Bilangual Populations - Poverty, Employment, Healthcare

2024-07-23

Loading in Data

```
#all crosswalks

ddi <- read_ipums_ddi("usa_00013.xml")
all_indicator_data <- read_ipums_micro(ddi)
```

```
## Use of data from IPUMS USA is subject to conditions including that users should cite the data appropriately. U
se command `ipums_conditions()` for more details.
```

```
#2022
poverty_2022 <- read.csv("../ACS_DATA/2022/ACSDT5Y2022.B16009-Data.csv")
language_2022 <- read.csv("../ACS_DATA/2022/ACSST5Y2022.S1601-Data.csv")
social_2022 <- read.csv("../ACS_DATA/2022/ACSCP5Y2022.CP02-Data.csv")
characteristics_2022 <- read.csv("../ACS_DATA/2022/ACSST5Y2022.S1603-Data.csv")
limited_eng_2022 <- read.csv("../ACS_DATA/2022/ACSST5Y2022.S1602-Data.csv")
household_2022 <- read.csv("../ACS_DATA/2022/ACSDT5Y2022.B16002-Data.csv")
education_2022 <- read.csv("../ACS_DATA/2022/ACSDT5Y2022.B16010-Data.csv")

#location data
regions <- read.csv("../location_data/County_12_Regions.csv")
rural_urban <-read.csv("../location_data/rural_urban.csv")
```

POVERTY

Used ACS 5 Year 2022 Data to calculate regional percent point change of children below poverty line by primary langauge spoken at home. First cleaned 2022 data, merged with region data which has label for each county's region then aggregated for each region.

```
children_poverty_2022 <- poverty_2022 |>
  #grabbing all relevant variables below poverty line
  select(Geographic.Area.Name,Estimate..Total.,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level.,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years.,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.only.English,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.Spanish,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.Asian.and.Pac
ific.Island.languages,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.other.Indo.Eu
ropean.languages,
         Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.other.languag
es
         )|>

  #renaming for ease and clarity
  rename(Total_Pop = Estimate..Total.,
         Total_Below_Line = Estimate..Total...Income.in.the.past.12.months.below.poverty.level.,
         Total_Children_Below_Line = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.1
7.years.,
         Only_English = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Spea
k.only.English,
         Spanish = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.Spa
nish,
         Asian_Pacific_Lang = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.year
s...Speak.Asian.and.Pacific.Island.languages,
         Other_IndoEuro_Lang = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.year
s...Speak.other.Indo.European.languages,
         Other_Lang = Estimate..Total...Income.in.the.past.12.months.below.poverty.level...5.to.17.years...Speak.
other.languages,
         County = Geographic.Area.Name)|>

#fixing county names

  mutate(County = sub(" County, Texas", "", County))
```

```
children_poverty_2022_regions <- left_join(children_poverty_2022, regions, by = "County")
write.csv(file = "Poverty_Children_Languages_2022.csv", children_poverty_2022_regions)
```

```
region_total <- function(bilangual_data) {
  region_totals <- bilangual_data |>
  group_by(Region)|>
  summarise(Region_Total = sum(Total_Children_Below_Line, na.rm = TRUE))

aggregated_precursor <- bilangual_data|>
  left_join(region_totals, by = "Region") |>
  mutate(Weight = Total_Children_Below_Line / Region_Total)

aggregated_data <- aggregated_precursor |>
  group_by(Region) |>
  summarise(
    Total_English = sum(Only_English * Weight, na.rm = TRUE),
    Total_Spanish = sum(Spanish * Weight, na.rm = TRUE),
    Total_Asian_Pacific = sum(Asian_Pacific_Lang * Weight, na.rm = TRUE),
    Total_IndoEuro = sum(Other_IndoEuro_Lang * Weight, na.rm = TRUE),
    Total_Other = sum(Other_Lang * Weight, na.rm = TRUE),
    Total_Children_Below_Line = sum(Total_Children_Below_Line * Weight, na.rm = TRUE)
  ) |>
  mutate(
    Percent_English = round(Total_English / Total_Children_Below_Line, 3),
    Percent_Spanish = round(Total_Spanish / Total_Children_Below_Line, 3),
    Percent_Asian_Pacific = round(Total_Asian_Pacific / Total_Children_Below_Line, 3),
    Percent_IndoEuro = round(Total_IndoEuro / Total_Children_Below_Line, 3),
    Percent_Other = round(Total_Other / Total_Children_Below_Line, 3)
  )

return(aggregated_data)
}
```

```
region_children_poverty_2022 <- region_total(children_poverty_2022_regions)
```

```
write.csv(file = "Poverty_Children_Languages_Regions.csv", region_children_poverty_2022)
```

MICRODATA

Microdata was taken from IPUMS:

Steven Ruggles, Sarah Flood, Matthew Sobek, Daniel Backman, Annie Chen, Grace Cooper, Stephanie Richards, Renae Rodgers, and Megan Schouweiler. IPUMS USA: Version 15.0 [dataset]. Minneapolis, MN: IPUMS, 2024. https://doi.org/10.18128/D010.V15.0 (https://doi.org/10.18128/D010.V15.0)

The following data analysis used the same dataset which has harmonized data for various variables taken in the ACS. The specific documentation for the variables can be seen here (https://live.usa.datadownload.ipums.org/web/extracts/usa/2313463/usa_00009.xml?jwt=eyJhbGciOiJSUzI1NiJ9.eyJpc3MiOiJ1bWEiLCJleHAiOjE3MjM2NDk5OTksIm5iZiI6MTcyMzY0OTA5OSwic3ViIjoiZjFkMzEzNjAtMDNmYS0wMTNkLWI3NmMtMl5Twi_Ep3XRAG87q_udF_dwM1sleWVEYHzJPNsLm9zhgQ0XtagjCunpkBvB-Cm2jmw_eKRwCp8ZurvJzjZ6MXEMcuW-nlherPxMBtL_PFUwz6_PNp8ZiflfUVez_fYet5xp6RAZCIprdZqBjkHBD5Ugc-MUFLioW8K2WNQqU08kgq3XYSCnthxT_x203ROSBeND512HMN52wH_UMtOm_u8A9cFLowA#SPEAKENG).

A dataset was created by filtering out N/A values and “Bilingual” was added as a variable based on meeting criteria of speaking another language other than English as well as speaking English “well” or “very well” and “Not Bilingual” was dtermiend by speaking only English.

A version of the previously described data was also created with a more detailed variable named “Bilingual Status” which contains “English Monolingual”, “Bilingual” and “NE Monolingual” (Non-English Monolingual). The following parameters were taken:

- English Monolingual: Only speaks English
- Bilingual: Speaks a language other than English as well as speaks English “well” or “very well”
- NE Monolingual: Speaks a language other than English as well as speaks English “not at all” or “less than well”

```
indicators_2022 <- all_indicator_data |>
  filter(YEAR == 2022) |>
  distinct(SERIAL, PERNUM, .keep_all = TRUE)
```

LANUGUAGE CODES

Language	Code
N/A	0, 95, 96, 99
English	1
Spanish	12
Asian/Pacific Islander Languages	43-56
Other Indo-European Langauges	2-8, 10-11, 13-31, 33-34, 36-37, 38, 40, 41
Other Languages	9, 32, 35, 39, 42, 57-64, 70-93, 94

Language	Code
Native Languages	70-94

```
microdat_bilingual <- indicators_2022 |>
  filter(LANGUAGE != 1 & LANGUAGE != 0 & LANGUAGE != 95 & LANGUAGE != 96) |> #doesn't speak english at home and g
ets rid of invalid entries
  filter(SPEAKENG == 4 | SPEAKENG == 5) |> #speaks english well or very well
  mutate(Bilingual = "Bilingual")

set.seed(123)
microdat_speaks_english <- indicators_2022 |>
  filter(LANGUAGE == 1 & LANGUAGE != 0 & LANGUAGE != 95 & LANGUAGE != 96) |> #speaks english at home and gets rid
of invalid entries
  filter(SPEAKENG == 3) |> #speaks only english at home
  mutate(Bilingual = "Not Bilingual") |>
  sample_n(nrow(microdat_bilingual))

table(microdat_bilingual$LANGUAGE)
```

```
##
##      2      3      4      5      6      7     10     11     12     13     14
##   3111     15    489    137     61     70    578   3162 230457   1452    332
##     15     16     17     18     19     20     21     22     23     25     26
##     45    344    153   1230    126    302    450     29    343     42    109
##     28     29     30     31     33     34     36     37     40     43     44
##     69   1441    272  11201     79    130    499      8   7005   7533     73
##     45     47     48     49     50     51     52     53     54     55     56
##    379    863    942   2537   6820    371    497     72   4182    199     20
##     57     58     59     60     61     62     63     71     72     74     75
##   3508     16    372    760    185     98   3438      2     52      3     35
##     81     82     84     89     94
##      7    132     31     15    117
```

```
table(microdat_bilingual$SPEAKENG)
```

```
##
##      4      5
## 230792  66208
```

```
table(microdat_bilingual$AGE) #age ranges from 5 to 92
```

```
##
##    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20
## 3231 3606 3864 3968 3921 4333 4445 4581 4662 4733 4921 4990 5118 5510 5353 4827
##   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36
## 4864 4572 4568 4483 4525 4592 4495 4468 4674 4812 4571 4631 4468 4562 4765 4675
##   37   38   39   40   41   42   43   44   45   46   47   48   49   50   51   52
## 4447 4713 4558 4845 4463 4533 4518 4436 4601 4314 4512 4279 4165 4345 4069 4030
##   53   54   55   56   57   58   59   60   61   62   63   64   65   66   67   68
## 3885 3803 3872 3755 3648 3686 3555 3450 3267 3330 3112 3018 3016 2937 2719 2630
##   69   70   71   72   73   74   75   76   77   78   79   80   81   82   83   84
## 2455 2422 2260 2082 1891 1831 1623 1465 1326 1192 1008  941  860  762  706  625
##   85   86   87   88   92
##  581  437  426  368 1440
```

```
table(microdat_speaks_english$LANGUAGE)
```

```
##
##      1
## 297000
```

```
table(microdat_speaks_english$SPEAKENG)
```

```
##
##      3
## 297000
```

```
table(microdat_speaks_english$AGE) #age ranges from 5 to 92
```

```
##
##    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20
## 3699 3823 3912 3877 3919 3980 4187 4218 4172 4147 4131 4114 4163 4396 4309 3748
##   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36
## 3391 3416 3359 3407 3490 3507 3649 3653 3678 3941 3801 3866 3858 3745 3783 3762
##   37   38   39   40   41   42   43   44   45   46   47   48   49   50   51   52
## 3842 3687 3870 3829 3511 3489 3445 3429 3180 3389 3518 3610 3673 3848 3833 3705
##   53   54   55   56   57   58   59   60   61   62   63   64   65   66   67   68
## 3804 3778 3951 4172 4304 4507 4494 4524 4661 4537 4559 4525 4419 4354 4062 3985
##   69   70   71   72   73   74   75   76   77   78   79   80   81   82   83   84
## 3861 3789 3719 3498 3199 3056 2766 2523 2338 2215 2022 1779 1671 1536 1335 1217
##   85   86   87   88   92
## 1089 1007  835  773 3177
```

```
#english data set almost three times as large as bilingual dataset

language_micro_data <- rbind(microdat_bilingual, microdat_speaks_english)
```

```
microdat_languages <- indicators_2022 |>
  filter(LANGUAGE != 1 & LANGUAGE != 0 & LANGUAGE != 95 & LANGUAGE != 96) |>  #doesn't speak English at home and
removes invalid entries
  filter(SPEAKENG %in% c(1, 4, 5, 6)) |>  #considers only relevant SPEAKENG values
  mutate(Language_Group = case_when(
    LANGUAGE == 12 ~ "Spanish",
    LANGUAGE %in% 43:56 ~ "Asian/Pacific Islander Languages",
    LANGUAGE %in% c(2:8, 10:11, 13:31, 33:34, 36:37, 38, 40, 41) ~ "Other Indo-European Languages",
    LANGUAGE %in% c(9, 32, 35, 39, 42, 57:64, 70:93, 94) ~ "Other Languages",
    TRUE ~ "Other Languages"
  ),
  Bilingual_Status = case_when(
    SPEAKENG %in% c(4, 5) ~ "Bilingual",
    SPEAKENG %in% c(1, 6) ~ "NE Monolingual"
  ))


microdat_speaks_english <- indicators_2022 |>
  filter(LANGUAGE == 1 & LANGUAGE != 0 & LANGUAGE != 95 & LANGUAGE != 96) |> #speaks english at home and gets rid
of invalid entries
  filter(SPEAKENG == 3) |> #speaks only english at home
  mutate(Language_Group = "English",
         Bilingual_Status = "English Monolingual")


language_micro_data_full <- rbind(microdat_languages, microdat_speaks_english)
```

```
table(language_micro_data_full$Language_Group)
```

```
##
## Asian/Pacific Islander Languages                         English
##                            30226                          842925
##    Other Indo-European Languages                 Other Languages
##                            35613                            9527
##                          Spanish
##                           287048
```

```
table(language_micro_data_full$Bilingual_Status)
```

```
##
##           Bilingual English Monolingual      NE Monolingual
##              297000              842925               65414
```

```
write.csv(file = "Extensive_Microdata_Bilingualism.csv", language_micro_data_full)
```

```
write.csv(file = "Microdata_Bilingualism.csv", language_micro_data)
```

OVERVIEW OF LANGUAGE ANF BILINGUAL STATUS POPUALTION COUNTS

```
survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = language_micro_data_full
)

#calculating the total weighted counts for each language group
bilingual_stat_dist <- svytotal(~Bilingual_Status, survey_design)

print(bilingual_stat_dist)
```

```
##                                       total    SE
## Bilingual_StatusBilingual            7761055 31787
## Bilingual_StatusEnglish Monolingual 17695085 41195
## Bilingual_StatusNE Monolingual       1859404 13352
```

```
language_group_dist <- svytotal(~Language_Group, survey_design)
print(language_group_dist)
```

```
##                                               total      SE
## Language_GroupAsian/Pacific Islander Languages   668626  9090.9
## Language_GroupEnglish                          17695085 41195.4
## Language_GroupOther Indo-European Languages      831164 10233.6
## Language_GroupOther Languages                    293443  7647.2
## Language_GroupSpanish                           7827226 35124.3
```

```
bilingual_stat_df <- as.data.frame(bilingual_stat_dist)
language_group_df <- as.data.frame(language_group_dist)
```

EMPLOYMENT IN MINORS

Finding average age of minors for each Bilingual Status group through survey design.

```
bilingual_employed_minors <- language_micro_data_full |>
  filter(AGE > 13 & AGE < 18) |>
  filter(EMPSTAT == 1) #means they are employed

survey_design_minors <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = bilingual_employed_minors
)

avg_working_age_by_status <- svyby(
  ~AGE,
  ~Language_Group,
  survey_design_minors,
  svymean,
  vartype = "ci"
)

print(avg_working_age_by_status)
```

```
##                                                Language_Group      AGE
## Asian/Pacific Islander Languages Asian/Pacific Islander Languages 16.53576
## English                                                   English 16.62641
## Other Indo-European Languages       Other Indo-European Languages 16.60639
## Other Languages                                   Other Languages 16.67224
## Spanish                                                   Spanish 16.67545
##                                      ci_l     ci_u
## Asian/Pacific Islander Languages 16.39453 16.67698
## English                          16.60735 16.64547
## Other Indo-European Languages    16.48785 16.72493
## Other Languages                  16.46134 16.88314
## Spanish                          16.64305 16.70784
```

HEALTHCARE COVERAGE

Finding percentage of healthcare coverage for each Bilingual_Status group.

```
language_micro_data_health <- language_micro_data_full |>
  mutate(HCOVANY = ifelse(HCOVANY == 2, 1, 0))

healthcare_des <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = language_micro_data_health
)

healthcare_coverage_by_language <- svyby(
  ~HCOVANY,
  ~Bilingual_Status,
  healthcare_des,
  svymean
)

#subtracting to find no coverage values
healthcare_coverage_by_language <- healthcare_coverage_by_language |>
  mutate(NoCoverage = 1-HCOVANY)
```

```
write.csv(file = "HealthcareCoverage_By_Language.csv", healthcare_coverage_by_language)
```

POVERTY

With micro data for each bilingual status group

```
language_micro_data_pov <- language_micro_data_full |>
  filter(POVERTY != 0) |>
  mutate(below_poverty_line = if_else(POVERTY < 100, 1, 0))

poverty_des <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  strata = ~STRATA,
  data = language_micro_data_pov
)

poverty_by_biling_stat <- svyby(
  ~below_poverty_line,
  ~Bilingual_Status,
  poverty_des,
  svymean,
)

print(poverty_by_biling_stat)
```

```
##                       Bilingual_Status below_poverty_line           se
## Bilingual                     Bilingual         0.14605305 0.0015646012
## English Monolingual English Monolingual         0.09975716 0.0008041401
## NE Monolingual           NE Monolingual         0.23037262 0.0031004821
```

```
write.csv(file = "Poverty_Rate_BilingStat.csv", poverty_by_biling_stat)
```

HOME OWNERSHIP

```
language_micro_data_home <- language_micro_data_full |>
  select(CLUSTER, STRATA, PERWT, OWNERSHP, Bilingual_Status, Language_Group) |>
  filter(OWNERSHP != 0) |>
  mutate(OWNERSHP = if_else(OWNERSHP == 2, 0, 1))

poverty_des <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  strata = ~STRATA,
  data = language_micro_data_home
)

homeownership_by_biling_stat <- svyby(
  ~OWNERSHP,
  ~Bilingual_Status,
  poverty_des,
  svymean,
)

print(homeownership_by_biling_stat)
```

```
##                        Bilingual_Status  OWNERSHP          se
## Bilingual                     Bilingual 0.6646292 0.002031540
## English Monolingual English Monolingual 0.6789625 0.001306859
## NE Monolingual           NE Monolingual 0.5516144 0.003705897
```

```
write.csv(file = "HomeOwnership_By_BilingStat.csv", homeownership_by_biling_stat)
```

FAMILY SIZE

Finding proportion of Bilingual_Status for each number of children in a household. First was done as just a simple overview to see if there is a remarkable difference in distribution and then when difference was seen a survey design was done.

```
household_data <- language_micro_data_full |>
  select(SERIAL, NCHILD, HHWT, Bilingual_Status, STRATA, PERWT) |>
  distinct(SERIAL, .keep_all = TRUE)

household_data <- household_data |>
  mutate(Child_Category = case_when(
    NCHILD == 0 ~ "0 Children",
    NCHILD == 1 ~ "1 Child",
    NCHILD == 2 ~ "2 Children",
    NCHILD >= 3 ~ "More than 3 Children"
  ))

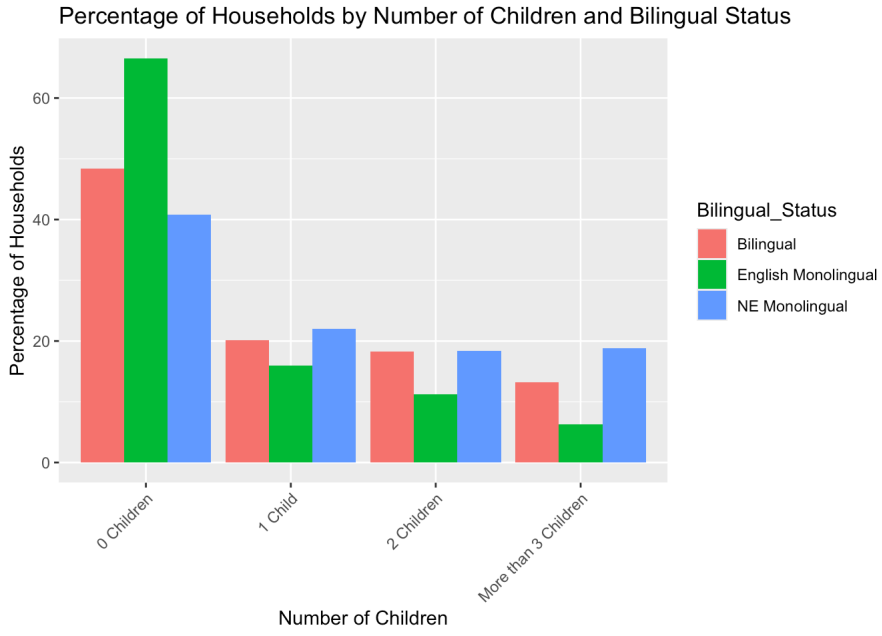
household_summary <- household_data |>
  group_by(Bilingual_Status, Child_Category) |>
  summarize(
    Count = n(),
    Total_Weight = sum(HHWT, na.rm = TRUE),
    .groups = 'drop'
  ) |>
  group_by(Bilingual_Status) |>
  mutate(
    Total_Households = sum(Total_Weight),
    Percentage = Total_Weight / Total_Households * 100
  )

print(household_summary)
```

```
## # A tibble: 12 × 6
## # Groups:   Bilingual_Status [3]
##    Bilingual_Status    Child_Category        Count Total_Weight Total_Households
##    <chr>               <chr>                 <int>        <dbl>            <dbl>
##  1 Bilingual           0 Children            73918      1573350          3253211
##  2 Bilingual           1 Child               27073       656272          3253211
##  3 Bilingual           2 Children            22420       594798          3253211
##  4 Bilingual           More than 3 Children  14772       428791          3253211
##  5 English Monolingual 0 Children           264844      4688190          7048317
##  6 English Monolingual 1 Child               53439      1126204          7048317
##  7 English Monolingual 2 Children            34742       794271          7048317
##  8 English Monolingual More than 3 Children  18084       439652          7048317
##  9 NE Monolingual      0 Children            13650       324519           795889
## 10 NE Monolingual      1 Child                6106       175213           795889
## 11 NE Monolingual      2 Children             4843       146405           795889
## 12 NE Monolingual      More than 3 Children   4499       149752           795889
## # ℹ 1 more variable: Percentage <dbl>
```

```
library(ggplot2)

ggplot(household_summary, aes(x = Child_Category, y = Percentage, fill = Bilingual_Status)) +
  geom_bar(stat = "identity", position = "dodge") +
  ggtitle("Percentage of Households by Number of Children and Bilingual Status") +
  xlab("Number of Children") +
  ylab("Percentage of Households") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



Survey Design

```
#creating the survey object
des_number_of_children <- svydesign(ids = ~1,
                strata = ~STRATA,
                weights = ~HHWT,
                data = household_data)

household_data_at_least_one_kid <- household_data |>
  filter(NCHILD > 0)

des_at_least_one_kid <- svydesign(ids = ~1,
                strata = ~STRATA,
                weights = ~HHWT,
                data = household_data_at_least_one_kid)
```

```
mean_by_bilingual <- svyby(~NCHILD, ~Bilingual_Status, des_number_of_children, svymean, na.rm = TRUE)

print(mean_by_bilingual)
```

```
##                       Bilingual_Status    NCHILD          se
## Bilingual                     Bilingual 1.0183680 0.004989489
## English Monolingual English Monolingual 0.5973837 0.002646491
## NE Monolingual           NE Monolingual 1.2481464 0.010952123
```

```
options(scipen = 999)
tab <- svytable(~Bilingual_Status + NCHILD, des_number_of_children)

proportion_table <- prop.table(tab, margin = 2)

print(proportion_table)
```

```
##                     NCHILD
## Bilingual_Status             0          1          2          3          4
##   Bilingual          0.23889097 0.33522791 0.38737094 0.42292651 0.41720879
##   English Monolingual 0.71183541 0.57527217 0.51728066 0.44208910 0.41008893
##   NE Monolingual      0.04927362 0.08949992 0.09534841 0.13498439 0.17270228
##                     NCHILD
## Bilingual_Status             5          6          7          8          9
##   Bilingual          0.42167388 0.38825633 0.43330778 0.51245387 0.31194472
##   English Monolingual 0.39854910 0.42456036 0.45477194 0.24308118 0.49062192
##   NE Monolingual      0.17977702 0.18718331 0.11192028 0.24446494 0.19743337
```

```
bilingual_number_of_children <- as.data.frame(proportion_table)

num_children_by_language_cat <- bilingual_number_of_children |>
  pivot_wider(names_from = NCHILD, values_from = Freq)
```

```
write.csv(file = "Number_of_Children_AllLanguageCats.csv", num_children_by_language_cat)
```

INCOME

Finding different distributions of income by education and diffrent bilingual groups and languages.

```
income_data_2022 <- language_micro_data |>
  select(AGE, INCTOT, Bilingual, PERWT, SEX, EDUCD, AGE, CLUSTER, STRATA, YEAR) |>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65)
```

Using Survey Design for Overview Analysis of Simple Bilingual vs. Not Bilingual

```
#setting it up
options(survey.lonely.psu = "adjust")

#creating the survey object
income_des <- svydesign(ids = ~CLUSTER,
                 strata = ~STRATA,
                 weights = ~PERWT,
                 data = income_data_2022)

#calculatng median by setting quantile to %50
median_income <- svyby(~INCTOT,
                       ~Bilingual,
                       income_des,
                       svyquantile,
                       quantiles = 0.5,
                       ci = TRUE)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
print(median_income)
```

```
##                   Bilingual INCTOT       se
## Bilingual         Bilingual  36475 130.1030
## Not Bilingual Not Bilingual  45000 202.0427
```

```
#splitting into proper quintiles
income_data <- income_data_2022 |>
  group_by(Bilingual)|>
  mutate(quintile = ntile(INCTOT, 5)) |>
  ungroup()

#creating a survey design with modified income data
des <- svydesign(ids = ~CLUSTER,
                 strata = ~STRATA,
                 weights = ~PERWT,
                 data = income_data)

#median for each quintile in income group
median_by_quintile <- svyby(~INCTOT, ~interaction(Bilingual, quintile), des, svyquantile, quantiles = 0.5, ci = T
RUE)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

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## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

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## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
print(median_by_quintile)
```

```
##                 interaction(Bilingual, quintile)     INCTOT        se
## Bilingual.1                         Bilingual.1   7584.811  81.88591
## Not Bilingual.1                 Not Bilingual.1   7599.000 112.49741
## Bilingual.2                         Bilingual.2  21900.000  62.24347
## Not Bilingual.2                 Not Bilingual.2  24861.000  96.68145
## Bilingual.3                         Bilingual.3  36400.000 122.95643
## Not Bilingual.3                 Not Bilingual.3  45360.000  57.65174
## Bilingual.4                         Bilingual.4  58453.000 106.23887
## Not Bilingual.4                 Not Bilingual.4  71189.000 168.11449
## Bilingual.5                         Bilingual.5 110000.000 565.80342
## Not Bilingual.5                 Not Bilingual.5 135977.000 424.99025
```

```
#changing the names of columns for clarity and separating interaction
final_median_by_quintile <- median_by_quintile |>
  separate(`interaction(Bilingual, quintile)`, into = c("Bilingual", "Quintile"), sep = "\\.") |>
  rename(median_income = INCTOT)
```

Income Medians by Education

CODES:

CODE	Educational Level
001 & 999	N/a & missing
002	no schooling completed
10-61	grade school
062	high school or GED
65-100	one or more years of college, no degree
101	bachelors
114	masters
115	professional degree beyond bachelors
116	doctoral

```
library(dplyr)
income_data_education <- income_data_2022 |>
  mutate(Educational_Level = case_when(
    EDUCD %in% c(1, 999) ~ "N/A or Missing",
    EDUCD == 2 ~ "No Schooling Completed",
    EDUCD >= 10 & EDUCD < 62 ~ "No High School Degree or GED",
    EDUCD >= 62 & EDUCD < 65 ~ "High School or GED",
    EDUCD >= 65 & EDUCD <= 100 ~ "Some College, No Degree",
    EDUCD == 101 ~ "Bachelor's",
    EDUCD == 114 ~ "Master's",
    EDUCD == 115 ~ "Professional Degree Beyond Bachelor's",
    EDUCD == 116 ~ "Doctoral",
    TRUE ~ NA_character_
  ))

print(income_data_education)
```

```
## # A tibble: 319,848 × 10
##    AGE       INCTOT    Bilingual PERWT SEX        EDUCD     CLUSTER STRATA  YEAR
##    <int+lbl> <dbl+lbl> <chr>     <dbl> <int+lbl>  <int+lbl>   <dbl>  <dbl> <int>
##  1 34        75989     Bilingual    20 1 [Male]   63 [Regu… 2.02e12  70048  2022
##  2 23         1169     Bilingual     8 1 [Male]   71 [1 or… 2.02e12 510048  2022
##  3 19        11691     Bilingual     8 1 [Male]   65 [Some… 2.02e12 400048  2022
##  4 19          701     Bilingual    11 1 [Male]   71 [1 or… 2.02e12 460348  2022
##  5 20        11691     Bilingual    10 1 [Male]   71 [1 or… 2.02e12 690048  2022
##  6 22         4676     Bilingual    16 2 [Female] 71 [1 or… 2.02e12 590248  2022
##  7 58        30863     Bilingual    17 1 [Male]   63 [Regu… 2.02e12 380148  2022
##  8 52        35072     Bilingual    18 1 [Male]   71 [1 or… 2.02e12 680748  2022
##  9 42         2104     Bilingual     6 1 [Male]   81 [Asso… 2.02e12 690048  2022
## 10 31         9352     Bilingual    16 1 [Male]   40 [Grad… 2.02e12 462548  2022
## # ℹ 319,838 more rows
## # ℹ 1 more variable: Educational_Level <chr>
```

```
income_data_education |>
  filter(is.na(Educational_Level))
```

```
## # A tibble: 0 × 10
## # ℹ 10 variables: AGE <int+lbl>, INCTOT <dbl+lbl>, Bilingual <chr>,
## #   PERWT <dbl>, SEX <int+lbl>, EDUCD <int+lbl>, CLUSTER <dbl>, STRATA <dbl>,
## #   YEAR <int>, Educational_Level <chr>
```

```
#creating survey design for education dataset
des_edu <- svydesign(ids = ~CLUSTER,
                     strata = ~STRATA,
                     weights = ~PERWT,
                     data = income_data_education)

#calculating the median income for each education level within each bilingual group
median_by_education <- svyby(~INCTOT, ~interaction(Bilingual, Educational_Level), des_edu, svyquantile, quantiles
= 0.5, ci = TRUE)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

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## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
#for clarity
median_by_education <- median_by_education |>
  separate(`interaction(Bilingual, Educational_Level)`, into = c("Bilingual", "Educational_Level"), sep = "\\.")|
>
  rename(median_income = INCTOT) |>
  rename(se_median_income = se) |>
  select(Bilingual, Educational_Level, median_income, se_median_income)

print(median_by_education)
```

```
##                                                  Bilingual
## Bilingual.Bachelor's                             Bilingual
## Not Bilingual.Bachelor's                     Not Bilingual
## Bilingual.Doctoral                               Bilingual
## Not Bilingual.Doctoral                       Not Bilingual
## Bilingual.High School or GED                     Bilingual
## Not Bilingual.High School or GED             Not Bilingual
## Bilingual.Master's                               Bilingual
## Not Bilingual.Master's                       Not Bilingual
## Bilingual.No High School Degree or GED           Bilingual
## Not Bilingual.No High School Degree or GED   Not Bilingual
## Bilingual.No Schooling Completed                 Bilingual
## Not Bilingual.No Schooling Completed         Not Bilingual
## Bilingual.Professional Degree Beyond Bachelor's  Bilingual
## Not Bilingual.Professional Degree Beyond Bachelor's Not Bilingual
## Bilingual.Some College, No Degree                Bilingual
## Not Bilingual.Some College, No Degree        Not Bilingual
##                                                                  Educational_Level
## Bilingual.Bachelor's                                                    Bachelor's
## Not Bilingual.Bachelor's                                                Bachelor's
## Bilingual.Doctoral                                                        Doctoral
## Not Bilingual.Doctoral                                                    Doctoral
## Bilingual.High School or GED                                       High School or GED
## Not Bilingual.High School or GED                                   High School or GED
## Bilingual.Master's                                                        Master's
## Not Bilingual.Master's                                                    Master's
## Bilingual.No High School Degree or GED                    No High School Degree or GED
## Not Bilingual.No High School Degree or GED                No High School Degree or GED
## Bilingual.No Schooling Completed                                No Schooling Completed
## Not Bilingual.No Schooling Completed                            No Schooling Completed
## Bilingual.Professional Degree Beyond Bachelor's     Professional Degree Beyond Bachelor's
## Not Bilingual.Professional Degree Beyond Bachelor's Professional Degree Beyond Bachelor's
## Bilingual.Some College, No Degree                          Some College, No Degree
## Not Bilingual.Some College, No Degree                      Some College, No Degree
##                                                 median_income
## Bilingual.Bachelor's                                    56207
## Not Bilingual.Bachelor's                                65000
## Bilingual.Doctoral                                      93525
## Not Bilingual.Doctoral                                 100000
## Bilingual.High School or GED                            29854
## Not Bilingual.High School or GED                        30000
## Bilingual.Master's                                      80375
## Not Bilingual.Master's                                  76745
## Bilingual.No High School Degree or GED                  28329
## Not Bilingual.No High School Degree or GED              20898
## Bilingual.No Schooling Completed                        30266
## Not Bilingual.No Schooling Completed                    21618
## Bilingual.Professional Degree Beyond Bachelor's         95000
## Not Bilingual.Professional Degree Beyond Bachelor's    120000
## Bilingual.Some College, No Degree                       32427
## Not Bilingual.Some College, No Degree                   38000
##                                                se_median_income
## Bilingual.Bachelor's                                   445.4339
## Not Bilingual.Bachelor's                               221.1701
## Bilingual.Doctoral                                    2383.8568
## Not Bilingual.Doctoral                                2598.1888
## Bilingual.High School or GED                           197.4458
## Not Bilingual.High School or GED                       235.4551
## Bilingual.Master's                                     613.4615
## Not Bilingual.Master's                                 996.9706
## Bilingual.No High School Degree or GED                 179.8377
## Not Bilingual.No High School Degree or GED             514.2023
## Bilingual.No Schooling Completed                       756.1098
## Not Bilingual.No Schooling Completed                  1343.5167
## Bilingual.Professional Degree Beyond Bachelor's       4296.4547
## Not Bilingual.Professional Degree Beyond Bachelor's   3897.1960
## Bilingual.Some College, No Degree                      187.2428
## Not Bilingual.Some College, No Degree                  383.4156
```

```
median_by_education_wide <- median_by_education |>
  pivot_wider(names_from = Educational_Level,
              values_from = c(median_income, se_median_income))

print(median_by_education_wide)
```

```
## # A tibble: 2 × 17
##   Bilingual median_income_Bachel…¹ median_income_Doctoral median_income_High S…²
##   <chr>                     <dbl>                  <dbl>                  <dbl>
## 1 Bilingual                 56207                  93525                  29854
## 2 Not Bili…                 65000                 100000                  30000
## # ℹ abbreviated names: ¹`median_income_Bachelor's`,
## #   ²`median_income_High School or GED`
## # ℹ 13 more variables: `median_income_Master's` <dbl>,
## #   `median_income_No High School Degree or GED` <dbl>,
## #   `median_income_No Schooling Completed` <dbl>,
## #   `median_income_Professional Degree Beyond Bachelor's` <dbl>,
## #   `median_income_Some College, No Degree` <dbl>, …
```

EXTENSIVE BILINGUAL

```
income_data_full <- language_micro_data_full |>
  select(AGE, INCTOT, Language_Group, PERWT, SEX, EDUCD, AGE, CLUSTER, STRATA, YEAR, Bilingual_Status) |>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65) |>
  filter(Bilingual_Status %in% c("English Monolingual", "Bilingual"))

#recalibrating weights similar to the previous dataset
sum_weights_filtered_full <- sum(income_data_full$PERWT, na.rm = TRUE)
sum_weights_original_full <- sum(language_micro_data_full$PERWT, na.rm = TRUE)

income_data_full <- income_data_full |>
  mutate(recalibrated_weight = PERWT * (sum_weights_filtered_full / sum_weights_original_full))

#applying the educational level mapping function
income_data_full <- income_data_full |>
  mutate(Educational_Level = case_when(
    EDUCD %in% c(1, 999) ~ "N/A or Missing",
    EDUCD == 2 ~ "No Schooling Completed",
    EDUCD >= 10 & EDUCD < 62 ~ "No High School Degree or GED",
    EDUCD >= 62 & EDUCD < 65 ~ "High School or GED",
    EDUCD >= 65 & EDUCD <= 100 ~ "Some College, No Degree",
    EDUCD == 101 ~ "Bachelor's",
    EDUCD == 114 ~ "Master's",
    EDUCD == 115 ~ "Professional Degree Beyond Bachelor's",
    EDUCD == 116 ~ "Doctoral",
    TRUE ~ NA_character_
  )) |>
  filter(!is.na(INCTOT), !is.na(PERWT), !is.na(EDUCD))
```

```
#survey design object
des_full <- svydesign(ids = ~CLUSTER,
                      strata = ~STRATA,
                      weights = ~PERWT,
                      data = income_data_full)

#calculating the median income for each education level within each language group
median_by_education_full <- svyby(~INCTOT, ~interaction(Language_Group, Educational_Level), des_full, svyquantil
e, quantiles = 0.5, ci = TRUE)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

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```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
#formatting the results for clarity
median_by_education_full <- median_by_education_full |>
  separate(`interaction(Language_Group, Educational_Level)`, into = c("Language_Group", "Educational_Level"), sep
= "\\.") |>
  rename(median_income = INCTOT) |>
  rename(se_median_income = se) |>
  select(Language_Group, Educational_Level, median_income, se_median_income)

print(median_by_education_full)
```

```
##                                                                                                  Language_Group
## Asian/Pacific Islander Languages.Bachelor's                                  Asian/Pacific Islander Languages
## English.Bachelor's                                                                                  English
## Other Indo-European Languages.Bachelor's                                        Other Indo-European Languages
## Other Languages.Bachelor's                                                                  Other Languages
## Spanish.Bachelor's                                                                                  Spanish
## Asian/Pacific Islander Languages.Doctoral                                    Asian/Pacific Islander Languages
## English.Doctoral                                                                                    English
## Other Indo-European Languages.Doctoral                                          Other Indo-European Languages
## Other Languages.Doctoral                                                                    Other Languages
## Spanish.Doctoral                                                                                    Spanish
## Asian/Pacific Islander Languages.High School or GED                          Asian/Pacific Islander Languages
## English.High School or GED                                                                          English
## Other Indo-European Languages.High School or GED                                Other Indo-European Languages
## Other Languages.High School or GED                                                          Other Languages
## Spanish.High School or GED                                                                          Spanish
## Asian/Pacific Islander Languages.Master's                                    Asian/Pacific Islander Languages
## English.Master's                                                                                    English
## Other Indo-European Languages.Master's                                          Other Indo-European Languages
## Other Languages.Master's                                                                    Other Languages
## Spanish.Master's                                                                                    Spanish
## Asian/Pacific Islander Languages.No High School Degree or GED                Asian/Pacific Islander Languages
## English.No High School Degree or GED                                                                English
## Other Indo-European Languages.No High School Degree or GED                      Other Indo-European Languages
## Other Languages.No High School Degree or GED                                                Other Languages
## Spanish.No High School Degree or GED                                                                Spanish
## Asian/Pacific Islander Languages.No Schooling Completed                      Asian/Pacific Islander Languages
## English.No Schooling Completed                                                                      English
## Other Indo-European Languages.No Schooling Completed                            Other Indo-European Languages
## Other Languages.No Schooling Completed                                                      Other Languages
## Spanish.No Schooling Completed                                                                      Spanish
## Asian/Pacific Islander Languages.Professional Degree Beyond Bachelor's Asian/Pacific Islander Languages
## English.Professional Degree Beyond Bachelor's                                                       English
## Other Indo-European Languages.Professional Degree Beyond Bachelor's      Other Indo-European Languages
## Other Languages.Professional Degree Beyond Bachelor's                                       Other Languages
## Spanish.Professional Degree Beyond Bachelor's                                                       Spanish
## Asian/Pacific Islander Languages.Some College, No Degree                     Asian/Pacific Islander Languages
## English.Some College, No Degree                                                                     English
## Other Indo-European Languages.Some College, No Degree                           Other Indo-European Languages
## Other Languages.Some College, No Degree                                                     Other Languages
## Spanish.Some College, No Degree                                                                     Spanish
##                                                                                          Educational_Level
## Asian/Pacific Islander Languages.Bachelor's                                                     Bachelor's
## English.Bachelor's                                                                              Bachelor's
## Other Indo-European Languages.Bachelor's                                                        Bachelor's
## Other Languages.Bachelor's                                                                      Bachelor's
## Spanish.Bachelor's                                                                              Bachelor's
## Asian/Pacific Islander Languages.Doctoral                                                         Doctoral
## English.Doctoral                                                                                Doctoral
## Other Indo-European Languages.Doctoral                                                          Doctoral
## Other Languages.Doctoral                                                                        Doctoral
## Spanish.Doctoral                                                                                Doctoral
## Asian/Pacific Islander Languages.High School or GED                                       High School or GED
## English.High School or GED                                                                High School or GED
## Other Indo-European Languages.High School or GED                                          High School or GED
## Other Languages.High School or GED                                                        High School or GED
## Spanish.High School or GED                                                                High School or GED
## Asian/Pacific Islander Languages.Master's                                                       Master's
## English.Master's                                                                                Master's
## Other Indo-European Languages.Master's                                                          Master's
## Other Languages.Master's                                                                        Master's
## Spanish.Master's                                                                                Master's
## Asian/Pacific Islander Languages.No High School Degree or GED                  No High School Degree or GED
## English.No High School Degree or GED                                           No High School Degree or GED
## Other Indo-European Languages.No High School Degree or GED                     No High School Degree or GED
## Other Languages.No High School Degree or GED                                   No High School Degree or GED
## Spanish.No High School Degree or GED                                           No High School Degree or GED
## Asian/Pacific Islander Languages.No Schooling Completed                              No Schooling Completed
## English.No Schooling Completed                                                       No Schooling Completed
## Other Indo-European Languages.No Schooling Completed                                 No Schooling Completed
## Other Languages.No Schooling Completed                                               No Schooling Completed
## Spanish.No Schooling Completed                                                       No Schooling Completed
## Asian/Pacific Islander Languages.Professional Degree Beyond Bachelor's Professional Degree Beyond Bachelor's
## English.Professional Degree Beyond Bachelor's                          Professional Degree Beyond Bachelor's
## Other Indo-European Languages.Professional Degree Beyond Bachelor's    Professional Degree Beyond Bachelor's
## Other Languages.Professional Degree Beyond Bachelor's                  Professional Degree Beyond Bachelor's
## Spanish.Professional Degree Beyond Bachelor's                          Professional Degree Beyond Bachelor's
## Asian/Pacific Islander Languages.Some College, No Degree                              Some College, No Degree
```

```
## English.Some College, No Degree                                                Some College, No Degree
## Other Indo-European Languages.Some College, No Degree                          Some College, No Degree
## Other Languages.Some College, No Degree                                        Some College, No Degree
## Spanish.Some College, No Degree                                                Some College, No Degree
##                                                                    median_income
## Asian/Pacific Islander Languages.Bachelor's                             59450.00
## English.Bachelor's                                                      64855.00
## Other Indo-European Languages.Bachelor's                                70000.00
## Other Languages.Bachelor's                                              47230.70
## Spanish.Bachelor's                                                      54046.00
## Asian/Pacific Islander Languages.Doctoral                              102239.00
## English.Doctoral                                                       100000.00
## Other Indo-European Languages.Doctoral                                 101154.62
## Other Languages.Doctoral                                                81973.90
## Spanish.Doctoral                                                        81068.00
## Asian/Pacific Islander Languages.High School or GED                     28074.30
## English.High School or GED                                              30000.00
## Other Indo-European Languages.High School or GED                        28705.00
## Other Languages.High School or GED                                      28057.00
## Spanish.High School or GED                                              30000.00
## Asian/Pacific Islander Languages.Master's                               82850.08
## English.Master's                                                        77826.00
## Other Indo-European Languages.Master's                                 103116.00
## Other Languages.Master's                                                74634.00
## Spanish.Master's                                                        68893.00
## Asian/Pacific Islander Languages.No High School Degree or GED           31698.52
## English.No High School Degree or GED                                    20963.00
## Other Indo-European Languages.No High School Degree or GED              29904.83
## Other Languages.No High School Degree or GED                            25000.00
## Spanish.No High School Degree or GED                                    28329.00
## Asian/Pacific Islander Languages.No Schooling Completed                 30018.14
## English.No Schooling Completed                                          21618.00
## Other Indo-European Languages.No Schooling Completed                    30419.41
## Other Languages.No Schooling Completed                                  33795.24
## Spanish.No Schooling Completed                                          30255.00
## Asian/Pacific Islander Languages.Professional Degree Beyond Bachelor's  91102.28
## English.Professional Degree Beyond Bachelor's                          120000.00
## Other Indo-European Languages.Professional Degree Beyond Bachelor's    114617.83
## Other Languages.Professional Degree Beyond Bachelor's                  124490.23
## Spanish.Professional Degree Beyond Bachelor's                           78325.10
## Asian/Pacific Islander Languages.Some College, No Degree                30000.00
## English.Some College, No Degree                                         38000.00
## Other Indo-European Languages.Some College, No Degree                   34447.00
## Other Languages.Some College, No Degree                                 30000.00
## Spanish.Some College, No Degree                                         32427.00
##                                                                 se_median_income
## Asian/Pacific Islander Languages.Bachelor's                            1362.4182
## English.Bachelor's                                                      104.8475
## Other Indo-European Languages.Bachelor's                               1141.4951
## Other Languages.Bachelor's                                             1723.9317
## Spanish.Bachelor's                                                      519.1036
## Asian/Pacific Islander Languages.Doctoral                              4196.6798
## English.Doctoral                                                       1492.3125
## Other Indo-European Languages.Doctoral                                 4620.7485
## Other Languages.Doctoral                                               6719.6196
## Spanish.Doctoral                                                       4290.6418
## Asian/Pacific Islander Languages.High School or GED                     793.1265
## English.High School or GED                                              137.2455
## Other Indo-European Languages.High School or GED                        652.8833
## Other Languages.High School or GED                                     1161.2904
## Spanish.High School or GED                                              197.4450
## Asian/Pacific Islander Languages.Master's                              2017.9180
## English.Master's                                                        826.0083
## Other Indo-European Languages.Master's                                 1434.2437
## Other Languages.Master's                                               4306.6470
## Spanish.Master's                                                        513.1665
## Asian/Pacific Islander Languages.No High School Degree or GED          1638.2313
## English.No High School Degree or GED                                    311.4651
## Other Indo-European Languages.No High School Degree or GED             1637.4436
## Other Languages.No High School Degree or GED                           2468.7922
## Spanish.No High School Degree or GED                                    179.8369
## Asian/Pacific Islander Languages.No Schooling Completed                1540.7231
## English.No Schooling Completed                                          649.7737
## Other Indo-European Languages.No Schooling Completed                   2668.1416
## Other Languages.No Schooling Completed                                 5119.0325
## Spanish.No Schooling Completed                                          834.3075
## Asian/Pacific Islander Languages.Professional Degree Beyond Bachelor's 10855.4245
## English.Professional Degree Beyond Bachelor's                          2635.8749
## Other Indo-European Languages.Professional Degree Beyond Bachelor's    4638.1206
```

```
## Other Languages.Professional Degree Beyond Bachelor's                      17327.0681
## Spanish.Professional Degree Beyond Bachelor's                               3580.6549
## Asian/Pacific Islander Languages.Some College, No Degree                    1123.2330
## English.Some College, No Degree                                             190.5628
## Other Indo-European Languages.Some College, No Degree                       1191.4365
## Other Languages.Some College, No Degree                                     1639.9328
## Spanish.Some College, No Degree                                             190.8130
```

```
#pivoting the data wider to have one row per Educational_Level
income_data_wide <- median_by_education_full |>
  pivot_wider(names_from = Language_Group,
              values_from = c(median_income, se_median_income))

print(income_data_wide)
```

```
## # A tibble: 8 × 11
##   Educational_Level                median_income_Asian/…¹ median_income_English
##   <chr>                                             <dbl>                 <dbl>
## 1 Bachelor's                                        59450                 64855
## 2 Doctoral                                         102239                100000
## 3 High School or GED                                28074.                30000
## 4 Master's                                          82850.                77826
## 5 No High School Degree or GED                      31699.                20963
## 6 No Schooling Completed                            30018.                21618
## 7 Professional Degree Beyond Bache…                 91102.                120000
## 8 Some College, No Degree                           30000                 38000
## # ℹ abbreviated name: ¹`median_income_Asian/Pacific Islander Languages`
## # ℹ 8 more variables: `median_income_Other Indo-European Languages` <dbl>,
## #   `median_income_Other Languages` <dbl>, median_income_Spanish <dbl>,
## #   `se_median_income_Asian/Pacific Islander Languages` <dbl>,
## #   se_median_income_English <dbl>,
## #   `se_median_income_Other Indo-European Languages` <dbl>,
## #   `se_median_income_Other Languages` <dbl>, se_median_income_Spanish <dbl>
```

Bilingual and Non-English Monolingual

```
#filtering and setting up the data
income_data_full_NE <- language_micro_data_full |>
  select(AGE, INCTOT, Language_Group, Bilingual_Status, PERWT, SEX, EDUCD, CLUSTER, STRATA, YEAR) |>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65) |>
  filter(Bilingual_Status %in% c("Bilingual", "NE Monolingual")) |>
  mutate(Educational_Level = case_when(
    EDUCD %in% c(1, 999) ~ "N/A or Missing",
    EDUCD == 2 ~ "No Schooling Completed",
    EDUCD >= 10 & EDUCD < 62 ~ "No High School Degree or GED",
    EDUCD >= 62 & EDUCD < 65 ~ "High School or GED",
    EDUCD >= 65 & EDUCD <= 100 ~ "Some College, No Degree",
    EDUCD == 101 ~ "Bachelor's",
    EDUCD == 114 ~ "Master's & Professional Degree Beyond Bachelor's",
    EDUCD == 115 ~ "Master's & Professional Degree Beyond Bachelor's",
    EDUCD == 116 ~ "Doctoral",
    TRUE ~ NA_character_
  )) |>
  filter(!is.na(INCTOT), !is.na(PERWT), !is.na(EDUCD))

table(income_data_full_NE$Educational_Level)
```

```
##
##                                     Bachelor's
##                                          33554
##                                       Doctoral
##                                           3131
##                                High School or GED
##                                          49626
## Master's & Professional Degree Beyond Bachelor's
##                                          19321
##                     No High School Degree or GED
##                                          35302
##                              No Schooling Completed
##                                           7551
##                            Some College, No Degree
##                                          51295
```

```
des_full_NE <- svydesign(ids = ~CLUSTER,
                         strata = ~STRATA,
                         weights = ~PERWT,
                         data = income_data_full_NE)

#calculating the median income by education level for each language group and bilingual status
median_by_education_full_NE <- svyby(~INCTOT,
                                     ~interaction(Language_Group, Educational_Level, Bilingual_Status),
                                     des_full_NE,
                                     svyquantile,
                                     quantiles = 0.5,
                                     ci = TRUE)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

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## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
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## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
#formatting the results for clarity
median_by_education_full_NE <- median_by_education_full_NE |>
  separate(`interaction(Language_Group, Educational_Level, Bilingual_Status)`,
           into = c("Language_Group", "Educational_Level", "Bilingual_Status"), sep = "\\.") |>
  rename(median_income = INCTOT) |>
  rename(se_median_income = se) |>
  select(Language_Group, Educational_Level, Bilingual_Status, median_income, se_median_income)

print(median_by_education_full_NE)
```

```
##
Language_Group
## Asian/Pacific Islander Languages.Bachelor's.Bilingual                                    Asian/Pacific
Islander Languages
## Other Indo-European Languages.Bachelor's.Bilingual                                       Other Indo
-European Languages
## Other Languages.Bachelor's.Bilingual
Other Languages
## Spanish.Bachelor's.Bilingual
Spanish
## Asian/Pacific Islander Languages.Doctoral.Bilingual                                      Asian/Pacific
Islander Languages
## Other Indo-European Languages.Doctoral.Bilingual                                         Other Indo
-European Languages
## Other Languages.Doctoral.Bilingual
Other Languages
## Spanish.Doctoral.Bilingual
Spanish
## Asian/Pacific Islander Languages.High School or GED.Bilingual                            Asian/Pacific
Islander Languages
## Other Indo-European Languages.High School or GED.Bilingual                               Other Indo
-European Languages
## Other Languages.High School or GED.Bilingual
Other Languages
## Spanish.High School or GED.Bilingual
Spanish
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual  Asian/Pacific
Islander Languages
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual     Other Indo
-European Languages
## Other Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual
Other Languages
## Spanish.Master's & Professional Degree Beyond Bachelor's.Bilingual
Spanish
## Asian/Pacific Islander Languages.No High School Degree or GED.Bilingual                  Asian/Pacific
Islander Languages
## Other Indo-European Languages.No High School Degree or GED.Bilingual                     Other Indo
-European Languages
## Other Languages.No High School Degree or GED.Bilingual
Other Languages
## Spanish.No High School Degree or GED.Bilingual
Spanish
## Asian/Pacific Islander Languages.No Schooling Completed.Bilingual                        Asian/Pacific
Islander Languages
## Other Indo-European Languages.No Schooling Completed.Bilingual                           Other Indo
-European Languages
## Other Languages.No Schooling Completed.Bilingual
Other Languages
## Spanish.No Schooling Completed.Bilingual
Spanish
## Asian/Pacific Islander Languages.Some College, No Degree.Bilingual                       Asian/Pacific
Islander Languages
## Other Indo-European Languages.Some College, No Degree.Bilingual                          Other Indo
-European Languages
## Other Languages.Some College, No Degree.Bilingual
Other Languages
## Spanish.Some College, No Degree.Bilingual
Spanish
## Asian/Pacific Islander Languages.Bachelor's.NE Monolingual                               Asian/Pacific
Islander Languages
## Other Indo-European Languages.Bachelor's.NE Monolingual                                  Other Indo
-European Languages
## Other Languages.Bachelor's.NE Monolingual
Other Languages
## Spanish.Bachelor's.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.Doctoral.NE Monolingual                                 Asian/Pacific
Islander Languages
## Other Indo-European Languages.Doctoral.NE Monolingual                                    Other Indo
-European Languages
## Spanish.Doctoral.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.High School or GED.NE Monolingual                       Asian/Pacific
Islander Languages
## Other Indo-European Languages.High School or GED.NE Monolingual                          Other Indo
-European Languages
## Other Languages.High School or GED.NE Monolingual
Other Languages
```

```
## Spanish.High School or GED.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual Asian/Pacific
Islander Languages
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual       Other Indo
-European Languages
## Other Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual
Other Languages
## Spanish.Master's & Professional Degree Beyond Bachelor's.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.No High School Degree or GED.NE Monolingual                     Asian/Pacific
Islander Languages
## Other Indo-European Languages.No High School Degree or GED.NE Monolingual                        Other Indo
-European Languages
## Other Languages.No High School Degree or GED.NE Monolingual
Other Languages
## Spanish.No High School Degree or GED.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.No Schooling Completed.NE Monolingual                           Asian/Pacific
Islander Languages
## Other Indo-European Languages.No Schooling Completed.NE Monolingual                              Other Indo
-European Languages
## Other Languages.No Schooling Completed.NE Monolingual
Other Languages
## Spanish.No Schooling Completed.NE Monolingual
Spanish
## Asian/Pacific Islander Languages.Some College, No Degree.NE Monolingual                          Asian/Pacific
Islander Languages
## Other Indo-European Languages.Some College, No Degree.NE Monolingual                             Other Indo
-European Languages
## Other Languages.Some College, No Degree.NE Monolingual
Other Languages
## Spanish.Some College, No Degree.NE Monolingual
Spanish
##
Educational_Level
## Asian/Pacific Islander Languages.Bachelor's.Bilingual
Bachelor's
## Other Indo-European Languages.Bachelor's.Bilingual
Bachelor's
## Other Languages.Bachelor's.Bilingual
Bachelor's
## Spanish.Bachelor's.Bilingual
Bachelor's
## Asian/Pacific Islander Languages.Doctoral.Bilingual
Doctoral
## Other Indo-European Languages.Doctoral.Bilingual
Doctoral
## Other Languages.Doctoral.Bilingual
Doctoral
## Spanish.Doctoral.Bilingual
Doctoral
## Asian/Pacific Islander Languages.High School or GED.Bilingual
High School or GED
## Other Indo-European Languages.High School or GED.Bilingual
High School or GED
## Other Languages.High School or GED.Bilingual
High School or GED
## Spanish.High School or GED.Bilingual
High School or GED
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual     Master's & Pr
ofessional Degree Beyond Bachelor's
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual        Master's & Pr
ofessional Degree Beyond Bachelor's
## Other Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual                      Master's & Pr
ofessional Degree Beyond Bachelor's
## Spanish.Master's & Professional Degree Beyond Bachelor's.Bilingual                              Master's & Pr
ofessional Degree Beyond Bachelor's
## Asian/Pacific Islander Languages.No High School Degree or GED.Bilingual
No High School Degree or GED
## Other Indo-European Languages.No High School Degree or GED.Bilingual
No High School Degree or GED
## Other Languages.No High School Degree or GED.Bilingual
No High School Degree or GED
## Spanish.No High School Degree or GED.Bilingual
No High School Degree or GED
## Asian/Pacific Islander Languages.No Schooling Completed.Bilingual
No Schooling Completed
## Other Indo-European Languages.No Schooling Completed.Bilingual
```

```
No Schooling Completed
## Other Languages.No Schooling Completed.Bilingual
No Schooling Completed
## Spanish.No Schooling Completed.Bilingual
No Schooling Completed
## Asian/Pacific Islander Languages.Some College, No Degree.Bilingual
Some College, No Degree
## Other Indo-European Languages.Some College, No Degree.Bilingual
Some College, No Degree
## Other Languages.Some College, No Degree.Bilingual
Some College, No Degree
## Spanish.Some College, No Degree.Bilingual
Some College, No Degree
## Asian/Pacific Islander Languages.Bachelor's.NE Monolingual
Bachelor's
## Other Indo-European Languages.Bachelor's.NE Monolingual
Bachelor's
## Other Languages.Bachelor's.NE Monolingual
Bachelor's
## Spanish.Bachelor's.NE Monolingual
Bachelor's
## Asian/Pacific Islander Languages.Doctoral.NE Monolingual
Doctoral
## Other Indo-European Languages.Doctoral.NE Monolingual
Doctoral
## Spanish.Doctoral.NE Monolingual
Doctoral
## Asian/Pacific Islander Languages.High School or GED.NE Monolingual
High School or GED
## Other Indo-European Languages.High School or GED.NE Monolingual
High School or GED
## Other Languages.High School or GED.NE Monolingual
High School or GED
## Spanish.High School or GED.NE Monolingual
High School or GED
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual Master's & Pr
ofessional Degree Beyond Bachelor's
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual    Master's & Pr
ofessional Degree Beyond Bachelor's
## Other Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                  Master's & Pr
ofessional Degree Beyond Bachelor's
## Spanish.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                          Master's & Pr
ofessional Degree Beyond Bachelor's
## Asian/Pacific Islander Languages.No High School Degree or GED.NE Monolingual
No High School Degree or GED
## Other Indo-European Languages.No High School Degree or GED.NE Monolingual
No High School Degree or GED
## Other Languages.No High School Degree or GED.NE Monolingual
No High School Degree or GED
## Spanish.No High School Degree or GED.NE Monolingual
No High School Degree or GED
## Asian/Pacific Islander Languages.No Schooling Completed.NE Monolingual
No Schooling Completed
## Other Indo-European Languages.No Schooling Completed.NE Monolingual
No Schooling Completed
## Other Languages.No Schooling Completed.NE Monolingual
No Schooling Completed
## Spanish.No Schooling Completed.NE Monolingual
No Schooling Completed
## Asian/Pacific Islander Languages.Some College, No Degree.NE Monolingual
Some College, No Degree
## Other Indo-European Languages.Some College, No Degree.NE Monolingual
Some College, No Degree
## Other Languages.Some College, No Degree.NE Monolingual
Some College, No Degree
## Spanish.Some College, No Degree.NE Monolingual
Some College, No Degree
##                                                                                  Bilingual_Sta
tus
## Asian/Pacific Islander Languages.Bachelor's.Bilingual                                  Biling
ual
## Other Indo-European Languages.Bachelor's.Bilingual                                     Biling
ual
## Other Languages.Bachelor's.Bilingual                                                   Biling
ual
## Spanish.Bachelor's.Bilingual                                                           Biling
ual
## Asian/Pacific Islander Languages.Doctoral.Bilingual                                    Biling
ual
```

```
## Other Indo-European Languages.Doctoral.Bilingual                                   Biling
ual
## Other Languages.Doctoral.Bilingual                                                 Biling
ual
## Spanish.Doctoral.Bilingual                                                         Biling
ual
## Asian/Pacific Islander Languages.High School or GED.Bilingual                      Biling
ual
## Other Indo-European Languages.High School or GED.Bilingual                         Biling
ual
## Other Languages.High School or GED.Bilingual                                       Biling
ual
## Spanish.High School or GED.Bilingual                                               Biling
ual
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual  Biling
ual
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual  Biling
ual
## Other Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual         Biling
ual
## Spanish.Master's & Professional Degree Beyond Bachelor's.Bilingual                 Biling
ual
## Asian/Pacific Islander Languages.No High School Degree or GED.Bilingual            Biling
ual
## Other Indo-European Languages.No High School Degree or GED.Bilingual               Biling
ual
## Other Languages.No High School Degree or GED.Bilingual                             Biling
ual
## Spanish.No High School Degree or GED.Bilingual                                     Biling
ual
## Asian/Pacific Islander Languages.No Schooling Completed.Bilingual                  Biling
ual
## Other Indo-European Languages.No Schooling Completed.Bilingual                     Biling
ual
## Other Languages.No Schooling Completed.Bilingual                                   Biling
ual
## Spanish.No Schooling Completed.Bilingual                                           Biling
ual
## Asian/Pacific Islander Languages.Some College, No Degree.Bilingual                 Biling
ual
## Other Indo-European Languages.Some College, No Degree.Bilingual                    Biling
ual
## Other Languages.Some College, No Degree.Bilingual                                  Biling
ual
## Spanish.Some College, No Degree.Bilingual                                          Biling
ual
## Asian/Pacific Islander Languages.Bachelor's.NE Monolingual                      NE Monoling
ual
## Other Indo-European Languages.Bachelor's.NE Monolingual                         NE Monoling
ual
## Other Languages.Bachelor's.NE Monolingual                                       NE Monoling
ual
## Spanish.Bachelor's.NE Monolingual                                               NE Monoling
ual
## Asian/Pacific Islander Languages.Doctoral.NE Monolingual                        NE Monoling
ual
## Other Indo-European Languages.Doctoral.NE Monolingual                           NE Monoling
ual
## Spanish.Doctoral.NE Monolingual                                                 NE Monoling
ual
## Asian/Pacific Islander Languages.High School or GED.NE Monolingual              NE Monoling
ual
## Other Indo-European Languages.High School or GED.NE Monolingual                 NE Monoling
ual
## Other Languages.High School or GED.NE Monolingual                               NE Monoling
ual
## Spanish.High School or GED.NE Monolingual                                       NE Monoling
ual
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual  NE Monoling
ual
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual  NE Monoling
ual
## Other Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual  NE Monoling
ual
## Spanish.Master's & Professional Degree Beyond Bachelor's.NE Monolingual         NE Monoling
ual
## Asian/Pacific Islander Languages.No High School Degree or GED.NE Monolingual    NE Monoling
ual
## Other Indo-European Languages.No High School Degree or GED.NE Monolingual       NE Monoling
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```
ual
## Other Languages.No High School Degree or GED.NE Monolingual                                    NE Monoling
ual
## Spanish.No High School Degree or GED.NE Monolingual                                           NE Monoling
ual
## Asian/Pacific Islander Languages.No Schooling Completed.NE Monolingual                        NE Monoling
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## Other Indo-European Languages.No Schooling Completed.NE Monolingual                           NE Monoling
ual
## Other Languages.No Schooling Completed.NE Monolingual                                         NE Monoling
ual
## Spanish.No Schooling Completed.NE Monolingual                                                 NE Monoling
ual
## Asian/Pacific Islander Languages.Some College, No Degree.NE Monolingual                       NE Monoling
ual
## Other Indo-European Languages.Some College, No Degree.NE Monolingual                          NE Monoling
ual
## Other Languages.Some College, No Degree.NE Monolingual                                        NE Monoling
ual
## Spanish.Some College, No Degree.NE Monolingual                                                NE Monoling
ual
##                                                                                            median_income
## Asian/Pacific Islander Languages.Bachelor's.Bilingual                                           59450.00
## Other Indo-European Languages.Bachelor's.Bilingual                                              70000.00
## Other Languages.Bachelor's.Bilingual                                                            47230.70
## Spanish.Bachelor's.Bilingual                                                                    54046.00
## Asian/Pacific Islander Languages.Doctoral.Bilingual                                            102239.00
## Other Indo-European Languages.Doctoral.Bilingual                                               101154.62
## Other Languages.Doctoral.Bilingual                                                              81973.90
## Spanish.Doctoral.Bilingual                                                                      81068.00
## Asian/Pacific Islander Languages.High School or GED.Bilingual                                   28074.30
## Other Indo-European Languages.High School or GED.Bilingual                                      28705.00
## Other Languages.High School or GED.Bilingual                                                    28057.00
## Spanish.High School or GED.Bilingual                                                            30000.00
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual     84172.00
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual       104652.53
## Other Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual                      78961.25
## Spanish.Master's & Professional Degree Beyond Bachelor's.Bilingual                              69400.51
## Asian/Pacific Islander Languages.No High School Degree or GED.Bilingual                         31698.52
## Other Indo-European Languages.No High School Degree or GED.Bilingual                            29904.83
## Other Languages.No High School Degree or GED.Bilingual                                          25000.00
## Spanish.No High School Degree or GED.Bilingual                                                  28329.00
## Asian/Pacific Islander Languages.No Schooling Completed.Bilingual                               30018.14
## Other Indo-European Languages.No Schooling Completed.Bilingual                                  30419.41
## Other Languages.No Schooling Completed.Bilingual                                                33795.24
## Spanish.No Schooling Completed.Bilingual                                                        30255.00
## Asian/Pacific Islander Languages.Some College, No Degree.Bilingual                              30000.00
## Other Indo-European Languages.Some College, No Degree.Bilingual                                 34447.00
## Other Languages.Some College, No Degree.Bilingual                                               30000.00
## Spanish.Some College, No Degree.Bilingual                                                       32427.00
## Asian/Pacific Islander Languages.Bachelor's.NE Monolingual                                      35186.67
## Other Indo-European Languages.Bachelor's.NE Monolingual                                         27509.32
## Other Languages.Bachelor's.NE Monolingual                                                       29785.71
## Spanish.Bachelor's.NE Monolingual                                                               28817.47
## Asian/Pacific Islander Languages.Doctoral.NE Monolingual                                        55956.17
## Other Indo-European Languages.Doctoral.NE Monolingual                                           66093.05
## Spanish.Doctoral.NE Monolingual                                                                 44053.50
## Asian/Pacific Islander Languages.High School or GED.NE Monolingual                              24113.00
## Other Indo-European Languages.High School or GED.NE Monolingual                                 22643.14
## Other Languages.High School or GED.NE Monolingual                                               21388.50
## Spanish.High School or GED.NE Monolingual                                                       27023.00
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual  35967.38
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual    49720.18
## Other Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                 64088.28
## Spanish.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                         37803.87
## Asian/Pacific Islander Languages.No High School Degree or GED.NE Monolingual                    24929.00
## Other Indo-European Languages.No High School Degree or GED.NE Monolingual                       21043.00
## Other Languages.No High School Degree or GED.NE Monolingual                                     24113.00
## Spanish.No High School Degree or GED.NE Monolingual                                             24753.00
## Asian/Pacific Islander Languages.No Schooling Completed.NE Monolingual                          26891.29
## Other Indo-European Languages.No Schooling Completed.NE Monolingual                             24153.85
## Other Languages.No Schooling Completed.NE Monolingual                                           17616.67
## Spanish.No Schooling Completed.NE Monolingual                                                   25000.00
## Asian/Pacific Islander Languages.Some College, No Degree.NE Monolingual                         23941.93
## Other Indo-European Languages.Some College, No Degree.NE Monolingual                            29887.33
## Other Languages.Some College, No Degree.NE Monolingual                                          26995.39
## Spanish.Some College, No Degree.NE Monolingual                                                  28104.00
##                                                                                            se_median_inc
ome
```

```
## Asian/Pacific Islander Languages.Bachelor's.Bilingual                                    1360.5
046
## Other Indo-European Languages.Bachelor's.Bilingual                                       1137.4
522
## Other Languages.Bachelor's.Bilingual                                                    1723.9
317
## Spanish.Bachelor's.Bilingual                                                             519.1
036
## Asian/Pacific Islander Languages.Doctoral.Bilingual                                      4196.6
798
## Other Indo-European Languages.Doctoral.Bilingual                                         4620.7
485
## Other Languages.Doctoral.Bilingual                                                      6719.6
758
## Spanish.Doctoral.Bilingual                                                              4290.6
418
## Asian/Pacific Islander Languages.High School or GED.Bilingual                            793.1
265
## Other Indo-European Languages.High School or GED.Bilingual                               652.8
854
## Other Languages.High School or GED.Bilingual                                            1161.5
210
## Spanish.High School or GED.Bilingual                                                     197.4
450
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual  2549.8
312
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual  1557.8
390
## Other Languages.Master's & Professional Degree Beyond Bachelor's.Bilingual              4069.0
191
## Spanish.Master's & Professional Degree Beyond Bachelor's.Bilingual                       551.4
440
## Asian/Pacific Islander Languages.No High School Degree or GED.Bilingual                  1638.2
313
## Other Indo-European Languages.No High School Degree or GED.Bilingual                     1637.3
483
## Other Languages.No High School Degree or GED.Bilingual                                  2468.8
177
## Spanish.No High School Degree or GED.Bilingual                                           179.8
369
## Asian/Pacific Islander Languages.No Schooling Completed.Bilingual                        1540.6
815
## Other Indo-European Languages.No Schooling Completed.Bilingual                           2667.9
823
## Other Languages.No Schooling Completed.Bilingual                                        5119.1
897
## Spanish.No Schooling Completed.Bilingual                                                 834.2
558
## Asian/Pacific Islander Languages.Some College, No Degree.Bilingual                       1123.2
330
## Other Indo-European Languages.Some College, No Degree.Bilingual                          1190.4
512
## Other Languages.Some College, No Degree.Bilingual                                       1639.9
343
## Spanish.Some College, No Degree.Bilingual                                                190.8
130
## Asian/Pacific Islander Languages.Bachelor's.NE Monolingual                               3683.4
568
## Other Indo-European Languages.Bachelor's.NE Monolingual                                  3352.4
401
## Other Languages.Bachelor's.NE Monolingual                                               5400.1
358
## Spanish.Bachelor's.NE Monolingual                                                       1021.4
365
## Asian/Pacific Islander Languages.Doctoral.NE Monolingual                                18131.4
416
## Other Indo-European Languages.Doctoral.NE Monolingual                                    8180.6
096
## Spanish.Doctoral.NE Monolingual                                                         21015.4
020
## Asian/Pacific Islander Languages.High School or GED.NE Monolingual                       1261.4
210
## Other Indo-European Languages.High School or GED.NE Monolingual                          2586.8
476
## Other Languages.High School or GED.NE Monolingual                                       3238.7
775
## Spanish.High School or GED.NE Monolingual                                                360.6
477
## Asian/Pacific Islander Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual  8282.6
```

```
804
## Other Indo-European Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual         11724.5
220
## Other Languages.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                        8860.4
349
## Spanish.Master's & Professional Degree Beyond Bachelor's.NE Monolingual                                2294.7
966
## Asian/Pacific Islander Languages.No High School Degree or GED.NE Monolingual                           1117.6
683
## Other Indo-European Languages.No High School Degree or GED.NE Monolingual                              2963.4
282
## Other Languages.No High School Degree or GED.NE Monolingual                                            2824.6
095
## Spanish.No High School Degree or GED.NE Monolingual                                                     255.0
814
## Asian/Pacific Islander Languages.No Schooling Completed.NE Monolingual                                 1579.7
710
## Other Indo-European Languages.No Schooling Completed.NE Monolingual                                    4249.3
332
## Other Languages.No Schooling Completed.NE Monolingual                                                  3209.0
684
## Spanish.No Schooling Completed.NE Monolingual                                                           731.3
002
## Asian/Pacific Islander Languages.Some College, No Degree.NE Monolingual                                1745.5
763
## Other Indo-European Languages.Some College, No Degree.NE Monolingual                                   2377.5
266
## Other Languages.Some College, No Degree.NE Monolingual                                                 9977.1
124
## Spanish.Some College, No Degree.NE Monolingual                                                          517.8
771
```

```
income_data_wide_NE <- median_by_education_full_NE |>
  pivot_wider(names_from = Language_Group,
              values_from = c(median_income, se_median_income))

print(income_data_wide_NE)
```

```
## # A tibble: 14 × 10
##    Educational_Level                    Bilingual_Status median_income_Asian/…¹
##    <chr>                                <chr>                             <dbl>
##  1 Bachelor's                           Bilingual                         59450
##  2 Doctoral                             Bilingual                        102239
##  3 High School or GED                   Bilingual                         28074.
##  4 Master's & Professional Degree Beyon… Bilingual                        84172
##  5 No High School Degree or GED         Bilingual                         31699.
##  6 No Schooling Completed               Bilingual                         30018.
##  7 Some College, No Degree              Bilingual                         30000
##  8 Bachelor's                           NE Monolingual                    35187.
##  9 Doctoral                             NE Monolingual                    55956.
## 10 High School or GED                   NE Monolingual                    24113
## 11 Master's & Professional Degree Beyon… NE Monolingual                   35967.
## 12 No High School Degree or GED         NE Monolingual                    24929
## 13 No Schooling Completed               NE Monolingual                    26891.
## 14 Some College, No Degree              NE Monolingual                    23942.
## # ℹ abbreviated name: ¹`median_income_Asian/Pacific Islander Languages`
## # ℹ 7 more variables: `median_income_Other Indo-European Languages` <dbl>,
## #   `median_income_Other Languages` <dbl>, median_income_Spanish <dbl>,
## #   `se_median_income_Asian/Pacific Islander Languages` <dbl>,
## #   `se_median_income_Other Indo-European Languages` <dbl>,
## #   `se_median_income_Other Languages` <dbl>, se_median_income_Spanish <dbl>
```

```
#filtering and setting up the data
income_data_all_stat <- language_micro_data_full |>
  select(AGE, INCTOT, Bilingual_Status, PERWT, SEX, CLUSTER, STRATA, YEAR) |>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65)
```

```
des_all_stat <- svydesign(ids = ~CLUSTER,
                          strata = ~STRATA,
                          weights = ~PERWT,
                          data = income_data_all_stat)

bilingual_median <- as.numeric(svyquantile(~INCTOT, subset(des_all_stat, Bilingual_Status == "Bilingual"), quanti
les = 0.5, ci = FALSE))
english_mono_median <- as.numeric(svyquantile(~INCTOT, subset(des_all_stat, Bilingual_Status == "English Monoling
ual"), quantiles = 0.5, ci = FALSE))
non_english_mono_median <- as.numeric(svyquantile(~INCTOT, subset(des_all_stat, Bilingual_Status == "NE Monolingu
al"), quantiles = 0.5, ci = FALSE))

#combining results into a single data frame
median_by_bilingual_stat <- data.frame(
  Bilingual_Status = c("Bilingual", "English Monolingual", "NE Monolingual"),
  median_income = c(bilingual_median, english_mono_median, non_english_mono_median)
)

print(median_by_bilingual_stat)
```

```
##      Bilingual_Status median_income
## 1           Bilingual         36475
## 2 English Monolingual         44966
## 3      NE Monolingual         25942
```

Linear Regression

```
lin_reg_income <- language_micro_data_full |>
  select(AGE, RACE, INCTOT, Language_Group, Bilingual_Status, PERWT, SEX, EDUCD, CLUSTER, STRATA, YEAR) |>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65) |>
  filter(SEX != 9) |>
  filter(Bilingual_Status %in% c("Bilingual", "English Monolingual")) |>
  mutate(Educational_Level = case_when(
    EDUCD %in% c(1, 999) ~ "N/A or Missing",
    EDUCD == 2 ~ "No Schooling Completed",
    EDUCD >= 10 & EDUCD < 62 ~ "No High School Degree or GED",
    EDUCD >= 62 & EDUCD < 65 ~ "High School or GED",
    EDUCD >= 65 & EDUCD <= 100 ~ "Some College, No Degree",
    EDUCD == 101 ~ "Bachelor's",
    EDUCD == 114 ~ "Master's & Professional Degree Beyond Bachelor's",
    EDUCD == 115 ~ "Master's & Professional Degree Beyond Bachelor's",
    EDUCD == 116 ~ "Doctoral",
    TRUE ~ NA_character_
  )) |>
  filter(!is.na(INCTOT), !is.na(PERWT), !is.na(EDUCD))

des_edu_lin_reg <- svydesign(
  ids = ~CLUSTER,
  strata = ~STRATA,
  weights = ~PERWT,
  data = lin_reg_income
)

biling_model <- svyglm(
  INCTOT ~ Educational_Level * Bilingual_Status,
  design = des_edu_lin_reg
)

# summary(biling_model)

language_model <- svyglm(
  INCTOT ~ Educational_Level * Language_Group,
  design = des_edu_lin_reg
)

summary(language_model)
```

```
##
## Call:
## svyglm(formula = INCTOT ~ Educational_Level * Language_Group,
##     design = des_edu_lin_reg)
##
## Survey design:
## svydesign(ids = ~CLUSTER, strata = ~STRATA, weights = ~PERWT,
##     data = lin_reg_income)
##
## Coefficients:
##
Estimate
## (Intercept)
72412.2
## Educational_LevelDoctoral
54566.3
## Educational_LevelHigh School or GED
-35387.3
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's
37536.7
## Educational_LevelNo High School Degree or GED
-32303.6
## Educational_LevelNo Schooling Completed
-31013.9
## Educational_LevelSome College, No Degree
-30592.7
## Language_GroupEnglish
15997.6
## Language_GroupOther Indo-European Languages
13638.8
## Language_GroupOther Languages
-11486.8
## Language_GroupSpanish
-6887.7
## Educational_LevelDoctoral:Language_GroupEnglish
-4664.2
## Educational_LevelHigh School or GED:Language_GroupEnglish
-12585.4
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupEnglish
-4151.5
## Educational_LevelNo High School Degree or GED:Language_GroupEnglish
-24664.4
## Educational_LevelNo Schooling Completed:Language_GroupEnglish
-24204.3
## Educational_LevelSome College, No Degree:Language_GroupEnglish
-7204.5
## Educational_LevelDoctoral:Language_GroupOther Indo-European Languages
-7480.2
## Educational_LevelHigh School or GED:Language_GroupOther Indo-European Languages
-7335.8
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Indo-European Languages
-661.2
## Educational_LevelNo High School Degree or GED:Language_GroupOther Indo-European Languages
-7749.3
## Educational_LevelNo Schooling Completed:Language_GroupOther Indo-European Languages
-13556.6
## Educational_LevelSome College, No Degree:Language_GroupOther Indo-European Languages
-6372.2
## Educational_LevelDoctoral:Language_GroupOther Languages
-21904.9
## Educational_LevelHigh School or GED:Language_GroupOther Languages
12097.9
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Languages
9093.5
## Educational_LevelNo High School Degree or GED:Language_GroupOther Languages
6025.3
## Educational_LevelNo Schooling Completed:Language_GroupOther Languages
15665.9
## Educational_LevelSome College, No Degree:Language_GroupOther Languages
10657.9
## Educational_LevelDoctoral:Language_GroupSpanish
-2317.9
## Educational_LevelHigh School or GED:Language_GroupSpanish
7208.2
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupSpanish
-7277.9
## Educational_LevelNo High School Degree or GED:Language_GroupSpanish
2265.3
```

```
## Educational_LevelNo Schooling Completed:Language_GroupSpanish
3511.8
## Educational_LevelSome College, No Degree:Language_GroupSpanish
6032.2
##
Std. Error
## (Intercept)
1237.1
## Educational_LevelDoctoral
4764.1
## Educational_LevelHigh School or GED
1825.1
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's
3654.9
## Educational_LevelNo High School Degree or GED
3653.7
## Educational_LevelNo Schooling Completed
4141.5
## Educational_LevelSome College, No Degree
1734.6
## Language_GroupEnglish
1299.3
## Language_GroupOther Indo-European Languages
1871.6
## Language_GroupOther Languages
2452.9
## Language_GroupSpanish
1405.2
## Educational_LevelDoctoral:Language_GroupEnglish
5398.5
## Educational_LevelHigh School or GED:Language_GroupEnglish
1879.1
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupEnglish
3759.7
## Educational_LevelNo High School Degree or GED:Language_GroupEnglish
3699.2
## Educational_LevelNo Schooling Completed:Language_GroupEnglish
4297.6
## Educational_LevelSome College, No Degree:Language_GroupEnglish
1792.6
## Educational_LevelDoctoral:Language_GroupOther Indo-European Languages
7722.2
## Educational_LevelHigh School or GED:Language_GroupOther Indo-European Languages
2922.9
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Indo-European Languages
4247.8
## Educational_LevelNo High School Degree or GED:Language_GroupOther Indo-European Languages
5070.3
## Educational_LevelNo Schooling Completed:Language_GroupOther Indo-European Languages
6368.8
## Educational_LevelSome College, No Degree:Language_GroupOther Indo-European Languages
2877.9
## Educational_LevelDoctoral:Language_GroupOther Languages
8290.3
## Educational_LevelHigh School or GED:Language_GroupOther Languages
3423.4
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Languages
6412.4
## Educational_LevelNo High School Degree or GED:Language_GroupOther Languages
7886.6
## Educational_LevelNo Schooling Completed:Language_GroupOther Languages
12319.3
## Educational_LevelSome College, No Degree:Language_GroupOther Languages
3179.0
## Educational_LevelDoctoral:Language_GroupSpanish
7586.1
## Educational_LevelHigh School or GED:Language_GroupSpanish
1964.6
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupSpanish
4086.4
## Educational_LevelNo High School Degree or GED:Language_GroupSpanish
3735.5
## Educational_LevelNo Schooling Completed:Language_GroupSpanish
4312.8
## Educational_LevelSome College, No Degree:Language_GroupSpanish
1880.4
##
t value
## (Intercept)
```

```
58.536
## Educational_LevelDoctoral
11.454
## Educational_LevelHigh School or GED
-19.389
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's
10.270
## Educational_LevelNo High School Degree or GED
-8.841
## Educational_LevelNo Schooling Completed
-7.489
## Educational_LevelSome College, No Degree
-17.637
## Language_GroupEnglish
12.313
## Language_GroupOther Indo-European Languages
7.287
## Language_GroupOther Languages
-4.683
## Language_GroupSpanish
-4.902
## Educational_LevelDoctoral:Language_GroupEnglish
-0.864
## Educational_LevelHigh School or GED:Language_GroupEnglish
-6.698
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupEnglish
-1.104
## Educational_LevelNo High School Degree or GED:Language_GroupEnglish
-6.667
## Educational_LevelNo Schooling Completed:Language_GroupEnglish
-5.632
## Educational_LevelSome College, No Degree:Language_GroupEnglish
-4.019
## Educational_LevelDoctoral:Language_GroupOther Indo-European Languages
-0.969
## Educational_LevelHigh School or GED:Language_GroupOther Indo-European Languages
-2.510
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Indo-European Languages
-0.156
## Educational_LevelNo High School Degree or GED:Language_GroupOther Indo-European Languages
-1.528
## Educational_LevelNo Schooling Completed:Language_GroupOther Indo-European Languages
-2.129
## Educational_LevelSome College, No Degree:Language_GroupOther Indo-European Languages
-2.214
## Educational_LevelDoctoral:Language_GroupOther Languages
-2.642
## Educational_LevelHigh School or GED:Language_GroupOther Languages
3.534
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Languages
1.418
## Educational_LevelNo High School Degree or GED:Language_GroupOther Languages
0.764
## Educational_LevelNo Schooling Completed:Language_GroupOther Languages
1.272
## Educational_LevelSome College, No Degree:Language_GroupOther Languages
3.353
## Educational_LevelDoctoral:Language_GroupSpanish
-0.306
## Educational_LevelHigh School or GED:Language_GroupSpanish
3.669
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupSpanish
-1.781
## Educational_LevelNo High School Degree or GED:Language_GroupSpanish
0.606
## Educational_LevelNo Schooling Completed:Language_GroupSpanish
0.814
## Educational_LevelSome College, No Degree:Language_GroupSpanish
3.208
##
Pr(>|t|)
## (Intercept)
< 0.0000000000000002
## Educational_LevelDoctoral
< 0.0000000000000002
## Educational_LevelHigh School or GED
< 0.0000000000000002
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's
< 0.0000000000000002
```

```
## Educational_LevelNo High School Degree or GED
< 0.0000000000000002
## Educational_LevelNo Schooling Completed
0.0000000000000698
## Educational_LevelSome College, No Degree
< 0.0000000000000002
## Language_GroupEnglish
< 0.0000000000000002
## Language_GroupOther Indo-European Languages
0.0000000000003172
## Language_GroupOther Languages
0.0000028280810162
## Language_GroupSpanish
0.0000009502625355
## Educational_LevelDoctoral:Language_GroupEnglish
0.387606
## Educational_LevelHigh School or GED:Language_GroupEnglish
0.0000000000212101
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupEnglish
0.269501
## Educational_LevelNo High School Degree or GED:Language_GroupEnglish
0.0000000000260697
## Educational_LevelNo Schooling Completed:Language_GroupEnglish
0.0000000178139346
## Educational_LevelSome College, No Degree:Language_GroupEnglish
0.0000584801479471
## Educational_LevelDoctoral:Language_GroupOther Indo-European Languages
0.332713
## Educational_LevelHigh School or GED:Language_GroupOther Indo-European Languages
0.012082
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Indo-European Languages
0.876306
## Educational_LevelNo High School Degree or GED:Language_GroupOther Indo-European Languages
0.126418
## Educational_LevelNo Schooling Completed:Language_GroupOther Indo-European Languages
0.033288
## Educational_LevelSome College, No Degree:Language_GroupOther Indo-European Languages
0.026819
## Educational_LevelDoctoral:Language_GroupOther Languages
0.008237
## Educational_LevelHigh School or GED:Language_GroupOther Languages
0.000410
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Languages
0.156159
## Educational_LevelNo High School Degree or GED:Language_GroupOther Languages
0.444868
## Educational_LevelNo Schooling Completed:Language_GroupOther Languages
0.203497
## Educational_LevelSome College, No Degree:Language_GroupOther Languages
0.000801
## Educational_LevelDoctoral:Language_GroupSpanish
0.759946
## Educational_LevelHigh School or GED:Language_GroupSpanish
0.000243
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupSpanish
0.074909
## Educational_LevelNo High School Degree or GED:Language_GroupSpanish
0.544243
## Educational_LevelNo Schooling Completed:Language_GroupSpanish
0.415484
## Educational_LevelSome College, No Degree:Language_GroupSpanish
0.001337
##
## (Intercept)
***
## Educational_LevelDoctoral
***
## Educational_LevelHigh School or GED
***
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's
***
## Educational_LevelNo High School Degree or GED
***
## Educational_LevelNo Schooling Completed
***
## Educational_LevelSome College, No Degree
***
## Language_GroupEnglish
***
```

```
## Language_GroupOther Indo-European Languages
***
## Language_GroupOther Languages
***
## Language_GroupSpanish
***
## Educational_LevelDoctoral:Language_GroupEnglish
## Educational_LevelHigh School or GED:Language_GroupEnglish
***
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupEnglish
## Educational_LevelNo High School Degree or GED:Language_GroupEnglish
***
## Educational_LevelNo Schooling Completed:Language_GroupEnglish
***
## Educational_LevelSome College, No Degree:Language_GroupEnglish
***
## Educational_LevelDoctoral:Language_GroupOther Indo-European Languages
## Educational_LevelHigh School or GED:Language_GroupOther Indo-European Languages
*
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Indo-European Languages
## Educational_LevelNo High School Degree or GED:Language_GroupOther Indo-European Languages
## Educational_LevelNo Schooling Completed:Language_GroupOther Indo-European Languages
*
## Educational_LevelSome College, No Degree:Language_GroupOther Indo-European Languages
*
## Educational_LevelDoctoral:Language_GroupOther Languages
**
## Educational_LevelHigh School or GED:Language_GroupOther Languages
***
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupOther Languages
## Educational_LevelNo High School Degree or GED:Language_GroupOther Languages
## Educational_LevelNo Schooling Completed:Language_GroupOther Languages
## Educational_LevelSome College, No Degree:Language_GroupOther Languages
***
## Educational_LevelDoctoral:Language_GroupSpanish
## Educational_LevelHigh School or GED:Language_GroupSpanish
***
## Educational_LevelMaster's & Professional Degree Beyond Bachelor's:Language_GroupSpanish
.
## Educational_LevelNo High School Degree or GED:Language_GroupSpanish
## Educational_LevelNo Schooling Completed:Language_GroupSpanish
## Educational_LevelSome College, No Degree:Language_GroupSpanish
**
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 4968419129)
##
## Number of Fisher Scoring iterations: 2
```

CSV FILES

```
write.csv(file = "Income_SD_Median_Income.csv", median_income)
write.csv(file = "Income_SD_Quintile_Medians.csv", final_median_by_quintile)
write.csv(file = "Income_SD_ByEducation_Medians.csv", median_by_education_wide)
```

```
write.csv(file = "Income_SD_ByEducation_ByLanguage_Medians.csv", income_data_wide)
```

```
write.csv(file = "Income_SD_ByEducation_Bilingual_Monolingual_Medians.csv", income_data_wide_NE)
```

```
write.csv(file = "Income_All_Biling_Stat.csv", median_by_bilingual_stat)
```

EMPLOYMENT

FInding unemployment rates for each bilingual groups.

Label	Code
N/A or Unknown	0; 9
Employed	1
Unemployed	2
Not in labor force	3

```
employment_2022 <- language_micro_data_full |>
  select(EMPSTAT, AGE, CLUSTER, PERWT, STRATA, Bilingual_Status, Language_Group) |>
  filter(EMPSTAT != 0 & EMPSTAT != 9)


employment_2022 |>
  filter(EMPSTAT == 3) |>
  group_by(AGE) |>
  summarise(count = n())
```

```
## # A tibble: 74 × 2
##    AGE       count
##    <int+lbl> <int>
##  1 16        14213
##  2 17        12761
##  3 18        10504
##  4 19         8397
##  5 20         5701
##  6 21         4754
##  7 22         4034
##  8 23         3569
##  9 24         3239
## 10 25         3313
## # ℹ 64 more rows
```

```
employment_2022 <- employment_2022 |>
  filter(EMPSTAT != 3)
```

```
employment_2022_binary <- employment_2022 |>
  mutate(EMPSTAT = ifelse(EMPSTAT == 2, 0, 1))

survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = employment_2022_binary
)

empstat_by_bilingual <- svyby(
  ~EMPSTAT,
  ~Bilingual_Status,
  survey_design,
  svymean,
  vartype = "ci"
)

empstat_by_bilingual <- empstat_by_bilingual |>
  mutate(unemployment = 1 - EMPSTAT) |>
  rename(employment = EMPSTAT)
```

```
write.csv(file = "Employment_Rates_by_Language_Group.csv", empstat_by_bilingual)
```

OCCUPATIONS

Codes: https://usa.ipums.org/usa/volii/occ2018.shtml#manager (https://usa.ipums.org/usa/volii/occ2018.shtml#manager)

Industry	Codes
Management, Business, and Financial Occupations	10-960
Computer, Engineering, and Science Occupations	1005-1980
Education, Legal, Community Service, Arts, and Media Occupations:	2001-2920
Healthcare Practitioners and Technical Occupations	3000-3550
Service Occupations	3601-4655
Sales and Office Occupations	Sales and Related Occupations (4700-4965) Office and Administrative Support Occupations (5000-5940)
Natural Resources, Construction, and Maintenance Occupations	Farming, Fishing, and Forestry Occupations(6005-6130) Construction and Extraction Occupations (6200-6950) Installation, Maintenance, and Repair Occupations(7000-7640)

Industry	Codes
Production, Transportation, and Material Moving Occupations	Production Occupations (7770-8990) Transportation and Material Moving Occupations (9005-9760)
Military Occupations:	9800-9830
Unemployed	9920

```
occupations_2022 <- language_micro_data_full |>
  select(PERWT, CLUSTER, STRATA, OCC,Bilingual_Status, Language_Group , AGE, EMPSTAT)|>
  filter(OCC != 9920 & OCC != 0 & AGE < 65) |>
  filter(EMPSTAT == 1)

occupations_2022_full <- occupations_2022 |>
   mutate(Occupation_Label = case_when(
    OCC >= 10 & OCC <= 960 ~ "Management, Business, and Financial Occupations",
    OCC >= 1005 & OCC <= 1980 ~ "Computer, Engineering, and Science Occupations",
    OCC >= 2001 & OCC <= 2920 ~ "Education, Legal, Community Service, Arts, and Media Occupations",
    OCC >= 3000 & OCC <= 3550 ~ "Healthcare Practitioners and Technical Occupations",
    OCC >= 3601 & OCC <= 4655 ~ "Service Occupations",
    OCC >= 4700 & OCC <= 4965 ~ "Sales and Related Occupations",
    OCC >= 5000 & OCC <= 5940 ~ "Office and Administrative Support Occupations",
    OCC >= 6005 & OCC <= 6130 ~ "Farming, Fishing, and Forestry Occupations",
    OCC >= 6200 & OCC <= 6950 ~ "Construction and Extraction Occupations",
    OCC >= 7000 & OCC <= 7640 ~ "Installation, Maintenance, and Repair Occupations",
    OCC >= 7700 & OCC <= 8990 ~ "Production Occupations",
    OCC >= 9005 & OCC <= 9760 ~ "Transportation and Material Moving Occupations",
    OCC >= 9800 & OCC <= 9830 ~ "Military Occupations"
  ))


table(occupations_2022_full$Occupation_Label)
```

```
##
##                   Computer, Engineering, and Science Occupations
##                                                            37776
##                          Construction and Extraction Occupations
##                                                            30806
## Education, Legal, Community Service, Arts, and Media Occupations
##                                                            61467
##                       Farming, Fishing, and Forestry Occupations
##                                                             2202
##               Healthcare Practitioners and Technical Occupations
##                                                            31792
##                Installation, Maintenance, and Repair Occupations
##                                                            18571
##                  Management, Business, and Financial Occupations
##                                                            95064
##                                             Military Occupations
##                                                             2561
##                    Office and Administrative Support Occupations
##                                                            58736
##                                          Production Occupations
##                                                            25404
##                                       Sales and Related Occupations
##                                                            53342
##                                             Service Occupations
##                                                            82333
##                   Transportation and Material Moving Occupations
##                                                            39517
```

```
survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = occupations_2022_full
)

bilingual_occupation_distribution <- svyby(
  ~Bilingual_Status,
  ~Occupation_Label,
  survey_design,
  svytotal,
  vartype = NULL
)

print(bilingual_occupation_distribution)
```

```
##
Occupation_Label
## Computer, Engineering, and Science Occupations                                    Computer, Engineering, and
Science Occupations
## Construction and Extraction Occupations                                                  Construction and Ext
raction Occupations
## Education, Legal, Community Service, Arts, and Media Occupations Education, Legal, Community Service, Arts, an
d Media Occupations
## Farming, Fishing, and Forestry Occupations                                           Farming, Fishing, and F
orestry Occupations
## Healthcare Practitioners and Technical Occupations                            Healthcare Practitioners and Te
chnical Occupations
## Installation, Maintenance, and Repair Occupations                              Installation, Maintenance, and
Repair Occupations
## Management, Business, and Financial Occupations                                  Management, Business, and Fi
nancial Occupations
## Military Occupations                                                                                      M
ilitary Occupations
## Office and Administrative Support Occupations                                     Office and Administrative
Support Occupations
## Production Occupations                                                                                 Pro
duction Occupations
## Sales and Related Occupations                                                                  Sales and
Related Occupations
## Service Occupations
Service Occupations
## Transportation and Material Moving Occupations                                   Transportation and Material
Moving Occupations
##                                                          Bilingual_StatusBilingual
## Computer, Engineering, and Science Occupations                                286519
## Construction and Extraction Occupations                                       330087
## Education, Legal, Community Service, Arts, and Media Occupations              348518
## Farming, Fishing, and Forestry Occupations                                     14691
## Healthcare Practitioners and Technical Occupations                            216669
## Installation, Maintenance, and Repair Occupations                             149078
## Management, Business, and Financial Occupations                               539334
## Military Occupations                                                           10072
## Office and Administrative Support Occupations                                 416942
## Production Occupations                                                        214243
## Sales and Related Occupations                                                 397599
## Service Occupations                                                           701085
## Transportation and Material Moving Occupations                                343654
##                                                          Bilingual_StatusEnglish Monolingual
## Computer, Engineering, and Science Occupations                                        574274
## Construction and Extraction Occupations                                               332908
## Education, Legal, Community Service, Arts, and Media Occupations                      981873
## Farming, Fishing, and Forestry Occupations                                             21677
## Healthcare Practitioners and Technical Occupations                                    503000
## Installation, Maintenance, and Repair Occupations                                     277572
## Management, Business, and Financial Occupations                                      1595743
## Military Occupations                                                                   46644
## Office and Administrative Support Occupations                                         974287
## Production Occupations                                                                337752
## Sales and Related Occupations                                                         890231
## Service Occupations                                                                  1193736
## Transportation and Material Moving Occupations                                        642826
##                                                          Bilingual_StatusNE Monolingual
## Computer, Engineering, and Science Occupations                                     8590
## Construction and Extraction Occupations                                          230901
## Education, Legal, Community Service, Arts, and Media Occupations                  19379
## Farming, Fishing, and Forestry Occupations                                        10304
## Healthcare Practitioners and Technical Occupations                                 6908
## Installation, Maintenance, and Repair Occupations                                 38157
## Management, Business, and Financial Occupations                                   35941
## Military Occupations                                                                351
## Office and Administrative Support Occupations                                     29375
## Production Occupations                                                            94833
## Sales and Related Occupations                                                     43234
## Service Occupations                                                              294366
## Transportation and Material Moving Occupations                                    89378
##                                                          se.Bilingual_StatusBilingual
## Computer, Engineering, and Science Occupations                                3983.2143
## Construction and Extraction Occupations                                       4598.1750
## Education, Legal, Community Service, Arts, and Media Occupations              4298.7611
## Farming, Fishing, and Forestry Occupations                                     936.7557
## Healthcare Practitioners and Technical Occupations                            3717.9425
## Installation, Maintenance, and Repair Occupations                             2869.5776
## Management, Business, and Financial Occupations                               5824.9229
```

```
## Military Occupations                                                    690.9699
## Office and Administrative Support Occupations                          4827.1293
## Production Occupations                                                 3432.3756
## Sales and Related Occupations                                          4879.3959
## Service Occupations                                                    6816.7154
## Transportation and Material Moving Occupations                         4724.4913
##                                                          se.Bilingual_StatusEnglish Monolingual
## Computer, Engineering, and Science Occupations                                          5254.7847
## Construction and Extraction Occupations                                                 4282.6467
## Education, Legal, Community Service, Arts, and Media Occupations                        7091.8780
## Farming, Fishing, and Forestry Occupations                                               997.2829
## Healthcare Practitioners and Technical Occupations                                      4981.0724
## Installation, Maintenance, and Repair Occupations                                       3768.9222
## Management, Business, and Financial Occupations                                         9047.5348
## Military Occupations                                                                    1475.7345
## Office and Administrative Support Occupations                                           7219.8145
## Production Occupations                                                                  4223.9744
## Sales and Related Occupations                                                           6969.9454
## Service Occupations                                                                     8258.6304
## Transportation and Material Moving Occupations                                          6194.7719
##                                                          se.Bilingual_StatusNE Monolingual
## Computer, Engineering, and Science Occupations                                    639.5010
## Construction and Extraction Occupations                                          4162.2797
## Education, Legal, Community Service, Arts, and Media Occupations                 1072.3463
## Farming, Fishing, and Forestry Occupations                                        802.8262
## Healthcare Practitioners and Technical Occupations                                512.9042
## Installation, Maintenance, and Repair Occupations                                1519.4302
## Management, Business, and Financial Occupations                                  1383.6573
## Military Occupations                                                              121.4441
## Office and Administrative Support Occupations                                    1218.4149
## Production Occupations                                                           2334.2013
## Sales and Related Occupations                                                    1545.3696
## Service Occupations                                                              4485.0630
## Transportation and Material Moving Occupations                                   2304.0715
```

```
sum(bilingual_occupation_distribution$Bilingual_StatusBilingual) +
sum(bilingual_occupation_distribution$`Bilingual_StatusEnglish Monolingual`) +
sum(bilingual_occupation_distribution$`Bilingual_StatusNE Monolingual`)
```

```
## [1] 13242731
```

```
table(occupations_2022_full$EMPSTAT)
```

```
##
##      1
## 539571
```

```
write.csv(file = "Occupations_by_LanguageGroup_FullSet.csv", bilingual_occupation_distribution)
```

FOOD INSECURITY

```
food_insecurity_pre <- language_micro_data_full |>
  select(Bilingual_Status, Language_Group, INCTOT, OWNERSHP, DIFFSENS, DIFFREM, DIFFPHYS, DIFFMOB, DIFFCARE, CLUS
TER, STRATA, PERWT) |>
  filter(OWNERSHP != 0) |>
  mutate(OWNERSHP = ifelse(OWNERSHP == 2, 0, 1))

unemployment_rates <- empstat_by_bilingual |>
  select(Bilingual_Status, unemployment)

poverty_rates <- poverty_by_biling_stat |>
  select(Bilingual_Status, below_poverty_line)

food_insecurity_pre <- food_insecurity_pre |>
  mutate(disability_stat = ifelse((DIFFSENS == 1 & DIFFSENS != 0) | (DIFFREM == 1 & DIFFREM != 0) | (DIFFPHYS ==
1 & DIFFPHYS != 0) | (DIFFMOB == 1 & DIFFMOB != 0) | (DIFFCARE == 1 & DIFFCARE != 0), 1, 0))

both_rates <- left_join(unemployment_rates, poverty_rates, by = "Bilingual_Status")

food_insecurity_2022 <- left_join(both_rates, food_insecurity_pre, by = "Bilingual_Status")
```

Coefficients were used from : https://www.feedingamerica.org/sites/default/files/2024-05/Map%20the%20Meal%20Gap%202024%20Technical%20Brief.pdf (https://www.feedingamerica.org/sites/default/files/2024-05/Map%20the%20Meal%20Gap%202024%20Technical%20Brief.pdf)

```
coef_unemployment <- 0.478
coef_poverty <- 0.337
coef_median_income <- -0.001
coef_homeownership <- -0.059
coef_disability <- 0.190

food_insecurity_2022 <- food_insecurity_2022 |>
  mutate(food_insecurity_score =
           coef_unemployment * unemployment +
           coef_poverty * below_poverty_line +
           coef_median_income * INCTOT +
           coef_homeownership * OWNERSHP +
           coef_disability * disability_stat)


fi_design <- svydesign(
  id = ~CLUSTER,
  strata = ~STRATA,
  weights = ~PERWT,
  data = food_insecurity_2022
)

fi_rate_by_group <- svyby(
  ~food_insecurity_score,
  ~Bilingual_Status,
  fi_design,
  svymean
)

print(fi_rate_by_group)
```

```
##                       Bilingual_Status food_insecurity_score        se
## Bilingual                     Bilingual            -1704.6784 11.507896
## English Monolingual English Monolingual            -1670.6812  7.461126
## NE Monolingual           NE Monolingual             -641.4405 14.691177
```

LINGUISTIC ISOLATION

Looking at different indicators for linguistic isolation group in Texas.

Label	Code
N/A	0
Not linguistically isolated	1
Linguistically isolated	2

```
linguistic_iso_2022 <- language_micro_data_full |>
  select(LANGUAGE, LANGUAGED, LINGISOL, AGE, CLUSTER, STRATA, PERWT, POVERTY, INCTOT, OCC, SEX, , HCOVANY, Langua
ge_Group, Bilingual_Status, EMPSTAT, EDUCD, YEAR) |>
  filter(LINGISOL != 0 & LANGUAGE != 1 & LANGUAGED != 100) |>
  mutate(LINGISOL = ifelse(LINGISOL == 1, "Not linguistically isolated", "Linguistically isolated"))
```

OVERVIEW DEMOGRAPHICS

```
isolated_2022 <- linguistic_iso_2022 |>
  filter(LINGISOL == "Linguistically isolated")

# table(isolated_2022$AGE)

survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = isolated_2022
)

ling_iso_age_distribution <- svyby(~I(AGE == AGE), ~AGE, survey_design, svytotal)

print(ling_iso_age_distribution)
```

```
##    AGE I(AGE == AGE)FALSE I(AGE == AGE)TRUE se.I(AGE == AGE)FALSE
## 5    5                  0             35465                      0
## 6    6                  0             35134                      0
## 7    7                  0             35585                      0
## 8    8                  0             37001                      0
## 9    9                  0             34852                      0
## 10  10                  0             33293                      0
## 11  11                  0             37030                      0
## 12  12                  0             35053                      0
## 13  13                  0             33998                      0
## 14  14                  0             13042                      0
## 15  15                  0             14629                      0
## 16  16                  0             12045                      0
## 17  17                  0             12847                      0
## 18  18                  0             14353                      0
## 19  19                  0             12470                      0
## 20  20                  0             14705                      0
## 21  21                  0             17703                      0
## 22  22                  0             17867                      0
## 23  23                  0             20324                      0
## 24  24                  0             20247                      0
## 25  25                  0             24490                      0
## 26  26                  0             24712                      0
## 27  27                  0             27036                      0
## 28  28                  0             27520                      0
## 29  29                  0             26191                      0
## 30  30                  0             31606                      0
## 31  31                  0             30755                      0
## 32  32                  0             33166                      0
## 33  33                  0             31863                      0
## 34  34                  0             33426                      0
## 35  35                  0             34196                      0
## 36  36                  0             31523                      0
## 37  37                  0             30730                      0
## 38  38                  0             31703                      0
## 39  39                  0             25333                      0
## 40  40                  0             31213                      0
## 41  41                  0             25186                      0
## 42  42                  0             27063                      0
## 43  43                  0             21461                      0
## 44  44                  0             21777                      0
## 45  45                  0             26062                      0
## 46  46                  0             21757                      0
## 47  47                  0             24568                      0
## 48  48                  0             21061                      0
## 49  49                  0             19811                      0
## 50  50                  0             23083                      0
## 51  51                  0             19351                      0
## 52  52                  0             21501                      0
## 53  53                  0             21955                      0
## 54  54                  0             21675                      0
## 55  55                  0             23647                      0
## 56  56                  0             23189                      0
## 57  57                  0             18152                      0
## 58  58                  0             21116                      0
## 59  59                  0             21647                      0
## 60  60                  0             22874                      0
## 61  61                  0             20287                      0
## 62  62                  0             22376                      0
## 63  63                  0             19643                      0
## 64  64                  0             19989                      0
## 65  65                  0             20388                      0
## 66  66                  0             18551                      0
## 67  67                  0             17994                      0
## 68  68                  0             17036                      0
## 69  69                  0             16867                      0
## 70  70                  0             15422                      0
## 71  71                  0             13747                      0
## 72  72                  0             14158                      0
## 73  73                  0             12154                      0
## 74  74                  0             12946                      0
## 75  75                  0             11685                      0
## 76  76                  0             10695                      0
## 77  77                  0              8904                      0
## 78  78                  0              8080                      0
## 79  79                  0              8197                      0
## 80  80                  0              6303                      0
## 81  81                  0              6516                      0
```

```
## 82  82                  0             6160                    0
## 83  83                  0             5609                    0
## 84  84                  0             4915                    0
## 85  85                  0             4915                    0
## 86  86                  0             4036                    0
## 87  87                  0             3256                    0
## 88  88                  0             2904                    0
## 92  92                  0            12527                    0
##    se.I(AGE == AGE)TRUE
## 5             1497.2114
## 6             1386.5306
## 7             1410.3080
## 8             1487.9484
## 9             1344.2221
## 10            1330.9944
## 11            1472.0148
## 12            1407.1724
## 13            1386.6957
## 14             817.6877
## 15            1002.5848
## 16             781.6413
## 17             804.5655
## 18             942.3409
## 19             876.3682
## 20             896.7930
## 21            1062.6265
## 22            1029.7246
## 23            1118.8209
## 24            1085.4929
## 25            1266.4312
## 26            1163.0431
## 27            1257.7198
## 28            1327.9242
## 29            1179.9470
## 30            1259.8250
## 31            1331.1592
## 32            1339.4248
## 33            1459.0824
## 34            1431.1780
## 35            1389.1017
## 36            1404.6109
## 37            1419.0920
## 38            1400.9528
## 39            1140.4415
## 40            1342.2515
## 41            1239.8676
## 42            1276.8795
## 43            1014.6390
## 44            1090.9687
## 45            1189.6438
## 46            1117.9478
## 47            1209.6322
## 48            1020.0673
## 49            1030.1544
## 50            1078.2160
## 51            1026.1939
## 52            1059.0985
## 53            1063.9211
## 54            1028.6618
## 55            1100.4791
## 56            1214.2687
## 57             875.9257
## 58             937.7216
## 59            1065.1334
## 60            1096.6269
## 61             996.0991
## 62            1111.8114
## 63             876.6017
## 64             951.1845
## 65             936.6509
## 66             961.9264
## 67             899.4701
## 68             961.2870
## 69             943.6823
## 70             818.2443
## 71             851.1543
## 72             790.0398
## 73             709.7378
## 74             798.0683
```

```
## 75            759.5752
## 76            719.6895
## 77            585.5399
## 78            565.0736
## 79            595.7663
## 80            432.9640
## 81            486.2518
## 82            528.0461
## 83            532.1314
## 84            457.8947
## 85            530.0096
## 86            430.1223
## 87            365.4989
## 88            329.3044
## 92            769.4183
```

```
write.csv(file = "Lingustically_Isolated_Ages.csv", ling_iso_age_distribution)
```

```
ling_iso_age_sex_distribution <- svyby(
  ~I(AGE == AGE),
  ~interaction(AGE, SEX),
  survey_design,
  svytotal
)

ling_iso_age_sex_df <- as.data.frame(ling_iso_age_sex_distribution)

ling_iso_age_sex_df <- ling_iso_age_sex_df |>
  mutate(
    AGE = as.numeric(sub("\\..*", "", rownames(ling_iso_age_sex_df))),
    SEX = as.factor(sub(".*\\.", "", rownames(ling_iso_age_sex_df)))
  )

ling_iso_age_sex_df <- ling_iso_age_sex_df |>
  select(AGE, SEX, everything())

print(ling_iso_age_sex_df)
```

```
##      AGE SEX interaction(AGE, SEX) I(AGE == AGE)FALSE I(AGE == AGE)TRUE
## 5.1    5   1                  5.1                  0             17960
## 6.1    6   1                  6.1                  0             18767
## 7.1    7   1                  7.1                  0             18261
## 8.1    8   1                  8.1                  0             19400
## 9.1    9   1                  9.1                  0             17862
## 10.1  10   1                 10.1                  0             17298
## 11.1  11   1                 11.1                  0             18649
## 12.1  12   1                 12.1                  0             16575
## 13.1  13   1                 13.1                  0             18427
## 14.1  14   1                 14.1                  0              6928
## 15.1  15   1                 15.1                  0              7195
## 16.1  16   1                 16.1                  0              6530
## 17.1  17   1                 17.1                  0              7555
## 18.1  18   1                 18.1                  0              7641
## 19.1  19   1                 19.1                  0              6679
## 20.1  20   1                 20.1                  0              7906
## 21.1  21   1                 21.1                  0             10323
## 22.1  22   1                 22.1                  0              9479
## 23.1  23   1                 23.1                  0              9956
## 24.1  24   1                 24.1                  0             10124
## 25.1  25   1                 25.1                  0             13075
## 26.1  26   1                 26.1                  0             12627
## 27.1  27   1                 27.1                  0             13383
## 28.1  28   1                 28.1                  0             13051
## 29.1  29   1                 29.1                  0             11426
## 30.1  30   1                 30.1                  0             16657
## 31.1  31   1                 31.1                  0             16746
## 32.1  32   1                 32.1                  0             17113
## 33.1  33   1                 33.1                  0             18378
## 34.1  34   1                 34.1                  0             18058
## 35.1  35   1                 35.1                  0             20591
## 36.1  36   1                 36.1                  0             17453
## 37.1  37   1                 37.1                  0             17037
## 38.1  38   1                 38.1                  0             17334
## 39.1  39   1                 39.1                  0             13889
## 40.1  40   1                 40.1                  0             18064
## 41.1  41   1                 41.1                  0             14285
## 42.1  42   1                 42.1                  0             15913
## 43.1  43   1                 43.1                  0             12617
## 44.1  44   1                 44.1                  0             12135
## 45.1  45   1                 45.1                  0             15983
## 46.1  46   1                 46.1                  0             11581
## 47.1  47   1                 47.1                  0             13763
## 48.1  48   1                 48.1                  0             10368
## 49.1  49   1                 49.1                  0             10580
## 50.1  50   1                 50.1                  0             12094
## 51.1  51   1                 51.1                  0             10432
## 52.1  52   1                 52.1                  0             11777
## 53.1  53   1                 53.1                  0             11768
## 54.1  54   1                 54.1                  0             11190
## 55.1  55   1                 55.1                  0             12424
## 56.1  56   1                 56.1                  0             12620
## 57.1  57   1                 57.1                  0              9279
## 58.1  58   1                 58.1                  0             10571
## 59.1  59   1                 59.1                  0             11893
## 60.1  60   1                 60.1                  0             12163
## 61.1  61   1                 61.1                  0             10103
## 62.1  62   1                 62.1                  0             11022
## 63.1  63   1                 63.1                  0              9029
## 64.1  64   1                 64.1                  0              9974
## 65.1  65   1                 65.1                  0              9565
## 66.1  66   1                 66.1                  0              9239
## 67.1  67   1                 67.1                  0              8508
## 68.1  68   1                 68.1                  0              8136
## 69.1  69   1                 69.1                  0              8215
## 70.1  70   1                 70.1                  0              7622
## 71.1  71   1                 71.1                  0              6616
## 72.1  72   1                 72.1                  0              6819
## 73.1  73   1                 73.1                  0              5715
## 74.1  74   1                 74.1                  0              5615
## 75.1  75   1                 75.1                  0              5827
## 76.1  76   1                 76.1                  0              4533
## 77.1  77   1                 77.1                  0              3816
## 78.1  78   1                 78.1                  0              3315
## 79.1  79   1                 79.1                  0              3859
## 80.1  80   1                 80.1                  0              2673
## 81.1  81   1                 81.1                  0              2969
```

```
## 82.1  82   1              82.1              0             2535
## 83.1  83   1              83.1              0             2271
## 84.1  84   1              84.1              0             2222
## 85.1  85   1              85.1              0             1503
## 86.1  86   1              86.1              0             1556
## 87.1  87   1              87.1              0             1390
## 88.1  88   1              88.1              0              838
## 92.1  92   1              92.1              0             4133
## 5.2    5   2               5.2              0            17505
## 6.2    6   2               6.2              0            16367
## 7.2    7   2               7.2              0            17324
## 8.2    8   2               8.2              0            17601
## 9.2    9   2               9.2              0            16990
## 10.2  10   2              10.2              0            15995
## 11.2  11   2              11.2              0            18381
## 12.2  12   2              12.2              0            18478
## 13.2  13   2              13.2              0            15571
## 14.2  14   2              14.2              0             6114
## 15.2  15   2              15.2              0             7434
## 16.2  16   2              16.2              0             5515
## 17.2  17   2              17.2              0             5292
## 18.2  18   2              18.2              0             6712
## 19.2  19   2              19.2              0             5791
## 20.2  20   2              20.2              0             6799
## 21.2  21   2              21.2              0             7380
## 22.2  22   2              22.2              0             8388
## 23.2  23   2              23.2              0            10368
## 24.2  24   2              24.2              0            10123
## 25.2  25   2              25.2              0            11415
## 26.2  26   2              26.2              0            12085
## 27.2  27   2              27.2              0            13653
## 28.2  28   2              28.2              0            14469
## 29.2  29   2              29.2              0            14765
## 30.2  30   2              30.2              0            14949
## 31.2  31   2              31.2              0            14009
## 32.2  32   2              32.2              0            16053
## 33.2  33   2              33.2              0            13485
## 34.2  34   2              34.2              0            15368
## 35.2  35   2              35.2              0            13605
## 36.2  36   2              36.2              0            14070
## 37.2  37   2              37.2              0            13693
## 38.2  38   2              38.2              0            14369
## 39.2  39   2              39.2              0            11444
## 40.2  40   2              40.2              0            13149
## 41.2  41   2              41.2              0            10901
## 42.2  42   2              42.2              0            11150
## 43.2  43   2              43.2              0             8844
## 44.2  44   2              44.2              0             9642
## 45.2  45   2              45.2              0            10079
## 46.2  46   2              46.2              0            10176
## 47.2  47   2              47.2              0            10805
## 48.2  48   2              48.2              0            10693
## 49.2  49   2              49.2              0             9231
## 50.2  50   2              50.2              0            10989
## 51.2  51   2              51.2              0             8919
## 52.2  52   2              52.2              0             9724
## 53.2  53   2              53.2              0            10187
## 54.2  54   2              54.2              0            10485
## 55.2  55   2              55.2              0            11223
## 56.2  56   2              56.2              0            10569
## 57.2  57   2              57.2              0             8873
## 58.2  58   2              58.2              0            10545
## 59.2  59   2              59.2              0             9754
## 60.2  60   2              60.2              0            10711
## 61.2  61   2              61.2              0            10184
## 62.2  62   2              62.2              0            11354
## 63.2  63   2              63.2              0            10614
## 64.2  64   2              64.2              0            10015
## 65.2  65   2              65.2              0            10823
## 66.2  66   2              66.2              0             9312
## 67.2  67   2              67.2              0             9486
## 68.2  68   2              68.2              0             8900
## 69.2  69   2              69.2              0             8652
## 70.2  70   2              70.2              0             7800
## 71.2  71   2              71.2              0             7131
## 72.2  72   2              72.2              0             7339
## 73.2  73   2              73.2              0             6439
## 74.2  74   2              74.2              0             7331
## 75.2  75   2              75.2              0             5858
```

```
## 76.2  76   2                76.2                0             6162
## 77.2  77   2                77.2                0             5088
## 78.2  78   2                78.2                0             4765
## 79.2  79   2                79.2                0             4338
## 80.2  80   2                80.2                0             3630
## 81.2  81   2                81.2                0             3547
## 82.2  82   2                82.2                0             3625
## 83.2  83   2                83.2                0             3338
## 84.2  84   2                84.2                0             2693
## 85.2  85   2                85.2                0             3412
## 86.2  86   2                86.2                0             2480
## 87.2  87   2                87.2                0             1866
## 88.2  88   2                88.2                0             2066
## 92.2  92   2                92.2                0             8394
##      se.I(AGE == AGE)FALSE se.I(AGE == AGE)TRUE
## 5.1                      0           1065.8547
## 6.1                      0            998.8706
## 7.1                      0            996.0418
## 8.1                      0           1057.9473
## 9.1                      0           1000.2551
## 10.1                     0            967.6361
## 11.1                     0           1087.6176
## 12.1                     0            972.4416
## 13.1                     0           1075.2284
## 14.1                     0            609.0970
## 15.1                     0            674.3683
## 16.1                     0            547.0177
## 17.1                     0            639.7068
## 18.1                     0            706.3281
## 19.1                     0            602.9397
## 20.1                     0            635.8154
## 21.1                     0            850.8433
## 22.1                     0            765.1070
## 23.1                     0            764.0561
## 24.1                     0            793.4883
## 25.1                     0            920.5404
## 26.1                     0            883.7385
## 27.1                     0            842.8864
## 28.1                     0            961.1310
## 29.1                     0            761.1800
## 30.1                     0            932.9010
## 31.1                     0            984.7649
## 32.1                     0            943.3178
## 33.1                     0           1106.9069
## 34.1                     0            983.8111
## 35.1                     0           1070.6090
## 36.1                     0           1075.4580
## 37.1                     0           1035.1271
## 38.1                     0            974.2174
## 39.1                     0            799.9175
## 40.1                     0            990.4356
## 41.1                     0            904.5620
## 42.1                     0           1033.4000
## 43.1                     0            816.5322
## 44.1                     0            831.6856
## 45.1                     0            975.5460
## 46.1                     0            727.7644
## 47.1                     0            873.2403
## 48.1                     0            717.8195
## 49.1                     0            775.7257
## 50.1                     0            770.4319
## 51.1                     0            727.3979
## 52.1                     0            810.4980
## 53.1                     0            780.1206
## 54.1                     0            739.3097
## 55.1                     0            796.3649
## 56.1                     0            879.9392
## 57.1                     0            608.7172
## 58.1                     0            682.5067
## 59.1                     0            841.2945
## 60.1                     0            840.0929
## 61.1                     0            734.8028
## 62.1                     0            756.7794
## 63.1                     0            557.3429
## 64.1                     0            675.2700
## 65.1                     0            606.8719
## 66.1                     0            652.0048
## 67.1                     0            653.8879
## 68.1                     0            656.4332
```

```
## 69.1                0            669.7955
## 70.1                0            642.7239
## 71.1                0            628.2306
## 72.1                0            598.2170
## 73.1                0            448.0759
## 74.1                0            514.3468
## 75.1                0            554.2596
## 76.1                0            425.5904
## 77.1                0            359.0982
## 78.1                0            322.3925
## 79.1                0            446.5276
## 80.1                0            264.1345
## 81.1                0            317.8426
## 82.1                0            356.4828
## 83.1                0            301.2407
## 84.1                0            339.0400
## 85.1                0            216.6298
## 86.1                0            262.4886
## 87.1                0            233.4737
## 88.1                0            158.7474
## 92.1                0            415.4951
## 5.2                 0           1052.2586
## 6.2                 0            963.3834
## 7.2                 0            977.3100
## 8.2                 0           1000.8489
## 9.2                 0            909.5491
## 10.2                0            919.0950
## 11.2                0            995.7646
## 12.2                0           1014.9562
## 13.2                0            875.7386
## 14.2                0            548.4292
## 15.2                0            696.5101
## 16.2                0            553.6783
## 17.2                0            489.8287
## 18.2                0            604.8892
## 19.2                0            629.5210
## 20.2                0            615.7715
## 21.2                0            623.2388
## 22.2                0            672.1651
## 23.2                0            802.0484
## 24.2                0            697.8997
## 25.2                0            796.1277
## 26.2                0            746.4791
## 27.2                0            891.3284
## 28.2                0            889.6314
## 29.2                0            858.0158
## 30.2                0            820.1749
## 31.2                0            812.8603
## 32.2                0            889.7698
## 33.2                0            855.0041
## 34.2                0           1014.4462
## 35.2                0            847.1011
## 36.2                0            826.1330
## 37.2                0            892.9085
## 38.2                0            924.6913
## 39.2                0            756.1754
## 40.2                0            865.6400
## 41.2                0            801.1876
## 42.2                0            725.0872
## 43.2                0            595.6351
## 44.2                0            680.3432
## 45.2                0            653.5128
## 46.2                0            816.5155
## 47.2                0            747.7983
## 48.2                0            700.3010
## 49.2                0            649.1130
## 50.2                0            724.7906
## 51.2                0            651.8996
## 52.2                0            640.8726
## 53.2                0            679.0321
## 54.2                0            699.5040
## 55.2                0            742.2779
## 56.2                0            777.3970
## 57.2                0            599.0168
## 58.2                0            630.8560
## 59.2                0            628.9780
## 60.2                0            643.5622
## 61.2                0            637.0257
## 62.2                0            734.5575
```

```
## 63.2                    0            644.0780
## 64.2                    0            640.6921
## 65.2                    0            704.0208
## 66.2                    0            689.8063
## 67.2                    0            602.6711
## 68.2                    0            643.4643
## 69.2                    0            644.5578
## 70.2                    0            487.0124
## 71.2                    0            552.9478
## 72.2                    0            498.3782
## 73.2                    0            502.7441
## 74.2                    0            581.7255
## 75.2                    0            508.5385
## 76.2                    0            575.5726
## 77.2                    0            453.1334
## 78.2                    0            425.8271
## 79.2                    0            392.7565
## 80.2                    0            340.4155
## 81.2                    0            358.7010
## 82.2                    0            388.0340
## 83.2                    0            438.4535
## 84.2                    0            303.1994
## 85.2                    0            483.9467
## 86.2                    0            341.1640
## 87.2                    0            280.2196
## 88.2                    0            282.3362
## 92.2                    0            586.2100
```

```
ling_iso_age_sex_df <- ling_iso_age_sex_df |>
  select(AGE, SEX, `I(AGE == AGE)TRUE`)

ling_iso_age_sex_df <- ling_iso_age_sex_df |>
  mutate(Age_Group = cut(AGE, breaks = seq(0, 100, by = 5), right = FALSE))

age_sex_summary <- ling_iso_age_sex_df |>
  group_by(Age_Group, SEX) |>
  summarise(Count = sum(`I(AGE == AGE)TRUE`, na.rm = TRUE))
```

```
## `summarise()` has grouped output by 'Age_Group'. You can override using the
## `.groups` argument.
```

```
age_sex_summary_wide <- age_sex_summary |>
  pivot_wider(names_from = SEX, values_from = Count, names_prefix = "Sex_")

colnames(age_sex_summary_wide) <- c("Age_Group", "Men", "Women")

print(age_sex_summary_wide)
```

```
## # A tibble: 18 × 3
## # Groups:   Age_Group [18]
##    Age_Group   Men Women
##    <fct>     <dbl> <dbl>
##  1 [5,10)    92250 85787
##  2 [10,15)   77877 74539
##  3 [15,20)   35600 30744
##  4 [20,25)   47788 43058
##  5 [25,30)   63562 66387
##  6 [30,35)   86952 73864
##  7 [35,40)   86304 67181
##  8 [40,45)   73014 53686
##  9 [45,50)   62275 50984
## 10 [50,55)   57261 50304
## 11 [55,60)   56787 50964
## 12 [60,65)   52291 52878
## 13 [65,70)   43663 47173
## 14 [70,75)   32387 36040
## 15 [75,80)   21350 26211
## 16 [80,85)   12670 16833
## 17 [85,90)    5287  9824
## 18 [90,95)    4133  8394
```

```
age_sex_summary_wide <- age_sex_summary_wide |>
  mutate(Total_Pop = Men + Women)

age_sex_summary_wide <- age_sex_summary_wide |>
  mutate(
    Men_Percent = - (Men / Total_Pop) ,
    Women_Percent = (Women / Total_Pop)
  )

age_sex_summary_wide <- age_sex_summary_wide |>
  select(Age_Group, Men_Percent, Women_Percent)

write.csv(file = "Linguistically_Isolated_PopPyramid.csv",age_sex_summary_wide, row.names = FALSE)
```

```
write.csv(file = "Linguistically_Isolated_PopPyramid.csv",age_sex_summary_wide )
```

BY LANGUAGE

```
survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = isolated_2022
)

ling_iso_language_distribution <- svytotal(~Language_Group, survey_design)

print(ling_iso_language_distribution)
```

```
##                                             total      SE
## Language_GroupAsian/Pacific Islander Languages  151611  4051.8
## Language_GroupOther Indo-European Languages      79157  3119.9
## Language_GroupOther Languages                    40397  2732.9
## Language_GroupSpanish                          1485137 12743.6
```

```
ling_iso_language_distribution <- as.data.frame(ling_iso_language_distribution)
```

```
write.csv(file = "Linguistically_Isolated_Languages.csv",ling_iso_language_distribution)
```

HEALTHCARE

```
ling_iso_health <- linguistic_iso_2022 |>
  mutate(HCOVANY = ifelse(HCOVANY == 2, 1, 0))

survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = ling_iso_health
)

ling_isohealthcare_coverage <- svyby(
  ~HCOVANY,
  ~LINGISOL,
  survey_design,
  svymean,
)

ling_isohealthcare_coverage <- ling_isohealthcare_coverage |>
  mutate(NoCoverage = 1-HCOVANY)
```

```
write.csv(file = "Linguistically_Isolated_Healthcare.csv", ling_isohealthcare_coverage)
```

OCCUPATIONS

```
ling_iso_occupations <- linguistic_iso_2022 |>
  filter(OCC != 0 & OCC != 9920 & AGE < 65) |>
  filter(EMPSTAT == 1) |>
  mutate(Occupation_Label = case_when(
    OCC >= 10 & OCC <= 960 ~ "Management, Business, and Financial Occupations",
    OCC >= 1005 & OCC <= 1980 ~ "Computer, Engineering, and Science Occupations",
    OCC >= 2001 & OCC <= 2920 ~ "Education, Legal, Community Service, Arts, and Media Occupations",
    OCC >= 3000 & OCC <= 3550 ~ "Healthcare Practitioners and Technical Occupations",
    OCC >= 3601 & OCC <= 4655 ~ "Service Occupations",
    OCC >= 4700 & OCC <= 4965 ~ "Sales and Related Occupations",
    OCC >= 5000 & OCC <= 5940 ~ "Office and Administrative Support Occupations",
    OCC >= 6005 & OCC <= 6130 ~ "Farming, Fishing, and Forestry Occupations",
    OCC >= 6200 & OCC <= 6950 ~ "Construction and Extraction Occupations",
    OCC >= 7000 & OCC <= 7640 ~ "Installation, Maintenance, and Repair Occupations",
    OCC >= 7700 & OCC <= 8990 ~ "Production Occupations",
    OCC >= 9005 & OCC <= 9760 ~ "Transportation and Material Moving Occupations",
    OCC >= 9800 & OCC <= 9830 ~ "Military Occupations"
  ))

table(ling_iso_occupations$Occupation_Label)
```

```
##
##                   Computer, Engineering, and Science Occupations
##                                                            11746
##                         Construction and Extraction Occupations
##                                                            16936
## Education, Legal, Community Service, Arts, and Media Occupations
##                                                            14852
##                        Farming, Fishing, and Forestry Occupations
##                                                              972
##               Healthcare Practitioners and Technical Occupations
##                                                             8827
##                Installation, Maintenance, and Repair Occupations
##                                                             6296
##                  Management, Business, and Financial Occupations
##                                                            21754
##                                             Military Occupations
##                                                              270
##                    Office and Administrative Support Occupations
##                                                            16725
##                                          Production Occupations
##                                                            10768
##                                       Sales and Related Occupations
##                                                            15464
##                                            Service Occupations
##                                                            33539
##                   Transportation and Material Moving Occupations
##                                                            14279
```

```
survey_design <- svydesign(
  id = ~CLUSTER,
  weights = ~PERWT,
  data = ling_iso_occupations
)

ling_iso_occupation_distribution <- svyby(
  ~LINGISOL,
  ~Occupation_Label,
  survey_design,
  svytotal,
  vartype = NULL
)

print(ling_iso_occupation_distribution)
```

```
##
Occupation_Label
## Computer, Engineering, and Science Occupations                                    Computer, Engineering, and
Science Occupations
## Construction and Extraction Occupations                                                 Construction and Ext
raction Occupations
## Education, Legal, Community Service, Arts, and Media Occupations Education, Legal, Community Service, Arts, an
d Media Occupations
## Farming, Fishing, and Forestry Occupations                                          Farming, Fishing, and F
orestry Occupations
## Healthcare Practitioners and Technical Occupations                            Healthcare Practitioners and Te
chnical Occupations
## Installation, Maintenance, and Repair Occupations                              Installation, Maintenance, and
Repair Occupations
## Management, Business, and Financial Occupations                                  Management, Business, and Fi
nancial Occupations
## Military Occupations                                                                                    M
ilitary Occupations
## Office and Administrative Support Occupations                                    Office and Administrative
Support Occupations
## Production Occupations                                                                                Pro
duction Occupations
## Sales and Related Occupations                                                                  Sales and
Related Occupations
## Service Occupations
Service Occupations
## Transportation and Material Moving Occupations                                   Transportation and Material
Moving Occupations
##                                                                LINGISOLLinguistically isolated
## Computer, Engineering, and Science Occupations                                             22807
## Construction and Extraction Occupations                                                   176886
## Education, Legal, Community Service, Arts, and Media Occupations                           27885
## Farming, Fishing, and Forestry Occupations                                                  7252
## Healthcare Practitioners and Technical Occupations                                         14411
## Installation, Maintenance, and Repair Occupations                                          34932
## Management, Business, and Financial Occupations                                            45052
## Military Occupations                                                                         453
## Office and Administrative Support Occupations                                              38015
## Production Occupations                                                                     72411
## Sales and Related Occupations                                                              51267
## Service Occupations                                                                       216492
## Transportation and Material Moving Occupations                                             81861
##                                                                LINGISOLNot linguistically isolated
## Computer, Engineering, and Science Occupations                                                271545
## Construction and Extraction Occupations                                                       383658
## Education, Legal, Community Service, Arts, and Media Occupations                              336867
## Farming, Fishing, and Forestry Occupations                                                     17485
## Healthcare Practitioners and Technical Occupations                                            208630
## Installation, Maintenance, and Repair Occupations                                             151301
## Management, Business, and Financial Occupations                                               529099
## Military Occupations                                                                            7091
## Office and Administrative Support Occupations                                                 406010
## Production Occupations                                                                        236488
## Sales and Related Occupations                                                                 387711
## Service Occupations                                                                           774354
## Transportation and Material Moving Occupations                                                349933
##                                                                se.LINGISOLLinguistically isolated
## Computer, Engineering, and Science Occupations                                            993.3948
## Construction and Extraction Occupations                                                  3706.8116
## Education, Legal, Community Service, Arts, and Media Occupations                         1185.0259
## Farming, Fishing, and Forestry Occupations                                                691.8161
## Healthcare Practitioners and Technical Occupations                                        896.3208
## Installation, Maintenance, and Repair Occupations                                        1457.1691
## Management, Business, and Financial Occupations                                          1660.2977
## Military Occupations                                                                      126.7017
## Office and Administrative Support Occupations                                            1418.6427
## Production Occupations                                                                   2097.0011
## Sales and Related Occupations                                                            1743.3616
## Service Occupations                                                                      3953.6424
## Transportation and Material Moving Occupations                                           2272.2934
##                                                                se.LINGISOLNot linguistically isolated
## Computer, Engineering, and Science Occupations                                               3860.282
## Construction and Extraction Occupations                                                      5121.641
## Education, Legal, Community Service, Arts, and Media Occupations                             4201.952
## Farming, Fishing, and Forestry Occupations                                                   1036.695
## Healthcare Practitioners and Technical Occupations                                           3612.331
## Installation, Maintenance, and Repair Occupations                                            2920.762
## Management, Business, and Financial Occupations                                              5629.916
```

```
## Military Occupations                                                    639.583
## Office and Administrative Support Occupations                          4689.204
## Production Occupations                                                 3630.113
## Sales and Related Occupations                                          4765.748
## Service Occupations                                                    7290.672
## Transportation and Material Moving Occupations                         4746.227
```

```
sum(ling_iso_occupation_distribution$`LINGISOLLinguistically isolated`) + sum(ling_iso_occupation_distribution$`L
INGISOLNot linguistically isolated`)
```

```
## [1] 4849896
```

```
write.csv(file = "Linguistically_Isolated_Occupations.csv", ling_iso_occupation_distribution)
```

POVERTY

```
ling_iso_poverty_2022 <- linguistic_iso_2022 |>
  filter(POVERTY != 0 & POVERTY <= 100) |>
  filter(LINGISOL == "Linguistically isolated")

poverty_survey_design <- svydesign(
  id = ~CLUSTER,
  strata = ~STRATA,
  weights = ~PERWT,
  data = ling_iso_poverty_2022
)

ling_iso_poverty_distribution <- svyby(
  ~POVERTY,
  ~Language_Group,
  poverty_survey_design,
  svytotal,
  vartype = NULL
)

print(ling_iso_poverty_distribution)
```

```
##                                                Language_Group  POVERTY
## Asian/Pacific Islander Languages Asian/Pacific Islander Languages  1378680
## Other Indo-European Languages       Other Indo-European Languages   860488
## Other Languages                                   Other Languages   711344
## Spanish                                                  Spanish 25721212
##                                       se
## Asian/Pacific Islander Languages 104275.72
## Other Indo-European Languages    101334.97
## Other Languages                   92778.81
## Spanish                          487204.22
```

```
#very high se, not very reliable
```

INCOME

```
ling_iso_income_2022 <- linguistic_iso_2022 |>
  select(AGE, INCTOT, PERWT, SEX, EDUCD, AGE, CLUSTER, STRATA, YEAR, Language_Group, Bilingual_Status, LINGISOL)
|>
  filter(INCTOT != 9999999 & INCTOT > 0) |>
  filter(AGE > 18 & AGE < 65)
```

```
des_ling_iso_income <- svydesign(
                 ids = ~CLUSTER,
                 strata = ~STRATA,
                 weights = ~PERWT,
                 data = ling_iso_income_2022)

median_income_ling_iso <- svyby(
  ~INCTOT,
  ~LINGISOL,
  des_ling_iso_income,
  svyquantile,
  quantiles = 0.5,
  ci = TRUE
)
```

```
## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available

## Warning in vcov.svyquantile(X[[i]], ...): Only diagonal of vcov() available
```

```
print(median_income_ling_iso)
```

```
##                                             LINGISOL INCTOT       se
## Linguistically isolated         Linguistically isolated  27557 208.6641
## Not linguistically isolated Not linguistically isolated  35130 179.0736
```

```
write.csv(file = "Linguistically_Isolated_MedianPersonal_Income.csv", median_income_ling_iso)
```