Editting Data

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*.

```
# Load necessary libraries
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.4.3     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.0
## v purrr     1.0.2
## -- 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 become errors
```

```
library(psych)
```

```
##
## Attaching package: 'psych'
##
## The following objects are masked from 'package:ggplot2':
##
##     %+%, alpha
```

```
library(stats)
library(lme4)
```

```
## Loading required package: Matrix
##
## Attaching package: 'Matrix'
##
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack
```

```
library(scales)
```

```
##
```

```
## Attaching package: 'scales'
##
## The following objects are masked from 'package:psych':
##
##     alpha, rescale
##
## The following object is masked from 'package:purrr':
##
##     discard
##
## The following object is masked from 'package:readr':
##
##     col_factor
```

```
library(jtools)
library(broom)
```

```
## Registered S3 methods overwritten by 'broom':
##   method            from
##   tidy.glht         jtools
##   tidy.summary.glht jtools
```

```
loading_zipdata <- "~/repos/Diversity-Richness/Zip.Code.Datasets/zip_data_unedited_nolabels.csv"
#making a pathway to the downloaded census data
Unedited_zipdata <- read.csv(loading_zipdata) #loading the census data
```

```
reduced_collumns_zip <- c(1:2, 33:34, 42, 47:146) #removing unnecessary columns


Zipcode_Census_data<- Unedited_zipdata[ , reduced_collumns_zip]
#make a new table without unnecessary columns

colnames(Zipcode_Census_data) <- c("FIPS", "Name", "3_Digit_Tabulation", "5_Digit_Tabulation" , "Area_Na

#writing usable column names
```

```
write.csv(Zipcode_Census_data, file = "~/repos/Diversity-Richness/Zip.Code.Datasets/Zipcode_Census_data
          row.names = FALSE)
#saving the table as a csv file
```

```
library(tidyverse)
library(ggplot2)

ggplot(Zipcode_Census_data) +
  geom_smooth(aes(x = X_Total_Population_White_Alone, y = Median_Household_Income, color = "#A1C9F4"), i
  geom_smooth(aes(x = X_Total_Population_Black_or_African_American_Alone, y = Median_Household_Income, c
  geom_smooth(aes(x = X_Total_Population_Asian_Alone, y = Median_Household_Income, color = "#8DE5A1"), i
  geom_smooth(aes(x = X_Total_Population_American_Indian_And_Native_Alaskan_Alone, y = Median_Household_
  geom_smooth(aes(x = X_Hispanic, y = Median_Household_Income, color = "#FF9F9B"), fill = "#FF9F9B", alp
  scale_color_manual(values = c( "#8DE5A1" = "#8DE5A1","#A1C9F4" = "#A1C9F4","#D0BBFF" = "#D0BBFF", "#FF
                     name = "Race",
                     labels = c("Asian", "White", "Native American/Alaskan", "Hispanic", "Black")) +
  labs(x = "Percentage Population of Population for Each Racial Demgraphic", y = "Median Household Incom
```

```
## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

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## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).
```

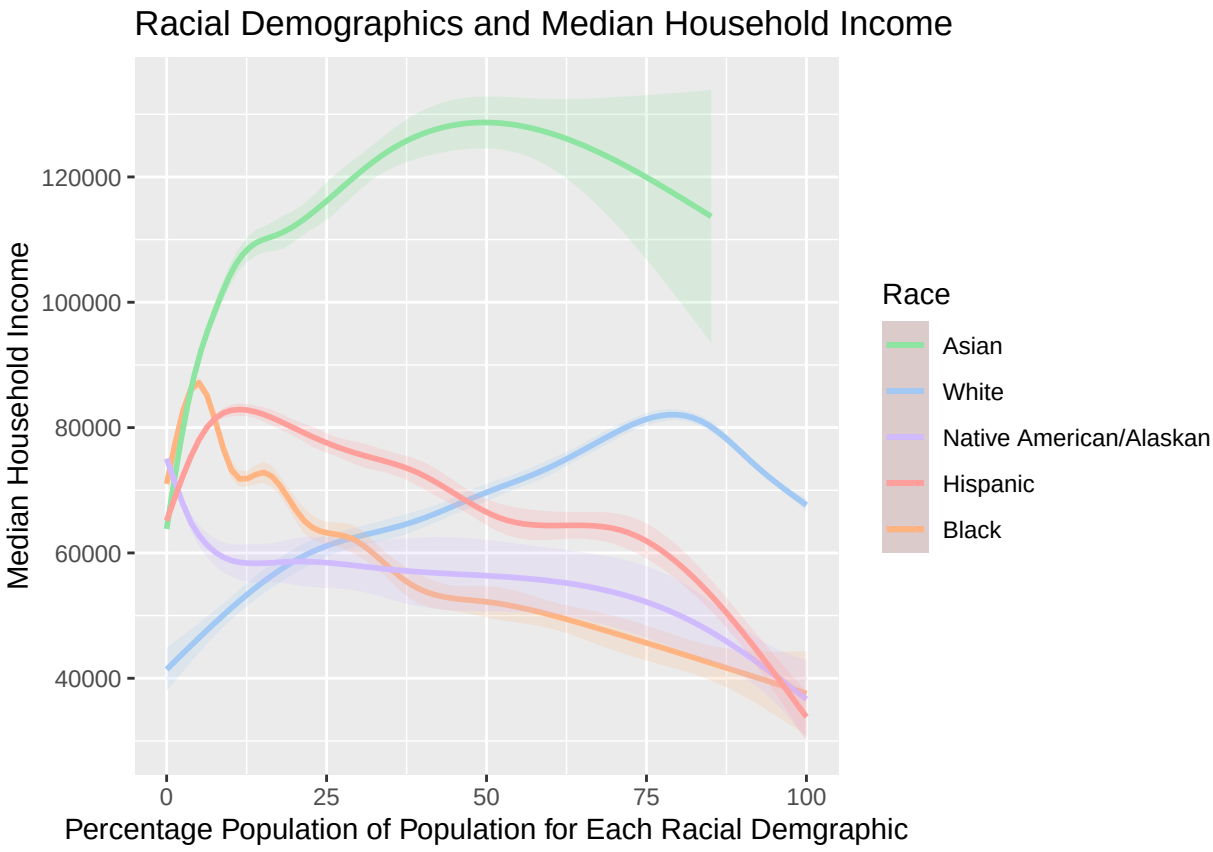

Figure 1: Race-Income Plot

```r
#Don't know how to correct red shading on key
```

```r
library(tidyverse)
library(ggplot2)


ggplot(Zipcode_Census_data) +
  geom_smooth(aes(x = X_Total_Population_White_Alone, y = Median_Household_Income, color = "#A1C9F4"), f
  geom_smooth(aes(x = X_Total_Population_Black_or_African_American_Alone, y = Median_Household_Income, c
  geom_smooth(aes(x = X_Total_Population_Asian_Alone, y = Median_Household_Income, color = "#8DE5A1"), f
  geom_smooth(aes(x = X_Total_Population_American_Indian_And_Native_Alaskan_Alone, y = Median_Household_
  geom_smooth(aes(x = X_Hispanic, y = Median_Household_Income, color = "#FF9F9B"), fill = "#FF9F9B", alp
  scale_color_manual(values = c( "#8DE5A1" = "#8DE5A1","#A1C9F4" = "#A1C9F4","#D0BBFF" = "#D0BBFF", "#FF
                     name = "Race",
                     labels = c("Asian", "White", "Native American/Alaskan", "Hispanic", "Black")) +
  labs(x = "Percentage Population of Population for Each Racial Demographic", y = "Median Household Inco
```

```
## `geom_smooth()` using formula = 'y ~ x'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

## `geom_smooth()` using formula = 'y ~ x'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

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## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).
```
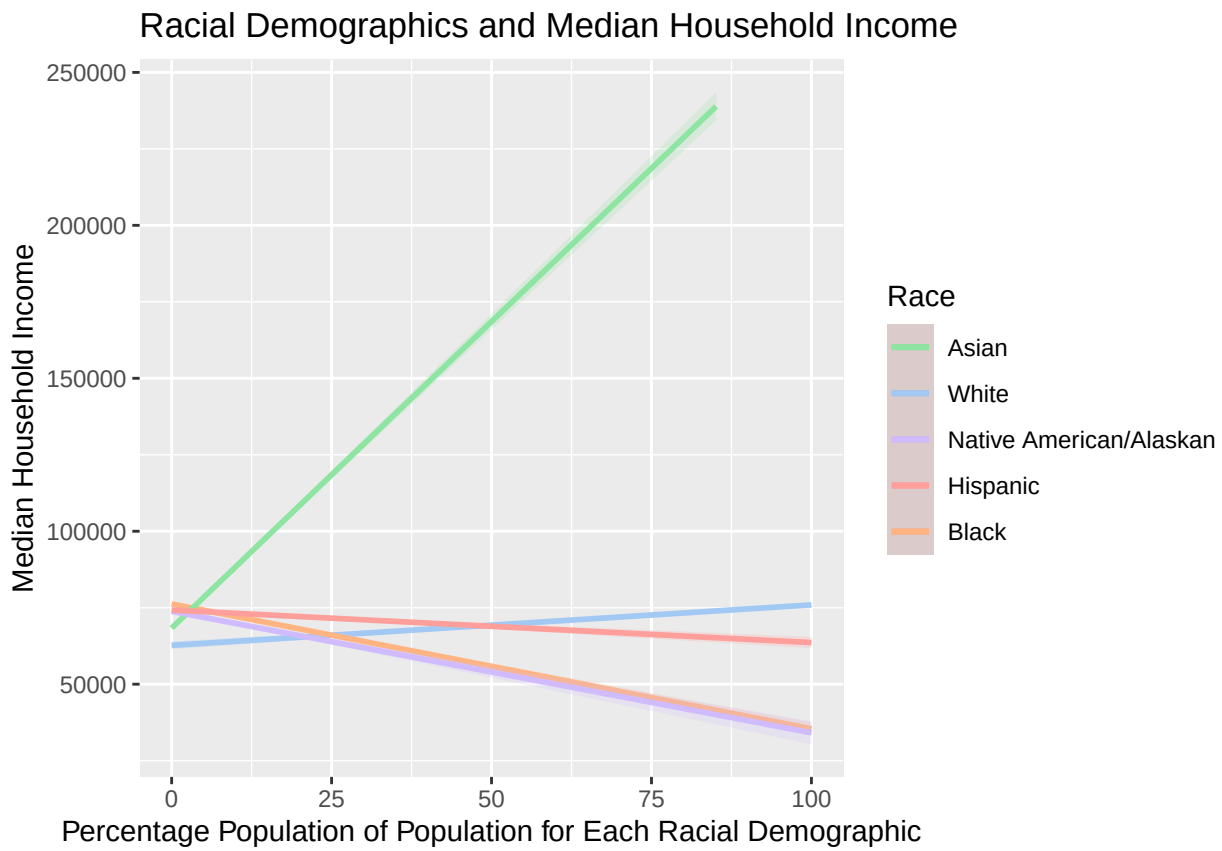




```
Zipcode_with_Zones <- Zipcode_Census_data %>%
  mutate(Zipcode_Zone= case_when(
   substr(Name, 7, 8) == "00" ~ "Puerto Rico",
   substr(Name, 7, 7) == "0" ~ "North East (Around MA)",
    substr(Name, 7, 7) == "1" ~ "Lower North East (Arond NY)",
    substr(Name, 7, 7) == "2" ~ "Central East Coast (Around VA)",
    substr(Name, 7, 7) == "3" ~ "South East (Around FL)",
    substr(Name, 7, 7) == "4" ~ "Great Lakes (Around MI)",
    substr(Name, 7, 7) == "5" ~ "Northern Midwest (Around MN)",
    substr(Name, 7, 7) == "6" ~ "Central Interior (Around IL)",
    substr(Name, 7, 7) == "7" ~ "Central South (Around TX)",
    substr(Name, 7, 7) == "8" ~ "Western Interior (Around CO)",
    substr(Name, 7, 7) == "9" ~ "West Coast (includes Hawaii/Alaska)",
    TRUE ~ "Other"  # Default case
  ), .after = Area_Name)

Zipcode_with_States <- Zipcode_with_Zones %>%
  mutate(State_Territory= case_when(
    between(as.integer(substr(Name, 7, 9)), 039, 049) ~ "ME",
    between(as.integer(substr(Name, 7, 9)), 030, 038) ~ "NH",
    between(as.integer(substr(Name, 7, 9)), 010, 027) ~ "MA",
    between(as.integer(substr(Name, 7, 9)), 028, 029) ~ "RI",
    between(as.integer(substr(Name, 7, 9)), 150, 196) ~ "PA",
    between(as.integer(substr(Name, 7, 9)), 197, 199) ~ "DE",
    between(as.integer(substr(Name, 7, 9)), 206, 219) ~ "MD",
    between(as.integer(substr(Name, 7, 9)), 200, 205) ~ "DC",
```

```
    between(as.integer(substr(Name, 7, 9)), 220, 246) ~ "VA",
    between(as.integer(substr(Name, 7, 9)), 247, 269) ~ "WV",
    between(as.integer(substr(Name, 7, 9)), 386, 399) ~ "MS",
    between(as.integer(substr(Name, 7, 9)), 370, 385) ~ "TN",
    between(as.integer(substr(Name, 7, 9)), 700, 715) ~ "LA",
    between(as.integer(substr(Name, 7, 9)), 716, 729) ~ "AR",
    between(as.integer(substr(Name, 7, 9)), 550, 567) ~ "MN",
    between(as.integer(substr(Name, 7, 9)), 820, 831) ~ "WY",
    between(as.integer(substr(Name, 7, 9)), 832, 839) ~ "ID",
    between(as.integer(substr(Name, 7, 9)), 870, 884) ~ "NM",
    between(as.integer(substr(Name, 7, 9)), 889, 899) ~ "NV",
    between(as.integer(substr(Name, 7, 9)), 900, 961) ~ "CA",
    between(as.integer(substr(Name, 7, 9)), 980, 994) ~ "WA",
    between(as.integer(substr(Name, 7, 9)), 967, 968) ~ "HI",
    between(as.integer(substr(Name, 7, 9)), 995, 999) ~ "AK",
    between(as.integer(substr(Name, 7, 9)), 962, 966) ~ "AP",
    between(as.integer(substr(Name, 7, 9)), 006, 009) ~ "PR/VI",
    between(as.integer(substr(Name, 7, 8)), 10, 14) ~ "NY",
    between(as.integer(substr(Name, 7, 8)), 07, 08) ~ "NJ",
    between(as.integer(substr(Name, 7, 8)), 27, 28) ~ "NC",
    between(as.integer(substr(Name, 7, 8)), 30, 31) ~ "GA",
    between(as.integer(substr(Name, 7, 8)), 32, 34) ~ "FL",
    between(as.integer(substr(Name, 7, 8)), 35, 36) ~ "AL",
    between(as.integer(substr(Name, 7, 8)), 40, 42) ~ "KY",
    between(as.integer(substr(Name, 7, 8)), 43, 45) ~ "OH",
    between(as.integer(substr(Name, 7, 8)), 46, 47) ~ "IN",
    between(as.integer(substr(Name, 7, 8)), 48, 49) ~ "MI",
    between(as.integer(substr(Name, 7, 8)), 50, 12) ~ "IA",
    between(as.integer(substr(Name, 7, 8)), 53, 54) ~ "WI",
    between(as.integer(substr(Name, 7, 8)), 60, 62) ~ "IL",
    between(as.integer(substr(Name, 7, 8)), 63, 65) ~ "MO",
    between(as.integer(substr(Name, 7, 8)), 66, 67) ~ "KS",
    between(as.integer(substr(Name, 7, 8)), 68, 69) ~ "NE",
    between(as.integer(substr(Name, 7, 8)), 73, 74) ~ "OK",
    between(as.integer(substr(Name, 7, 8)), 75, 79) ~ "TX",
    between(as.integer(substr(Name, 7, 8)), 80, 81) ~ "CO",
    between(as.integer(substr(Name, 7, 8)), 85, 86) ~ "AZ",
    str_detect(Name, "05") ~ "VT",
    str_detect(Name, "06") ~ "CT",
    str_detect(Name, "29") ~ "SC",
    str_detect(Name, "57") ~ "SD",
    str_detect(Name, "58") ~ "ND",
    str_detect(Name, "59") ~ "MT",
    str_detect(Name, "84") ~ "UT",
    str_detect(Name, "97") ~ "OR",
    str_detect(Name, "09") ~ "AE",
    str_detect(Name, "340") ~ "AA",
    str_detect(Name, "969") ~ "PW/FM/MH/MP/GU",
    str_detect(Name, "96799") ~ "AS",
    TRUE ~ "Other"  # Default case
  ), .after = Zipcode_Zone)

write.csv(Zipcode_with_States, file = "~/repos/Diversity-Richness/Zip.Code.Datasets/Zipcode_data_with_A
```

```r
# Create the boxplot
ggplot(Zipcode_with_Zones, aes(x = Zipcode_Zone, y = X_Total_Population_White_Alone, fill = Zipcode_Zone
  geom_boxplot(outlier.shape = NA) +
  labs(x = "ZIP Code Zones", y = "Percentage White",
       title = "Percentage of Population White by Zip Code Region", fill = "Zone Names") +
  theme(axis.text.x = element_blank())
```

```
## Warning: Removed 587 rows containing non-finite values (`stat_boxplot()`).
```

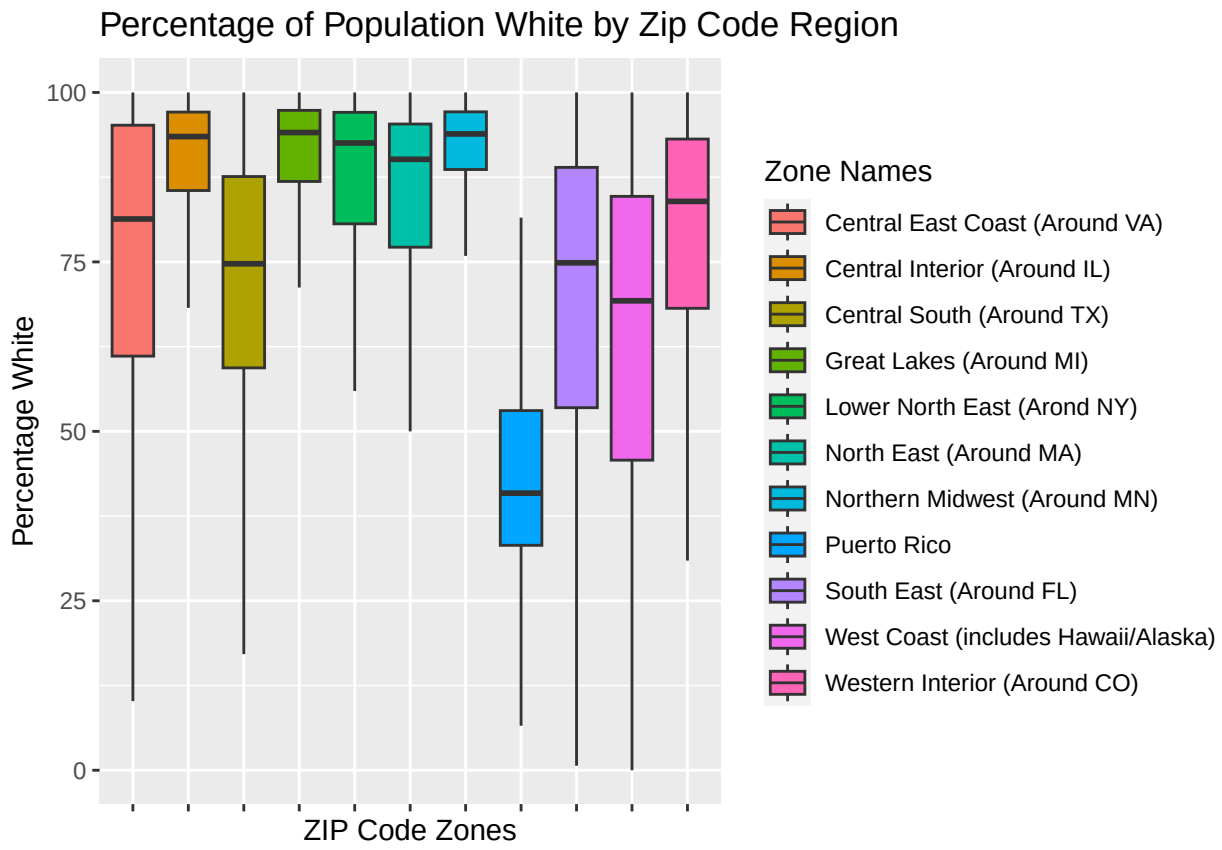


Figure 2: (ref:Whiteness-Income-Boxplot-Caption)

(ref:ZIP-Region-Table-Caption) ZIP Region Table.

```r
Zipcode_with_States %>%
  group_by(Zipcode_Zone) %>%
  summarize(
    mean.percent.white = mean(X_Total_Population_White_Alone, na.rm = T),
    sd.percent.white = sd(X_Total_Population_White_Alone, na.rm = T),
    mean.percent.black = mean(X_Total_Population_Black_or_African_American_Alone, na.rm = T),
    sd.percent.black = sd(X_Total_Population_Black_or_African_American_Alone, na.rm = T),
    mean.percent.asian = mean(X_Total_Population_Asian_Alone, na.rm = T),
    sd.percent.asian = sd(X_Total_Population_Asian_Alone, na.rm = T),
    mean.percent.native.american = mean(X_Total_Population_American_Indian_And_Native_Alaskan_Alone, na
    sd.percent.native.american = sd(X_Total_Population_American_Indian_And_Native_Alaskan_Alone, na.rm =
```

Table 1: Average ZIP Code Demographics by Region

Region	% White	SD White	% Black	SD Black	% Asian	SD Asian	% Native Americn	SD Native American	% Hispanic	SD Hispanic	ZIP Codes Per Region
Central East Coast (Around VA)	**75.02**	23.79	**15.97**	20.58	**1.85**	4.47	**0.53**	3.80	**5.47**	7.66	**3452**
Central Interior (Around IL)	**87.65**	16.50	**4.12**	12.27	**1.34**	3.58	**0.58**	3.36	**5.78**	9.86	**3721**
Central South (Around TX)	**71.48**	20.73	**11.12**	17.71	**1.62**	3.89	**2.05**	5.32	**19.83**	24.46	**3808**
Great Lakes (Around MI)	**88.36**	16.24	**5.32**	13.45	**1.05**	2.67	**0.32**	1.56	**3.47**	5.70	**3812**
Lower North East (Arond NY)	**84.84**	19.50	**5.30**	12.05	**2.59**	6.03	**0.29**	2.54	**6.36**	10.47	**3726**
North East (Around MA)	**83.01**	18.66	**4.39**	9.62	**3.95**	7.19	**0.32**	1.56	**8.06**	12.45	**2445**
Northern Midwest (Around MN)	**89.37**	15.50	**1.48**	5.30	**1.05**	2.77	**3.08**	12.65	**3.74**	5.62	**3766**
Puerto Rico	**43.15**	18.15	**9.12**	9.05	**0.23**	0.45	**0.15**	0.26	**97.96**	6.07	**132**
South East (Around FL)	**68.73**	24.74	**21.41**	24.39	**1.55**	3.32	**0.33**	1.23	**9.14**	14.17	**3483**
West Coast (includes Hawaii/Alaska)	**63.64**	26.01	**3.04**	5.78	**7.91**	12.41	**5.51**	17.96	**22.06**	23.07	**3177**
Western Interior (Around CO)	**76.22**	24.31	**1.77**	4.17	**1.43**	2.87	**6.29**	20.06	**20.39**	23.04	**2252**

```
    mean.percent.hispanic = mean(X_Hispanic, na.rm = T),
    sd.percent.hispanic = sd(X_Hispanic, na.rm = T),
    n.per.region = n()
  ) %>%
  knitr::kable("latex", col.names = c("Region", "% White",  "SD White", "% Black",  "SD Black", "% Asian
               digits = 2,
               align = "lrlrlrlrlrlr",
               caption = "Average ZIP Code Demographics by Region") %>%
 kableExtra::kable_styling(position = "left", latex_options = "scale_down") %>%
  kableExtra::column_spec(seq(2, 12, 2), bold = TRUE)
```

```
#for some reason scale doum is not working
#struggling with captioning and referencing
```

@ref(fig:plot-primary-results)

I will now refer to "Figure @ref(fig:Smooth-Plot-Income-Race)" , Figure @ref(fig:Smooth-Plot-Income-Race), Figure @ref(fig:Race-Income Plot), Figure @ref(fig:Race-Income Plot)

Descriptive Chunk:

```
library(papaja)
```

```
## Loading required package: tinylabels
```

```
##
## Attaching package: 'papaja'
```

```
## The following object is masked from 'package:jtools':
##
##     theme_apa
```

```
Census.desc <- Zipcode_with_States %>%
  select(X_Total_Population_White_Alone, Median_Household_Income) %>%
  drop_na()

Census.desc.long <- Census.desc %>%
  pivot_longer(c(X_Total_Population_White_Alone, Median_Household_Income), names_to = "measure")

Census.desc.long %>%
  group_by(measure) %>%
```

Table 2:

measure	mean	median	sd	first_quartile	third_quartile	range
Median_Household_Income	73,132.63	66,993.00	31,359.58	53,466.00	85,313.00	247,502.00
X_Total_Population_White_Alone	78.92	87.45	22.12	69.49	95.04	100.00

```
  summarize(mean = mean(value),
         median = median(value),
         sd = sd(value),
         first_quartile = quantile(value, probs = c(.25)),
         third_quartile = quantile(value, probs = c(.75)),
         range = diff(range(value))) %>%
  apa_table()
```

Hypothesis Testing: Whiteness/Income

```
whiteness_income_corr <- cor(Census.desc)
(whiteness_income_corr_simple <- cor(Census.desc[ ,1], Census.desc[ ,2]))
```

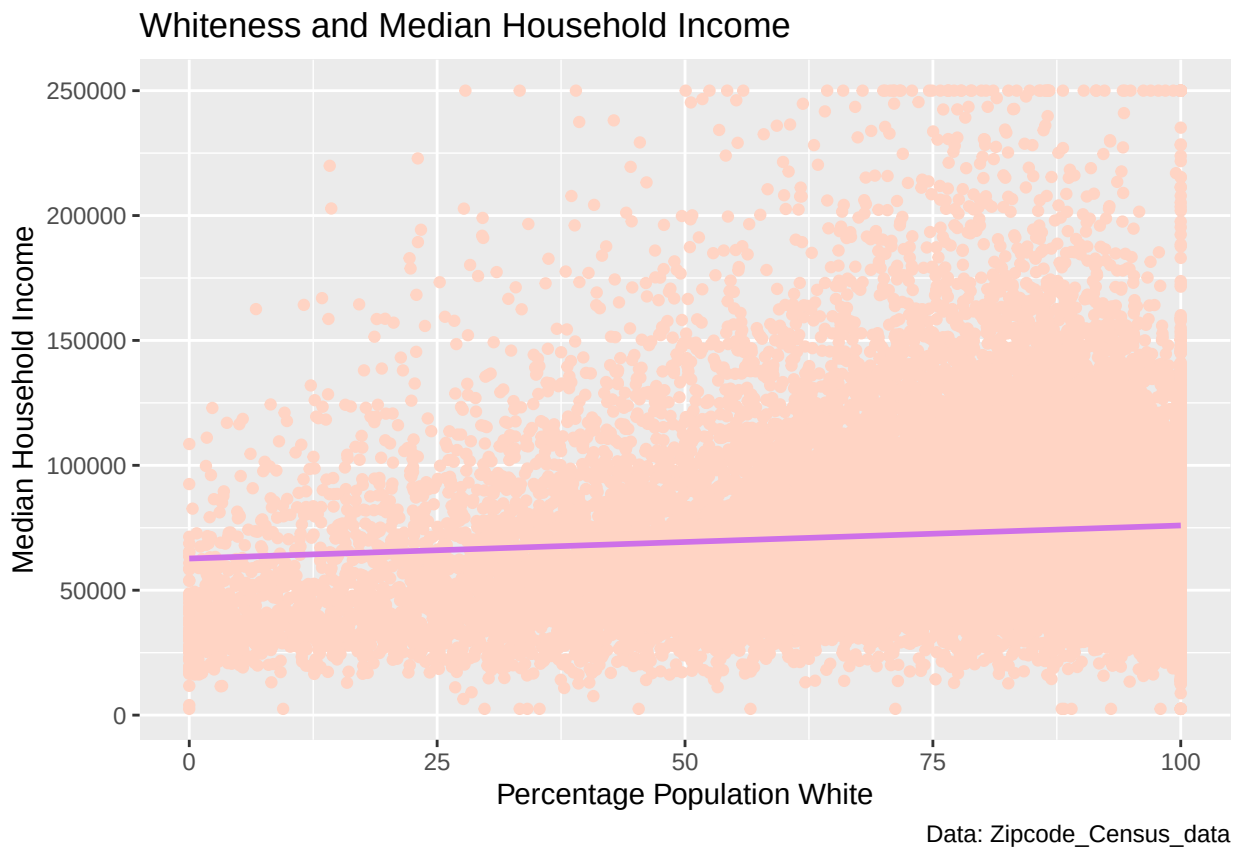
```
## [1] 0.09329494
```

```
whiteness_income_corr2 <- corr.test(Census.desc) #run corr
whiteness_income_corr2$p.adj
```

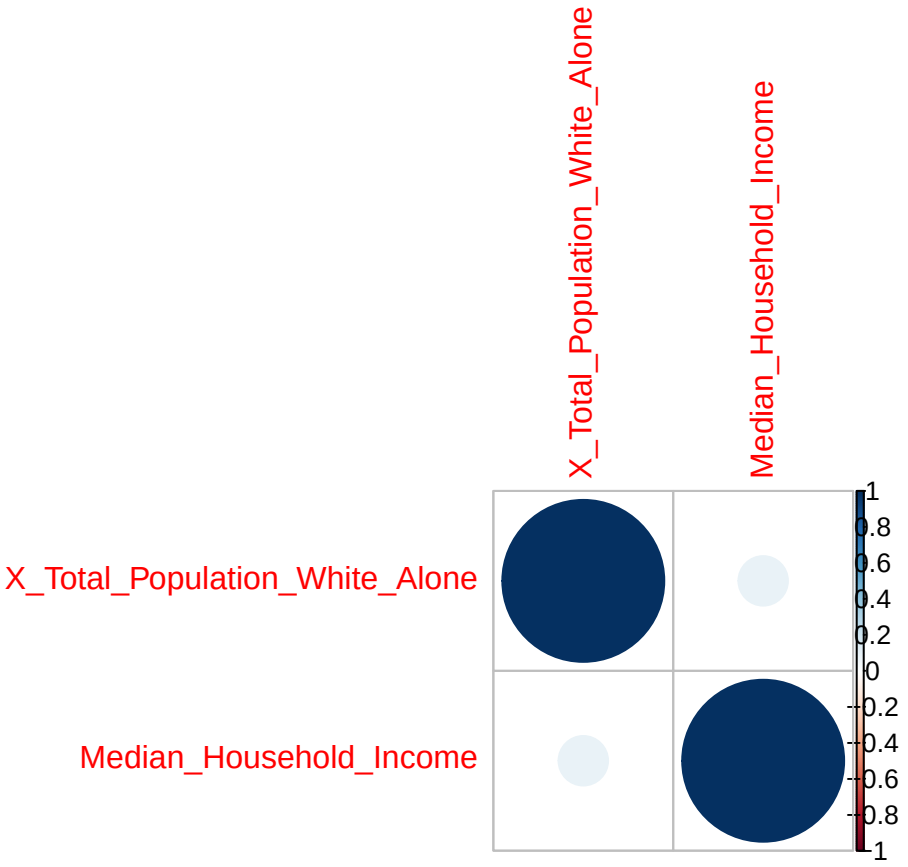
```
## [1] 3.656746e-60
```

```
ggplot(Zipcode_Census_data) +
  geom_jitter(aes(x = X_Total_Population_White_Alone, y = Median_Household_Income), fill ="black", colo
   geom_smooth(aes(x = X_Total_Population_White_Alone, y = Median_Household_Income), fill ="#ffb5e2", c
  labs(x = "Percentage Population White", y = "Median Household Income",
         title = "Whiteness and Median Household Income", caption = "Data: Zipcode_Census_data")
```

```
## `geom_smooth()` using formula = 'y ~ x'

## Warning: Removed 3153 rows containing non-finite values (`stat_smooth()`).

## Warning: Removed 3153 rows containing missing values (`geom_point()`).
```




```
corrplot::corrplot(whiteness_income_corr)
```




```
Census_desc2 <- Zipcode_with_States %>%
  select("X_Total_Population_White_Alone", "X_Total_Population_Black_or_African_American_Alone", "X_Tota
  drop_na()


less_diversity_ttest <- t.test(
       filter(Census_desc2, X_Total_Population_White_Alone >= 75)$Median_Household_Income,
       filter(Census_desc2, X_Total_Population_White_Alone <= 75)$Median_Household_Income)

less_diversity_ttest
```

```
##
##  Welch Two Sample t-test
##
## data:  filter(Census_desc2, X_Total_Population_White_Alone >= 75)$Median_Household_Income and filter
## t = 10.021, df = 15398, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  3348.951 4977.716
## sample estimates:
## mean of x mean of y
##  74406.65  70243.32
```

```
asian_westcoast_test <- t.test(
       filter(Census_desc2, X_Total_Population_Asian_Alone >= 50, Zipcode_Zone == "West Coast (includes
```

```
      filter(Census_desc2, X_Total_Population_White_Alone <= 50, Zipcode_Zone == "West Coast (includes

asian_westcoast_test
```

```
##
##  Welch Two Sample t-test
##
## data:  filter(Census_desc2, X_Total_Population_Asian_Alone >= 50, Zipcode_Zone == "West Coast (inclu
## t = 7.547, df = 70.625, p-value = 1.187e-10
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  35308.15 60667.43
## sample estimates:
## mean of x mean of y
##  130621.3   82633.5
```

```
(income_race_model <- lm(data = Census_desc2, Median_Household_Income ~ X_Total_Population_White_Alone)
```

```
##
## Call:
## lm(formula = Median_Household_Income ~ X_Total_Population_White_Alone,
##     data = Census_desc2)
##
## Coefficients:
##                     (Intercept)  X_Total_Population_White_Alone
##                         62693.0                           132.3
```

```
(income_race_model_sum <- summary(income_race_model))
```

```
##
## Call:
## lm(formula = Median_Household_Income ~ X_Total_Population_White_Alone,
##     data = Census_desc2)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -73423 -19799  -6711  11852 183624
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                   62693.039    661.225   94.81   <2e-16 ***
## X_Total_Population_White_Alone   132.286      8.068   16.40   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 31220 on 30619 degrees of freedom
## Multiple R-squared:  0.008704,   Adjusted R-squared:  0.008672
## F-statistic: 268.8 on 1 and 30619 DF,  p-value: < 2.2e-16
```

```
income_race_tidy <- tidy(income_race_model)
```

In Model 1, which includes just one independent variable (`Median_Household_Income ~ X_Total_Population_White_Alone`) the percentage of the ZIP Code population that is white is positively associated with median household income ($\beta = 132.286$, $p < 3.6567462 \times 10^{-60}$). The Intercept, or approximated mean of median household income if the percent white were were zero, is $ 62693.04 , and for every additional unit of percent of the population white, we expect an increase of $ 132.286. (Additionally, it is important to note that the Intercept is different than the mean median household income for all ZIP Codes $ 73132.63 .) Therefore, if we increased percent white by one unit that manner, we would expect the mean ZIP Code median household income to increase to $ 62825.33 . Additionally, Model 1 shows a very singifcant relationship between percent of the population white and median household income ($< .001$) indicating a strong association between the two variables.

6.2693039×10^4