

Population and Economic Trends in Maui County

La Su

```
library(dplyr)
library(ggplot2)

maui_trends <- readRDS("maui_trends.rds")
```

1. Introduction

This project explores three key characteristics: total population, median household income, and unemployment rate trends in Maui County. The data is from American Community Survey (ACS) 5-year estimates between 2010 and 2023. Changes in population size, household income, and labor market conditions can have significant implications for local residents. Unemployment data is available starting in 2011. The value for 2010 is missing and is excluded from the unemployment visualization.

In addition to time trends, a map of median household income is used to show how income levels vary across different areas within County. To help users observe these trends visually, I also created a Shiny app with multiple tabs and year range sliders.

```
library(tidycensus)
# census_api_key("94b46884a3b542109a2af8bdf4b79025ca4e652d", install = TRUE)
```

2. Analysis on Population

```
library(purrr)

years <- 2010:2023
```

```
pop_time <- map_df(years, function(y) {  
  get_acs(  
    geography = "county",  
    variables = "B01003_001",  
    state = "HI",  
    county = "Maui County",  
    year = y,  
    survey = "acs5"  
  ) %>%  
  mutate(year = y)  
})
```

Getting data from the 2006-2010 5-year ACS

Getting data from the 2007-2011 5-year ACS

Getting data from the 2008-2012 5-year ACS

Getting data from the 2009-2013 5-year ACS

Getting data from the 2010-2014 5-year ACS

Getting data from the 2011-2015 5-year ACS

Getting data from the 2012-2016 5-year ACS

Getting data from the 2013-2017 5-year ACS

Getting data from the 2014-2018 5-year ACS

Getting data from the 2015-2019 5-year ACS

Getting data from the 2016-2020 5-year ACS

Getting data from the 2017-2021 5-year ACS

Getting data from the 2018-2022 5-year ACS

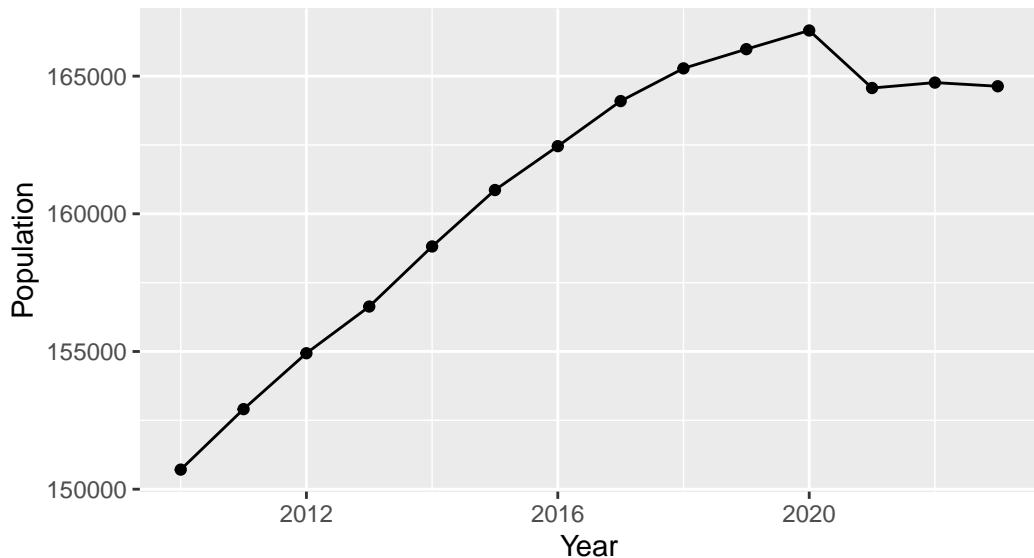
Getting data from the 2019-2023 5-year ACS

```
pop_time
```

```
# A tibble: 14 x 6
  GEOID NAME      variable   estimate    moe  year
  <chr> <chr>     <chr>       <dbl> <dbl> <int>
1 15009 Maui County, Hawaii B01003_001 150711    26 2010
2 15009 Maui County, Hawaii B01003_001 152907    17 2011
3 15009 Maui County, Hawaii B01003_001 154937    18 2012
4 15009 Maui County, Hawaii B01003_001 156633    18 2013
5 15009 Maui County, Hawaii B01003_001 158814    19 2014
6 15009 Maui County, Hawaii B01003_001 160863    21 2015
7 15009 Maui County, Hawaii B01003_001 162456    18 2016
8 15009 Maui County, Hawaii B01003_001 164094    16 2017
9 15009 Maui County, Hawaii B01003_001 165281    16 2018
10 15009 Maui County, Hawaii B01003_001 165979    15 2019
11 15009 Maui County, Hawaii B01003_001 166657    184 2020
12 15009 Maui County, Hawaii B01003_001 164568    17 2021
13 15009 Maui County, Hawaii B01003_001 164765    21 2022
14 15009 Maui County, Hawaii B01003_001 164632    17 2023
```

```
ggplot(pop_time, aes(x = year, y = estimate)) +
  geom_line() +
  geom_point() +
  labs(
    title = "Population of Maui County",
    subtitle = "ACS 5-year Estimates (2010-2023)",
    x = "Year",
    y = "Population"
  )
```

Population of Maui County ACS 5-year Estimates (2010–2023)



Interpretation: this figure shows the population of Maui county from 2010 to 2023. The population increased steadily from approximately 150,000 in 2010 to near 167,000 in 2020. After 2020, population declined a bit.

3. Analysis on Economic

```
income_time <- map_df(years, function(y) {  
  get_acs(  
    geography = "county",  
    variables = "B19013_001",  
    state = "HI",  
    county = "Maui County",  
    year = y,  
    survey = "acs5"  
) %>%  
  mutate(year = y)  
})
```

Getting data from the 2006–2010 5-year ACS

Getting data from the 2007–2011 5-year ACS

Getting data from the 2008-2012 5-year ACS

Getting data from the 2009-2013 5-year ACS

Getting data from the 2010-2014 5-year ACS

Getting data from the 2011-2015 5-year ACS

Getting data from the 2012-2016 5-year ACS

Getting data from the 2013-2017 5-year ACS

Getting data from the 2014-2018 5-year ACS

Getting data from the 2015-2019 5-year ACS

Getting data from the 2016-2020 5-year ACS

Getting data from the 2017-2021 5-year ACS

Getting data from the 2018-2022 5-year ACS

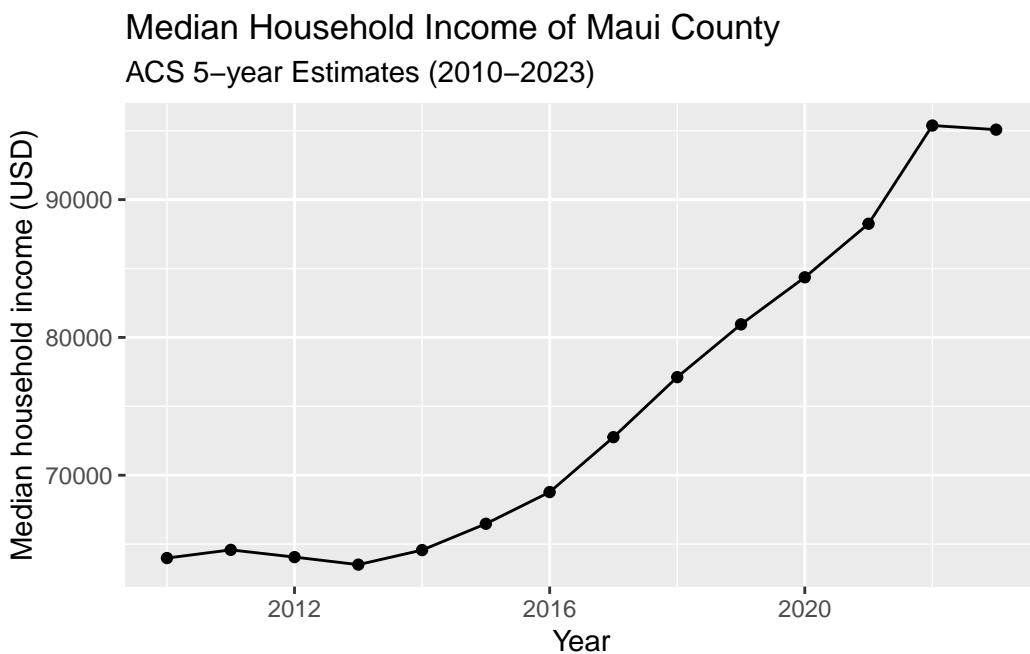
Getting data from the 2019-2023 5-year ACS

income_time

```
# A tibble: 14 x 6
  GEOID NAME      variable   estimate    moe  year
  <chr> <chr>      <chr>     <dbl> <dbl> <int>
1 15009 Maui County, Hawaii B19013_001    63989  1956  2010
2 15009 Maui County, Hawaii B19013_001    64583  2418  2011
3 15009 Maui County, Hawaii B19013_001    64058  2029  2012
4 15009 Maui County, Hawaii B19013_001    63512  2165  2013
5 15009 Maui County, Hawaii B19013_001    64567  2135  2014
6 15009 Maui County, Hawaii B19013_001    66476  2202  2015
7 15009 Maui County, Hawaii B19013_001    68777  2169  2016
8 15009 Maui County, Hawaii B19013_001    72762  1654  2017
9 15009 Maui County, Hawaii B19013_001    77117  2267  2018
```

10	15009	Maui County, Hawaii	B19013_001	80948	3153	2019
11	15009	Maui County, Hawaii	B19013_001	84363	2227	2020
12	15009	Maui County, Hawaii	B19013_001	88249	3778	2021
13	15009	Maui County, Hawaii	B19013_001	95379	3268	2022
14	15009	Maui County, Hawaii	B19013_001	95076	3077	2023

```
ggplot(income_time, aes(x = year, y = estimate)) +
  geom_line() +
  geom_point() +
  labs(
    title = "Median Household Income of Maui County",
    subtitle = "ACS 5-year Estimates (2010-2023)",
    x = "Year",
    y = "Median household income (USD)"
  )
```



Interpretation: this figure shows the median household income in Maui county from 2010 to 2023. Median income remained stable in the early 2010s, growth after 2013. By 2022-2023, median household income exceeded \$90,000, indicating strong income growth in recent years. This trend shows increasing earnings capacity, although rising income may encounter increased living cost.

4. Analysis on Unemployment Rate

```
library(tidyr)

unemp_time <- map_df(2011:2023, function(y) {
  get_acs(
    geography = "county",
    variables = c(
      labor_force = "B23025_002",
      unemployed = "B23025_005"
    ),
    state = "HI",
    county = "Maui County",
    year = y,
    survey = "acs5"
  ) %>%
  select(variable, estimate) %>%
  pivot_wider(names_from = variable, values_from = estimate) %>%
  mutate(
    year = y,
    unemployment_rate = unemployed / labor_force * 100
  )
})
```

Getting data from the 2007-2011 5-year ACS

Getting data from the 2008-2012 5-year ACS

Getting data from the 2009-2013 5-year ACS

Getting data from the 2010-2014 5-year ACS

Getting data from the 2011-2015 5-year ACS

Getting data from the 2012-2016 5-year ACS

Getting data from the 2013-2017 5-year ACS

Getting data from the 2014-2018 5-year ACS

Getting data from the 2015-2019 5-year ACS

Getting data from the 2016-2020 5-year ACS

Getting data from the 2017-2021 5-year ACS

Getting data from the 2018-2022 5-year ACS

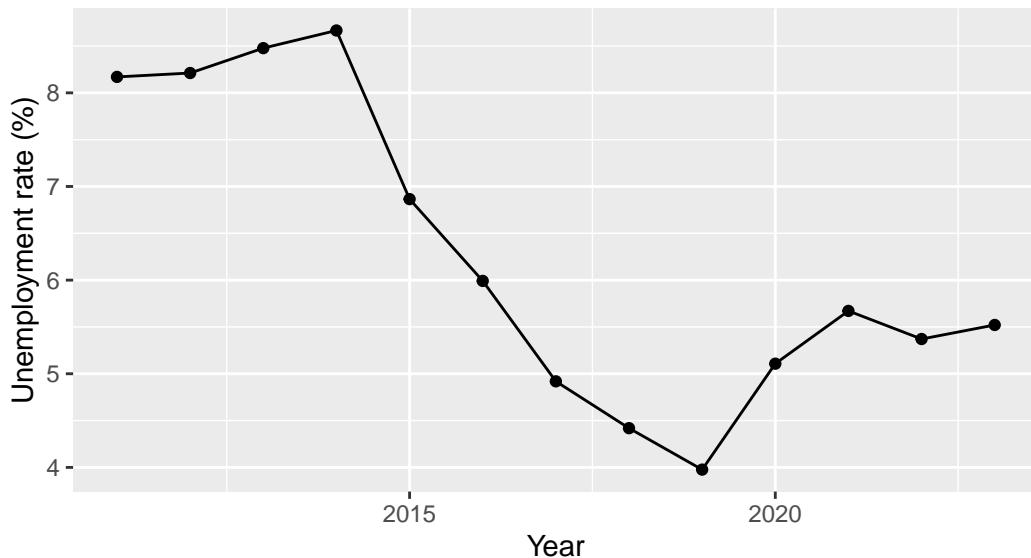
Getting data from the 2019-2023 5-year ACS

```
unemp_time
```

```
# A tibble: 13 x 4
  labor_force unemployed year unemployment_rate
    <dbl>        <dbl> <int>            <dbl>
1     85532      6988  2011            8.17
2     86585      7110  2012            8.21
3     87078      7382  2013            8.48
4     87192      7556  2014            8.67
5     87952      6038  2015            6.87
6     88256      5288  2016            5.99
7     88390      4348  2017            4.92
8     88279      3901  2018            4.42
9     88797      3531  2019            3.98
10    88904      4541  2020            5.11
11    87195      4945  2021            5.67
12    86911      4668  2022            5.37
13    86215      4760  2023            5.52
```

```
ggplot(unemp_time, aes(x = year, y = unemployment_rate)) +
  geom_line() +
  geom_point() +
  labs(
    title = "Unemployment Rate in Maui County",
    subtitle = "ACS 5-Year Estimates (2011-2023)",
    x = "Year",
    y = "Unemployment rate (%)"
  )
```

Unemployment Rate in Maui County ACS 5-Year Estimates (2011–2023)



Interpretation: this figure shows the unemployment rate in Maui County from 2011 to 2023. The unemployment rate was relatively high in the early 2010s, higher than 8% between 2011 and 2014. The unemployment declined from 2015 to 2019, reaching about 4% in 2019. After 2020, the unemployment rate increased, reflecting recent labor market depression.

5. Mapping

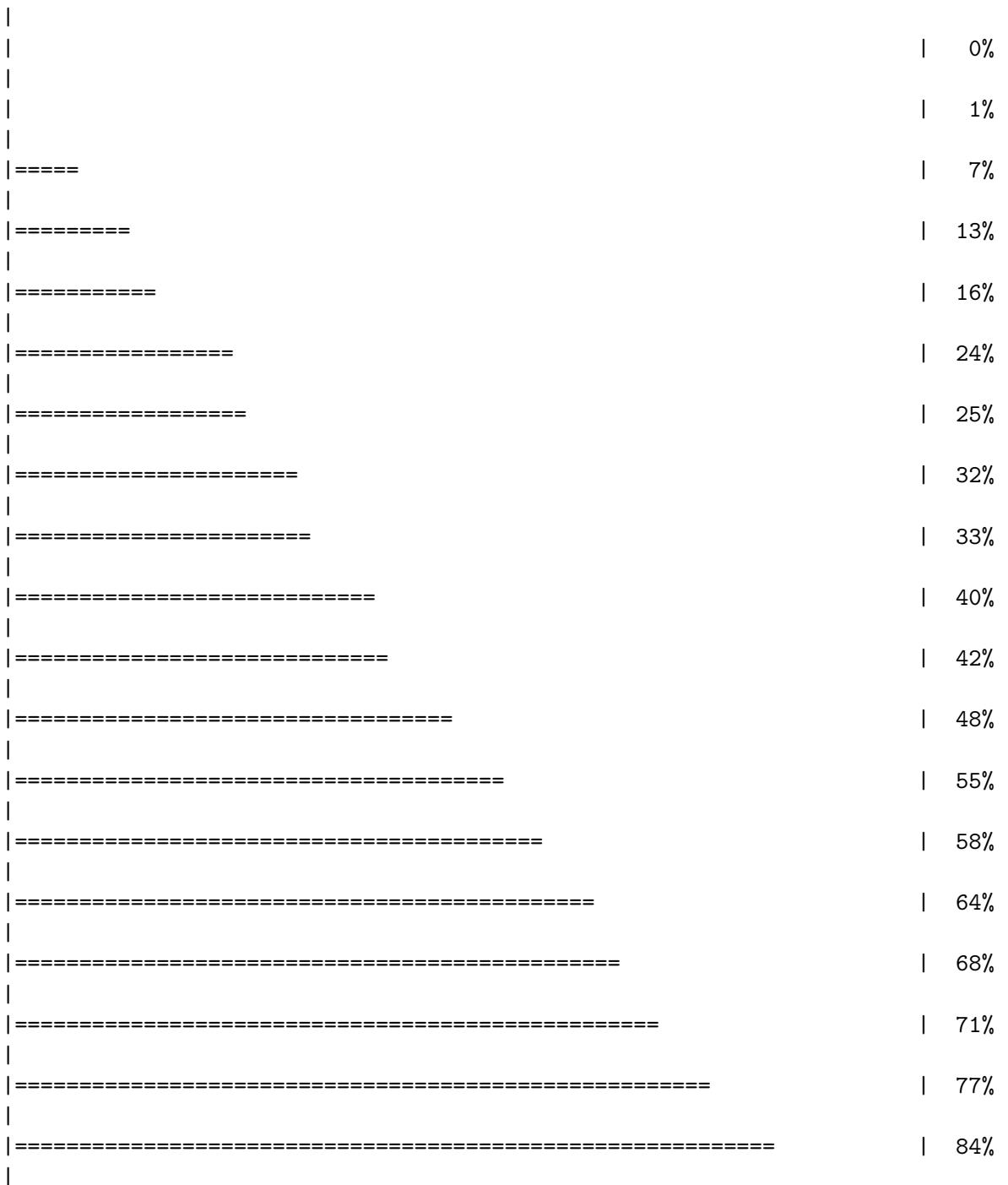
```
library(sf)
```

Linking to GEOS 3.13.0, GDAL 3.8.5, PROJ 9.5.1; sf_use_s2() is TRUE

```
income_med <- get_acs(  
  geography = "tract",  
  variables = "B19013_001",  
  state = "HI",  
  county = "Maui County",  
  year = 2023,  
  survey = "acs5",  
  geometry = TRUE  
)
```

Getting data from the 2019–2023 5-year ACS

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



```

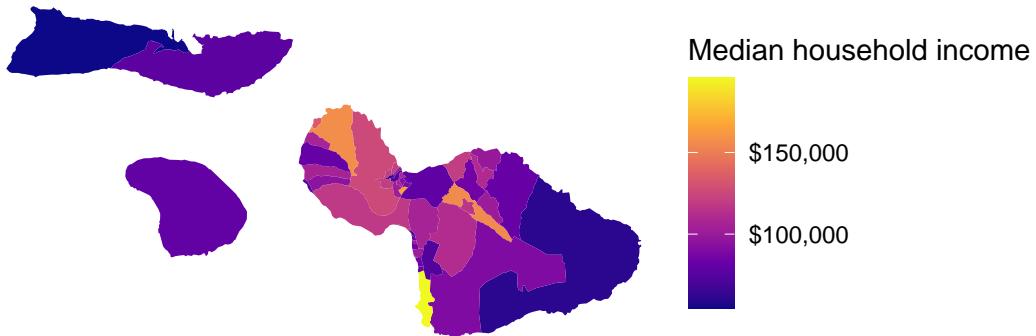
=====
| 86%
|
=====
| 92%
|
=====
| 98%
|
=====
| 100%

```

```
income_med <- income_med %>%
  filter(!is.na(estimate))
```

```
ggplot(income_med) +
  geom_sf(aes(fill = estimate), color = NA) +
  scale_fill_viridis_c(
    option = "plasma",
    labels = scales::dollar_format()
  ) +
  labs(
    title = "Median Household Income",
    subtitle = "Maui County, ACS 5-Year Estimates (2019–2023)",
    fill = "Median household income"
  ) +
  theme_void()
```

Median Household Income
Maui County, ACS 5-Year Estimates (2019–2023)



Interpretation: this map shows median household income across census tracts in Maui County. Income levels vary across different parts of the county. Higher income tracts are concentrated in coastal and residential areas, lower income tracts are in other parts of the island.

6. Conclusion

This project explores population and economic trends in Maui County. The results show that Maui's population increased steadily from 2010 through the late 2010s. Over the same period, median household income rose notably, showing broader economic growth and rising living costs. Unemployment rates declined after the early 2010s, reached a low before 2020, and then increased around the COVID-19 period, indicating the economic depressions. The Shiny app allows users to explore these trends across different time ranges, making it easier to compare changes over time.