

# 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

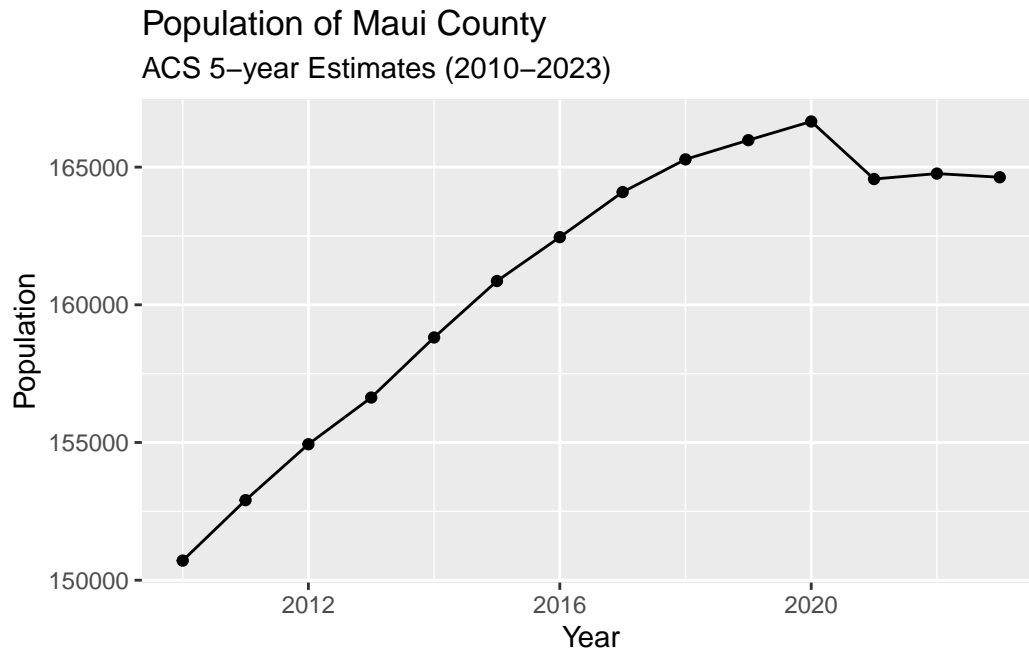
Getting data from the 2019-2023 5-year ACS

```
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"  
  )
```



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

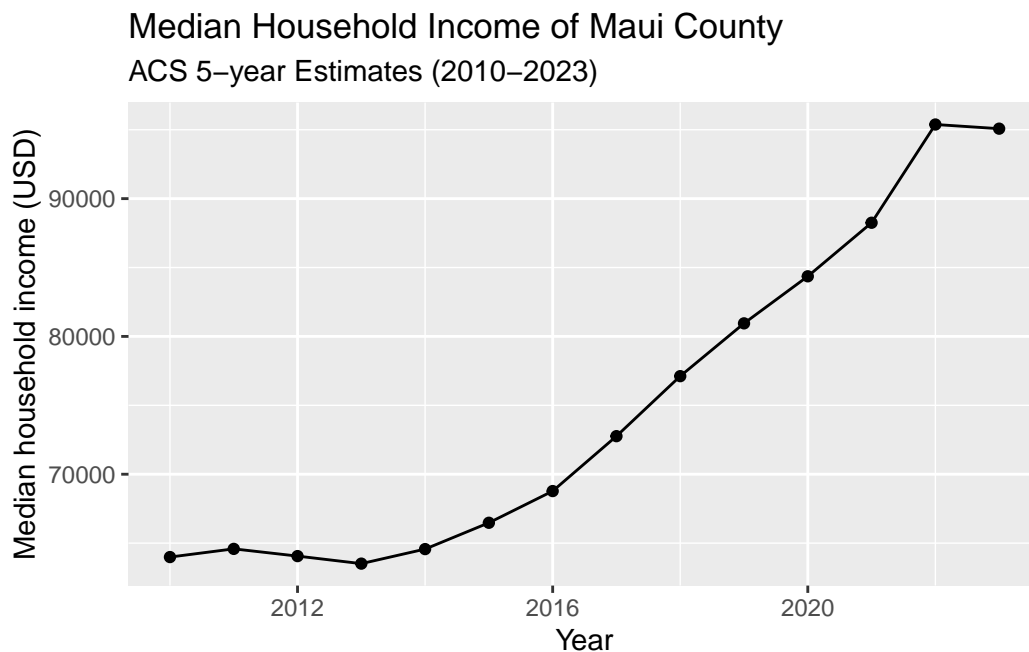
```
income_time
```

```
# 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
```

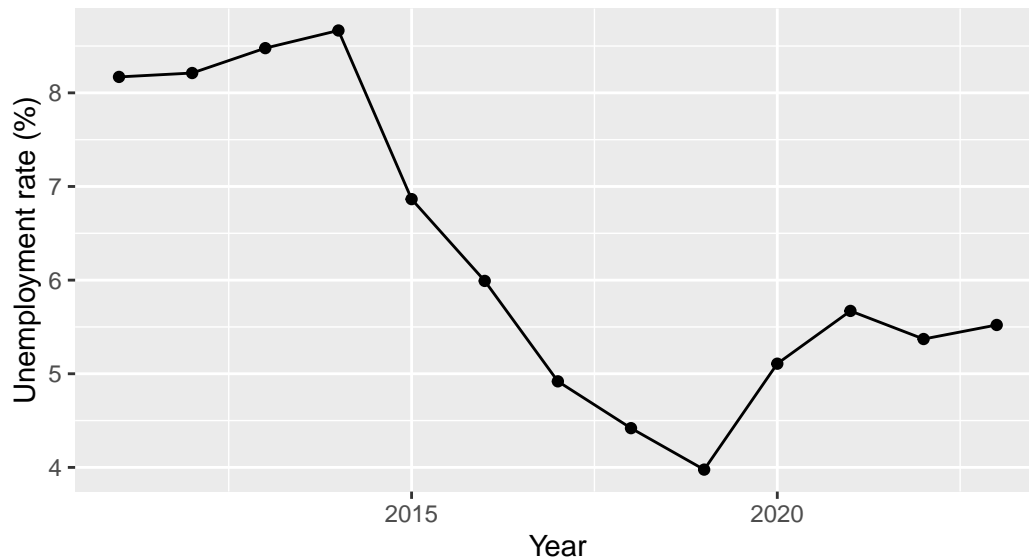
```
# A tibble: 13 x 4
```

	labor_force <dbl>	unemployed <dbl>	year <int>	unemployment_rate <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

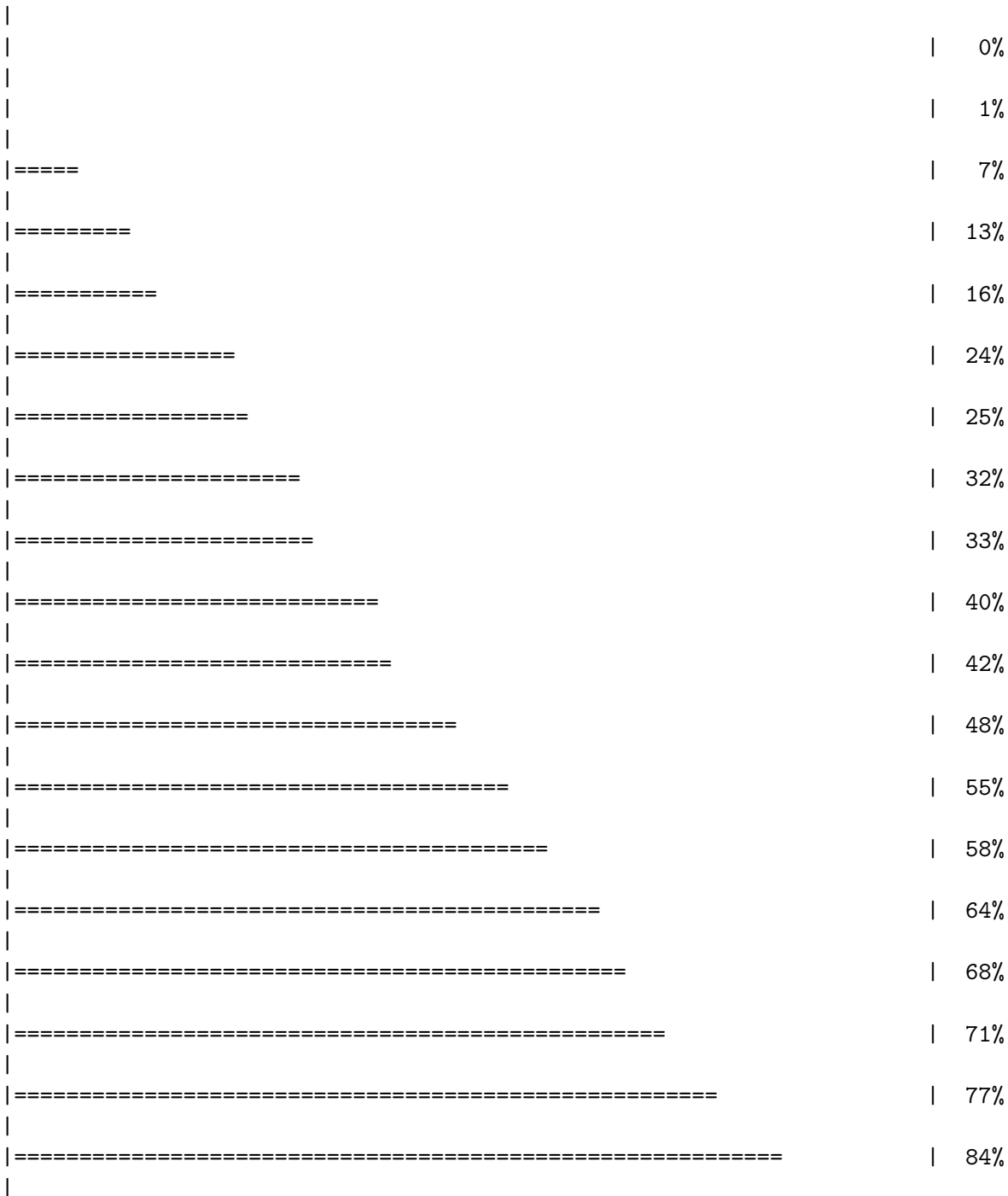
```
library(sf)
```

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))

```

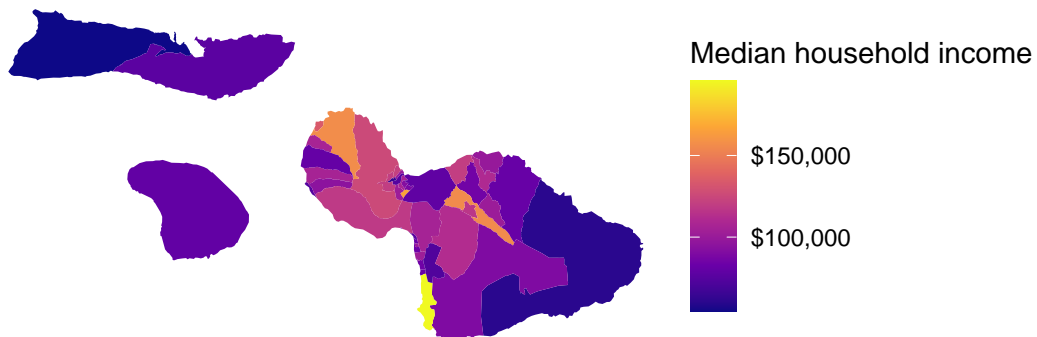
```

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.