age50to54 + age55to59,
         age60to69 = age60to61 + age62to64 + age65to66 + age67to69,
         age70to79 = age70to74 + age75to79,
         age80plus = age80to84 + ageover84) %>%
  select(NAME, GEOID, age0to9:age80plus) %>%
  pivot_longer(-c(NAME, GEOID), names_to = "agegroup", values_to =
"count") %>%
  mutate(sex = "Female")

agegroups <- agegroups_male %>%
  bind_rows(agegroups_female)

agegroups %>%
  ggplot() +
  geom_bar(aes(x = agegroup, y = ifelse(sex == "Female", -count,
count), fill = sex), stat = "identity") +
  coord_flip() +
  geom_text(aes(x = agegroup, y = -count, label = ifelse (sex ==
"Female",

percent(count/sum(count), accuracy = 0.1), "")),
            color = "white", hjust = -0.2) +
  geom_text(aes(x = agegroup, y = count, label =ifelse (sex == "Male",

percent(count/sum(count), accuracy = 0.1), "")),
            color = "white", hjust = 1.1) +
  scale_x_discrete(labels = c("0-9", "10-19","20-29", "30-39", "40-49",
"50-59", "60-69", "70-79", "80+")) +
  labs(x = "",
```

```
       y = "Population",
       fill = "",
       title = "Figure 3: Seattle Population \nby Age & Gender",
       subtitle = "2010 Decennial Census") +
  scale_y_continuous(labels = abs) +
  theme(panel.grid = element_blank()) +
  theme_economist_white() +
  theme(legend.position = "bottom") +
  scale_fill_wsj()
```

State Pyramid Chart:

```
agegroups_male_wa <- get_decennial(year = 2010,
                                   variable = age_male_vector,
                                   state = "WA",
                                   geography = "state",
                                   output = "wide")

agegroups_male_wa <- agegroups_male_wa %>%
  mutate(age0to9 = age0to4 + age5to9,
         age10to19 = age10to14 + age15to17 + age18to19,
         age20to29 = age20 + age21 + age22to24 + age25to29,
         age30to39 = age30to34 + age35to39,
         age40to49 = age40to44 + age45to49,
         age50to59 = age50to54 + age55to59,
         age60to69 = age60to61 + age62to64 + age65to66 + age67to69,
         age70to79 = age70to74 + age75to79,
         age80plus = age80to84 + ageover84) %>%
  select(NAME, GEOID, age0to9:age80plus) %>%
  pivot_longer(-c(NAME, GEOID), names_to = "agegroup", values_to =
"count") %>%
  mutate(sex = "Male")

agegroups_female_wa <- get_decennial(year = 2010,
                                   variable = age_female_vector,
                                   state = "WA",
                                   geography = "state",
                                   output = "wide")

agegroups_female_wa <- agegroups_female_wa %>%
  mutate(age0to9 = age0to4 + age5to9,
         age10to19 = age10to14 + age15to17 + age18to19,
         age20to29 = age20 + age21 + age22to24 + age25to29,
         age30to39 = age30to34 + age35to39,
         age40to49 = age40to44 + age45to49,
         age50to59 = age50to54 + age55to59,
         age60to69 = age60to61 + age62to64 + age65to66 + age67to69,
         age70to79 = age70to74 + age75to79,
         age80plus = age80to84 + ageover84) %>%
  select(NAME, GEOID, age0to9:age80plus) %>%
```

```
  pivot_longer(-c(NAME, GEOID), names_to = "agegroup", values_to =
"count") %>%
  mutate(sex = "Female")

agegroups_wa <- agegroups_male_wa %>%
  bind_rows(agegroups_female_wa)

agegroups_wa %>%
  ggplot() +
  geom_bar(aes(x = agegroup, y = ifelse(sex == "Female", -count,
count), fill = sex), stat = "identity") +
  coord_flip() +
  geom_text(aes(x = agegroup, y = -count, label = ifelse (sex ==
"Female",

percent(count/sum(count), accuracy = 0.1), "")),
            color = "white", hjust = -0.2) +
  geom_text(aes(x = agegroup, y = count, label =ifelse (sex == "Male",

percent(count/sum(count), accuracy = 0.1), "")),
            color = "white", hjust = 1.1) +
  scale_x_discrete(labels = c("0-9", "10-19","20-29", "30-39", "40-49",
"50-59", "60-69", "70-79", "80+")) +
  labs(x = "",
       y = "Population",
       fill = "",
       title = "Figure 4: Washington State Population \nby Age &
Gender",
       subtitle = "2010 Decennial Census") +
  scale_y_continuous(labels = abs) +
  theme(panel.grid = element_blank()) +
  theme_economist_white() +
  theme(legend.position = "bottom") +
  scale_fill_wsj()
```