Milestone #4

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##Relevant Previous Importing and Data-cleaning Steps

```
## Warning in system("timedatectl", intern = TRUE): running command 'timedatectl'
## had status 1

## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v dplyr   1.0.8
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

## Rows: 1000 Columns: 24
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (24): ID, NERVOUS, WORRYING, PROBINTR, PROBDOWN, ASTHMA, HEARTDIS, DIABE...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
## Rows: 1000 Columns: 7
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (5): smokstat, HOWMANY, SMOK6UNI, BUYCALIF, WHEREBUY
## dbl (2): psraid, SMOK6NUM
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Milestone #4 assignments (delete this header later)

Calculating Pack-years

```
#We calculated pack-years, which is given by the formula of
#pack-years = # of packs of cigarettes smoked per day * years a person has smoked.
#This calculation led to the creation of a new variable called `pack_years`.
#`pack_years` was created conditionally based on the three different time units
#as determined by the existing variable `smok6uni`, which are: "Days", "Months",
#and "Years". To change the unit of "Days" to years, we set up a conditional
#statement in the code to divide `smok6num` by 365 before multiplying the result
#by `packs_per_day` to get pack-years. Similarly, to change the unit of "Months"
#to years, we set up a conditional statement in the code to divide `smok6num`
#by 12 before multiplying the result by `packs_per_day` to get pack-years. For
#`smok6uni` observations that have the value "Years", we just multiplied
#`smok6num` by `packs_per_day` to get pack-years directly. We assigned
#this overall change in the data frame smoker_data_2 to a new data frame
#called smoker_data_3, which includes the new variable `pack_years`.

smoker_data_3 <- smoker_data_2 %>%
  mutate(pack_years =
           case_when(smok6uni == "Days" ~ packs_per_day*(smok6num/365),
                     smok6uni == "Months" ~ packs_per_day*(smok6num/12),
                     smok6uni == "Years" ~ packs_per_day*(smok6num)))

#We then rounded `pack_years` to the nearest whole number for all observations.

smoker_data_3$pack_years <- round(smoker_data_3$pack_years, 0)

#Afterwards, we viewed our new data frame, which includes our new variable
#`pack_years`.

smoker_data_3
```

```
## # A tibble: 1,000 x 9
##    psraid smokstat     wherebuy buycalif howmany smok6num smok6uni packs_per_day
##     <dbl> <chr>        <chr>    <chr>      <dbl>    <dbl> <chr>            <dbl>
##  1 100099 Current dai~ At othe~ In Cali~      30       36 Years             1.5
##  2 100109 Current dai~ At toba~ In Cali~      20       25 Years             1
##  3 100121 Current non~ At conv~ In Cali~       1       NA <NA>              0.05
##  4 100191 Current dai~ At conv~ In Cali~      15       20 Years             0.75
##  5 100206 Current dai~ At conv~ In Cali~      15        7 Years             0.75
##  6 100232 Current dai~ At liqu~ In Cali~      20       45 Years             1
##  7 100256 Current non~ At conv~ Somewhe~       3       NA <NA>              0.15
##  8 100262 Current dai~ At othe~ In Cali~      15       19 Years             0.75
##  9 100317 Current dai~ At conv~ In Cali~       7        2 Years             0.35
## 10 100319 Current dai~ At toba~ In Cali~      20       15 Years             1
## # ... with 990 more rows, and 1 more variable: pack_years <dbl>
```

Joining Cleaned Data Sets Together

```
#In order to join our two cleaned data sets together, we first had to remove the
#strings of 'DIS' and 'STAT' from the `id` column of race_data_2 by using gsub().
#We overwrote these changes in the race_data_2 data frame and viewed these new
#changes to make sure the `id` variable only contains numbers and no
#characters.

race_data_2$id <- gsub('[DISSTAT]', '', race_data_2$id)
race_data_2
```

```
## # A tibble: 1,000 x 10
##    id     nervous  worrying probintr probdown asthma heartdis diabetes othmenill
##    <chr>  <chr>    <chr>    <chr>    <chr>    <chr>  <chr>    <chr>    <chr>
##  1 100099 Nearly ~ Not at ~ Nearly ~ Not at ~ No     Yes      No       No
##  2 100109 Several~ Several~ Several~ Not at ~ No     No       No       No
##  3 100121 Not at ~ Not at ~ Not at ~ Not at ~ No     No       No       No
##  4 100191 Several~ Not at ~ Not at ~ Not at ~ Yes    No       No       No
##  5 100206 Not at ~ Several~ Not at ~ Not at ~ No     No       No       No
##  6 100232 Not at ~ Not at ~ Not at ~ Not at ~ No     Yes      No       No
##  7 100256 Not at ~ Not at ~ Not at ~ Several~ Yes    Yes      No       No
##  8 100262 Several~ Nearly ~ Several~ Several~ No     No       No       No
##  9 100317 Several~ Several~ Several~ <NA>     No     No       No       Yes
## 10 100319 More th~ Several~ Not at ~ Not at ~ No     No       No       No
## # ... with 990 more rows, and 1 more variable: race <chr>
```

```
#Next, looking at the smoker_data_3 data frame, we see that the `psraid`
#variable contains each study participant's unique ID number, but the variable
#is a numeric data type. On the other hand, `id` from the race_data_2
#data frame is a character data type. We needed to convert `psraid` then from
#character to numeric data type because 1) `psraid` is an identifier rather than
#a numeric value to mathematically manipulate even if it does contain numbers
#and 2) in order to perform a join, the two variables must be the same data
#type.

smoker_data_3$psraid <- as.character(smoker_data_3$psraid)

#Afterward, we performed an inner join between race_data_2 and
#smoker_data_3 by each study participant's unique ID number, which is
#represented by `id` in race_data_2 and `psraid` in smoker_data_3. We
#chose to do an inner join because we wanted to select participants that
#exist in each of our two data sets for our final data frame.
#We assigned this join to a new data frame called joined_smoking_df.

joined_smoking_df <- inner_join(x = race_data_2, y = smoker_data_3,
                                by=c("id" = "psraid"))

#Then, we viewed the new data frame we created
joined_smoking_df
```

```
## # A tibble: 1,000 x 18
##    id     nervous  worrying probintr probdown asthma heartdis diabetes othmenill
##    <chr>  <chr>    <chr>    <chr>    <chr>    <chr>  <chr>    <chr>    <chr>
##  1 100099 Nearly ~ Not at ~ Nearly ~ Not at ~ No     Yes      No       No
##  2 100109 Several~ Several~ Several~ Not at ~ No     No       No       No
##  3 100121 Not at ~ Not at ~ Not at ~ Not at ~ No     No       No       No
##  4 100191 Several~ Not at ~ Not at ~ Not at ~ Yes    No       No       No
##  5 100206 Not at ~ Several~ Not at ~ Not at ~ No     No       No       No
##  6 100232 Not at ~ Not at ~ Not at ~ Not at ~ No     Yes      No       No
##  7 100256 Not at ~ Not at ~ Not at ~ Several~ Yes    Yes      No       No
##  8 100262 Several~ Nearly ~ Several~ Several~ No     No       No       No
##  9 100317 Several~ Several~ Several~ <NA>     No     No       No       Yes
## 10 100319 More th~ Several~ Not at ~ Not at ~ No     No       No       No
## # ... with 990 more rows, and 9 more variables: race <chr>, smokstat <chr>,
## #   wherebuy <chr>, buycalif <chr>, howmany <dbl>, smok6num <dbl>,
## #   smok6uni <chr>, packs_per_day <dbl>, pack_years <dbl>
```

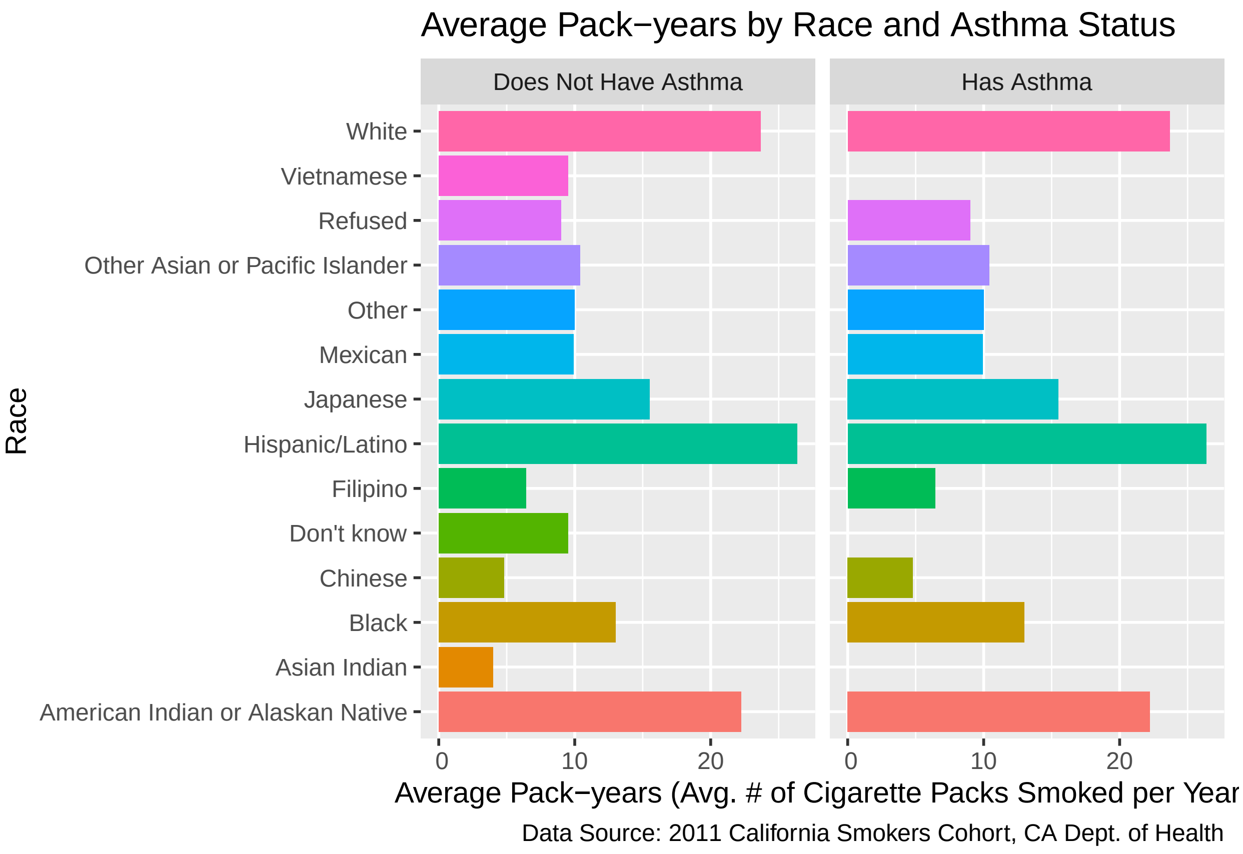
```r
#We filtered out all NA values in `pack_years` in the joined_smoking_df
#data frame so that we would not get "NA" as a result of our average pack-years
#computations. We then averaged all the values in `pack_years` for each race
#category and added this to the joined_smoking_df data frame as a new variable
#called `avg_pack_years_by_race`. This new subset was then assigned to a new
#data frame called joined_smoking_df_2.

joined_smoking_df_2 <- joined_smoking_df %>%
  filter(!is.na(pack_years)) %>%
  group_by(race) %>%
  mutate(avg_pack_years_by_race = sum(pack_years)/n())

joined_smoking_df_2
```

```
## # A tibble: 828 x 19
## # Groups:   race [14]
##    id     nervous  worrying probintr probdown asthma heartdis diabetes othmenill
##    <chr>  <chr>    <chr>    <chr>    <chr>    <chr>  <chr>    <chr>    <chr>
##  1 100099 Nearly ~ Not at ~ Nearly ~ Not at ~ No     Yes      No       No
##  2 100109 Several~ Several~ Several~ Not at ~ No     No       No       No
##  3 100191 Several~ Not at ~ Not at ~ Not at ~ Yes    No       No       No
##  4 100206 Not at ~ Several~ Not at ~ Not at ~ No     No       No       No
##  5 100232 Not at ~ Not at ~ Not at ~ Not at ~ No     Yes      No       No
##  6 100262 Several~ Nearly ~ Several~ Several~ No     No       No       No
##  7 100317 Several~ Several~ Several~ <NA>     No     No       No       Yes
##  8 100319 More th~ Several~ Not at ~ Not at ~ No     No       No       No
##  9 100351 Several~ Several~ Several~ Several~ No     No       No       Yes
## 10 100391 Nearly ~ Nearly ~ Several~ Several~ No     No       No       No
## # ... with 818 more rows, and 10 more variables: race <chr>, smokstat <chr>,
## #   wherebuy <chr>, buycalif <chr>, howmany <dbl>, smok6num <dbl>,
## #   smok6uni <chr>, packs_per_day <dbl>, pack_years <dbl>,
## #   avg_pack_years_by_race <dbl>
```

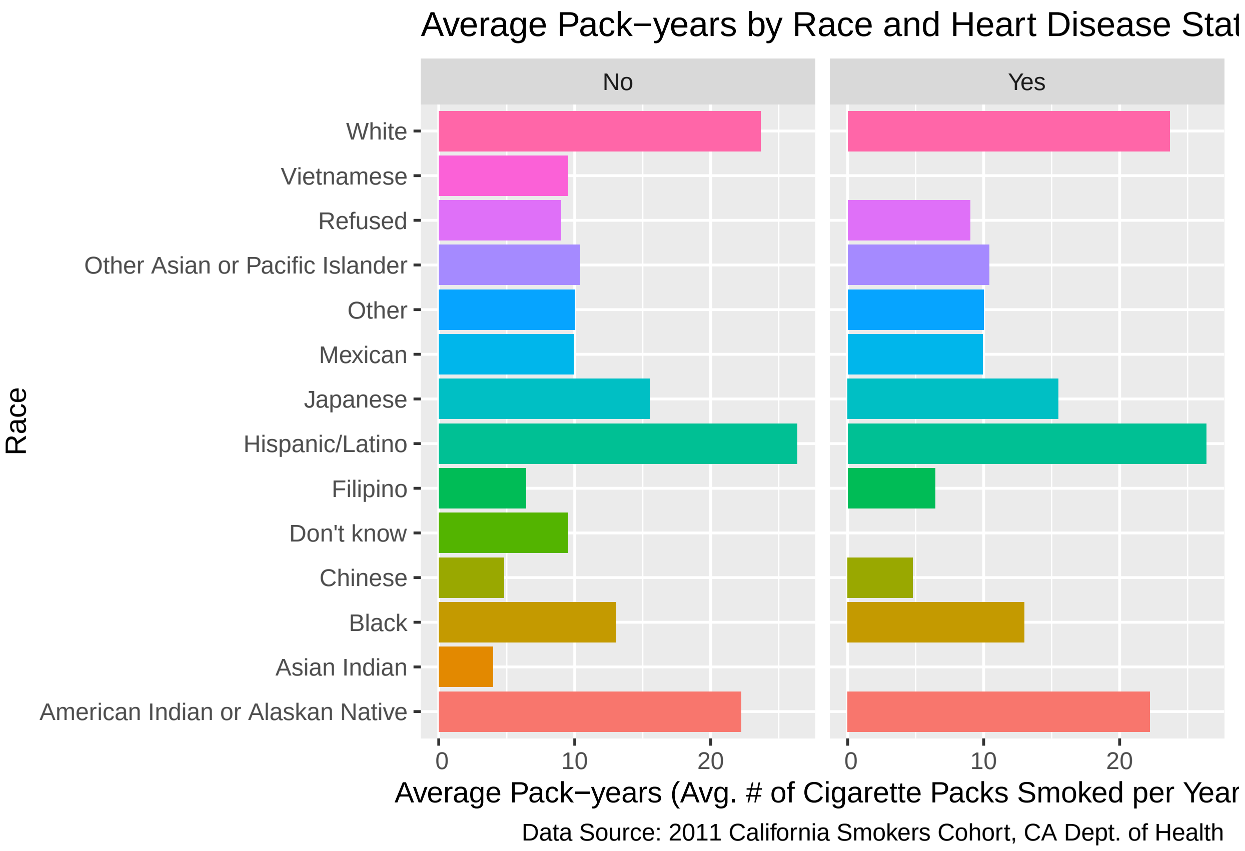
Visualizations

Pack-years by Race and Disease (Four Graphs)

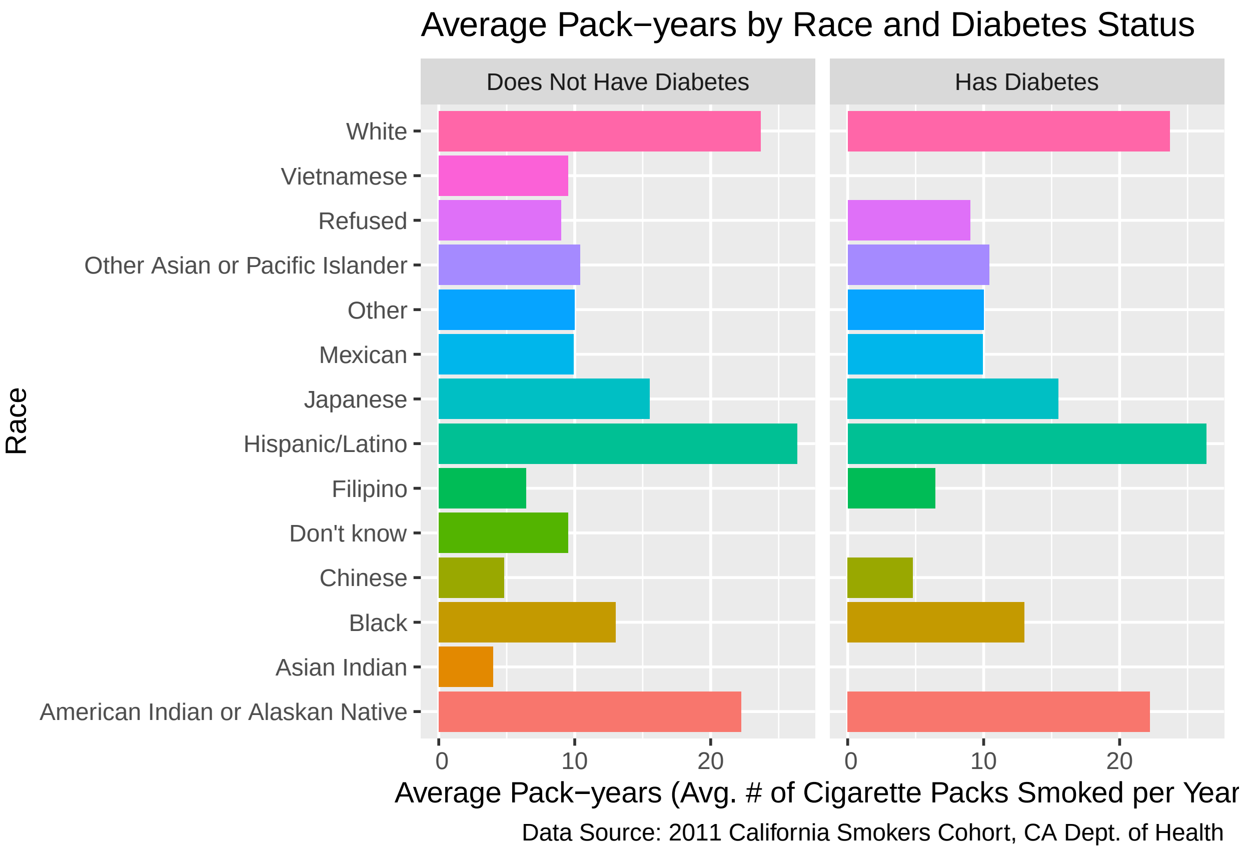
```
joined_smoking_df_2 %>%
  drop_na(c(asthma, pack_years)) %>%
  ggplot(aes(x = race, y = avg_pack_years_by_race)) +
  geom_bar(aes(fill=race), stat="identity", position = "dodge") +
  coord_flip() +
  guides(fill = "none") +
  labs(x = "Race",
       y = "Average Pack-years (Avg. # of Cigarette Packs Smoked per Year)",
  title = "Average Pack-years by Race and Asthma Status",
  caption = "Data Source: 2011 California Smokers Cohort, CA Dept. of Health") +
  scale_y_continuous(labels = function(x) format(x,big.mark=",",
                                                     scientific=FALSE)) +
  facet_wrap(~ asthma, labeller = labeller(asthma =
                                             c("No" = "Does Not Have Asthma",
                                                      "Yes" = "Has Asthma")))
```



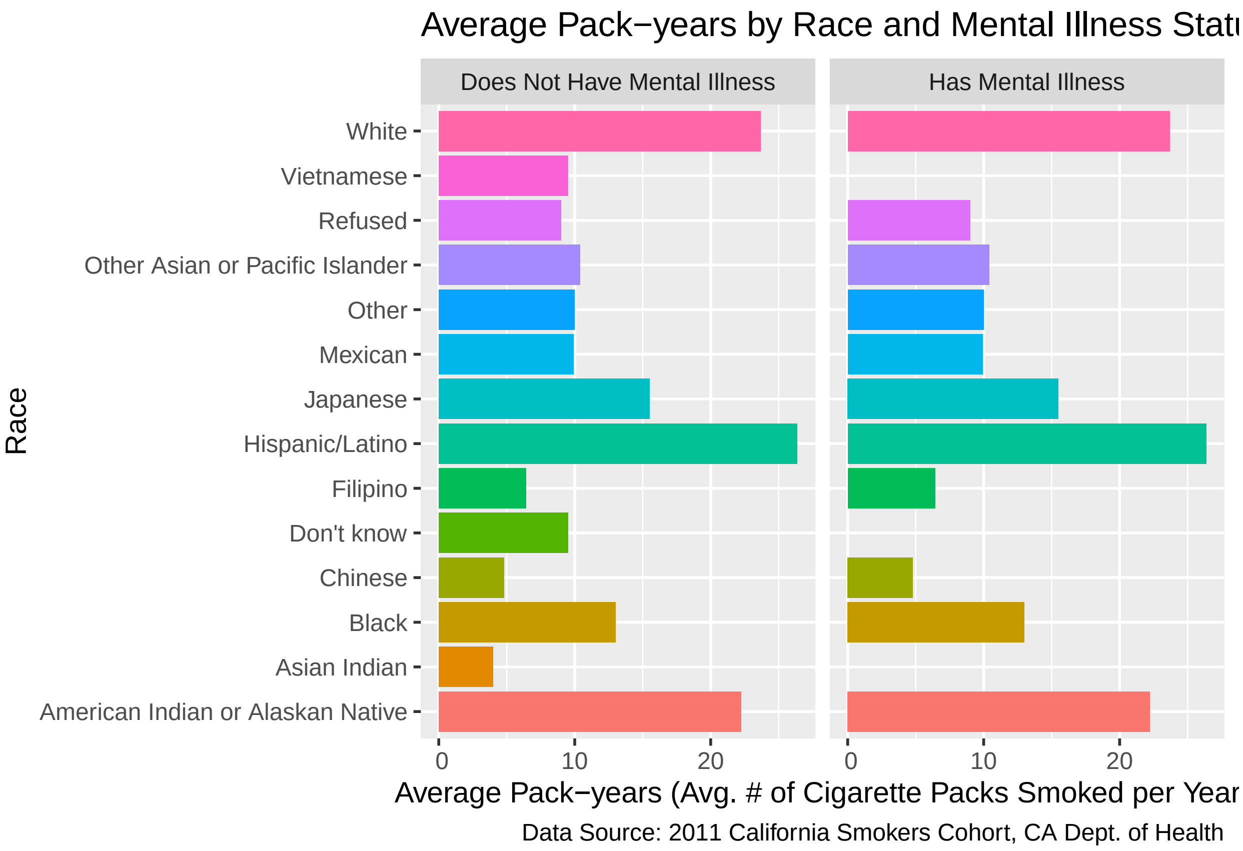
```
joined_smoking_df_2 %>%
  drop_na(c(heartdis, pack_years)) %>%
  ggplot(aes(x = race, y = avg_pack_years_by_race)) +
  geom_bar(aes(fill=race), stat="identity", position = "dodge") +
  coord_flip() +
  guides(fill = "none") +
  labs(x = "Race",
       y = "Average Pack-years (Avg. # of Cigarette Packs Smoked per Year)",
  title = "Average Pack-years by Race and Heart Disease Status",
  caption = "Data Source: 2011 California Smokers Cohort, CA Dept. of Health") +
  scale_y_continuous(labels = function(x) format(x,big.mark=",",
                                                     scientific=FALSE)) +
  facet_wrap(~ asthma, labeller = labeller(heartdis =
                                      c("No" = "Does Not Have Heart Disease",
                                        "Yes" = "Has Heart Disease")))
```



```
joined_smoking_df_2 %>%
  drop_na(c(diabetes, pack_years)) %>%
  ggplot(aes(x = race, y = avg_pack_years_by_race)) +
  geom_bar(aes(fill=race), stat="identity", position = "dodge") +
  coord_flip() +
  guides(fill = "none") +
  labs(x = "Race",
       y = "Average Pack-years (Avg. # of Cigarette Packs Smoked per Year)",
  title = "Average Pack-years by Race and Diabetes Status",
  caption = "Data Source: 2011 California Smokers Cohort, CA Dept. of Health") +
  scale_y_continuous(labels = function(x) format(x,big.mark=",",
                                                     scientific=FALSE)) +
  facet_wrap(~ asthma, labeller = labeller(asthma =
                                             c("No" = "Does Not Have Diabetes",
                                                      "Yes" = "Has Diabetes")))
```



```
joined_smoking_df_2 %>%
  drop_na(c(othmenill, pack_years)) %>%
  ggplot(aes(x = race, y = avg_pack_years_by_race)) +
  geom_bar(aes(fill=race), stat="identity", position = "dodge") +
  coord_flip() +
  guides(fill = "none") +
  labs(x = "Race",
       y = "Average Pack-years (Avg. # of Cigarette Packs Smoked per Year)",
  title = "Average Pack-years by Race and Mental Illness Status",
  caption = "Data Source: 2011 California Smokers Cohort, CA Dept. of Health") +
  scale_y_continuous(labels = function(x) format(x,big.mark=",",
                                                     scientific=FALSE)) +
  facet_wrap(~ asthma, labeller = labeller(asthma =
                                      c("No" = "Does Not Have Mental Illness",
                                        "Yes" = "Has Mental Illness")))
```



Interpretation of the Four Graphs of Pack-years by Disease:
Among individuals who reported that they do not have asthma, heart disease, diabetes, and/or mental illness, those who identified as "White" by race appear to have the greatest number of pack-years (i.e., cigarette packs smoked per year) out of all races in the 2011 California Smokers Cohort. In addition, among all individuals who reported that they do have asthma, heart disease, diabetes, and/or mental illness, those who identified as "Hispanic/Latino" by race appear to have the greatest number of pack-years (i.e., cigarette packs smoked per year) out of all races in the 2011 California Smokers Cohort.

##OUR GROUP'S RESEARCH QUESTION (For reference only to help us think of relevant #graphs - delete later): "For this project, we aim to investigate how tobacco use primarily impacts mental illness among smokers in California in 2011, as well as explore how race and location of cigarette purchase can impact disease status."

Visualizations (3 total) **one print quality tables per scenario** With Kable: pack-years vs. asthma/heart disease/diabetes/mental illness (1 table)

"Compare the average number of pack-years by at least four disease outcomes (e.g. asthma, heart disease, diabetes, physical illness, and/or mental illness). Provide a print-quality table that shows the average number of pack-years and the disease outcomes."

Average number of pack-years = pack_years/sum(pack_years)

one print quality plot or chart per scenario With ggplot: 1 bar graph (x = disease, y = pack-years) **one additional table or plot** With ggplot: dodged bar chart with (x = cigarette purchase location, aes(fill = othmenill) to view cigarette purchase location and mental illness status

Each visual should include:

code legend (if necessary) Unless we decide to input a third variable in a graph.

interpretation (1 to 2 sentences)

##PDF should be prepared for presentation **each part of milestone on new page only necessary info outputted show work with "echo"**