class 17 Vaccination Mini Project

Getting Started

```r
vax <- read.csv("statewide-covid-19-vaccines-administered-by-zip-code.csv")
head(vax)
tail(vax)
```

> Q1. What column details the total number of people fully vaccinated?

persons_fully_vaccinated

> Q2. What column details the Zip code tabulation area?

zip_code_tabulation_area

> Q3. What is the earliest date in this dataset?

2021-01-05

> Q4. What is the latest date in this dataset?

2022-11-22

```r
skimr::skim(vax)
```

Table 1: Data summary

Name	vax
Number of rows	174636
Number of columns	18
Column type frequency:	
character	5

Table 1: Data summary

numeric	13
Group variables	None

Variable type: character

skim_variable	n_missing	complete_rate	min	max	empty	n_unique	whitespace
as_of_date	0	1	10	10	0	99	0
local_health_jurisdiction	0	1	0	15	495	62	0
county	0	1	0	15	495	59	0
vem_source	0	1	15	26	0	3	0
redacted	0	1	2	69	0	2	0

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
zip_code_tabulation_area	0	1.00	93665.11	1817.39	90001	92257.75	93658.50	95380.50	97635.0	
vaccine_equity_metric_quintile	8613	0.95	2.44	1.11	1	1.00	2.00	3.00	4.0	
age12_plus_population	0	1.00	18895.04	18993.88	0	1346.95	13685.10	31756.12	88556.7	
age5_plus_population	0	1.00	20875.24	21105.98	0	1460.50	15364.00	34877.00	101902.0	
tot_population	8514	0.95	23372.77	22628.51	12	2126.00	18714.00	38168.00	111165.0	
persons_fully_vaccinated	14921	0.91	13466.34	14722.46	11	883.00	8024.00	22529.00	87186.0	
persons_partially_vaccinated	14921	0.91	1707.50	1998.80	11	167.00	1194.00	2547.00	39204.0	
percent_of_population_fully_vaccinated	18665	0.89	0.55	0.25	0	0.39	0.59	0.73	1.0	
percent_of_population_partially_vaccinated	18665	0.89	0.08	0.09	0	0.05	0.06	0.08	1.0	
percent_of_population_with_1_plus_dose	19562	0.89	0.61	0.25	0	0.46	0.65	0.79	1.0	
booster_recip_count	70421	0.60	5655.17	6867.49	11	280.00	2575.00	9421.00	58304.0	
bivalent_dose_recip_count	156958	0.10	1646.02	2161.84	11	109.00	719.00	2443.00	18109.0	
eligible_recipient_count	0	1.00	12309.19	14555.83	0	466.00	5810.00	21140.00	86696.0	

```r
# To find all the NA values in the persons_fully_vaccinated column
sum( is.na(vax$persons_fully_vaccinated) )
```

```
[1] 14921
```

> Q5. How many numeric columns are in this dataset?

13

> Q6. Note that there are “missing values” in the dataset. How many NA values there in the persons_fully_vaccinated column?

14921

> Q7. What percent of persons_fully_vaccinated values are missing (to 2 significant figures)?

9.2%

Working with Dates

```
library(lubridate)
```

```
Loading required package: timechange
```

```

Attaching package: 'lubridate'
```

```
The following objects are masked from 'package:base':

    date, intersect, setdiff, union
```

```
today()
```

```
[1] "2022-11-28"
```

```
# Specify that we are using the year-month-day format
vax$as_of_date <- ymd(vax$as_of_date)
```

Using this format, we can determine the span of the datasets.

```
today() - vax$as_of_date[1]
```

```
Time difference of 692 days
```

```
vax$as_of_date[nrow(vax)] - vax$as_of_date[1]
```

```
Time difference of 686 days
```

> Q9. How many days have passed since the last update of the dataset?

6 Days

> Q10. How many unique dates are in the dataset (i.e. how many different dates are detailed)?

99 unique dates

Working with Zip-Codes

```
library(zipcodeR)
```

```
geocode_zip('92037')
```

```
# A tibble: 1 x 3
  zipcode   lat   lng
  <chr>   <dbl> <dbl>
1 92037    32.8 -117.
```

```
# Calculate distance of zipcode centers in miles

zip_distance('92037','92109')
```

```
  zipcode_a zipcode_b distance
1     92037     92109     2.33
```

You can pull useful data from zipcodes with this function.

```
reverse_zipcode(c('92037', "92109") )
```

```
# A tibble: 2 x 24
  zipcode zipcode_~1 major~2 post_~3 common_c~4 county state   lat   lng timez~5
  <chr>   <chr>      <chr>   <chr>       <blob> <chr>  <chr> <dbl> <dbl> <chr>
1 92037   Standard   La Jol~ La Jol~ <raw 20 B> San D~ CA     32.8 -117. Pacific
2 92109   Standard   San Di~ San Di~ <raw 21 B> San D~ CA     32.8 -117. Pacific
```

```
# ... with 14 more variables: radius_in_miles <dbl>, area_code_list <blob>,
#   population <int>, population_density <dbl>, land_area_in_sqmi <dbl>,
#   water_area_in_sqmi <dbl>, housing_units <int>,
#   occupied_housing_units <int>, median_home_value <int>,
#   median_household_income <int>, bounds_west <dbl>, bounds_east <dbl>,
#   bounds_north <dbl>, bounds_south <dbl>, and abbreviated variable names
#   1: zipcode_type, 2: major_city, 3: post_office_city, ...
```

Focus on the San Diego Area

```
# Subset to San Diego county only areas
sd <- vax[ vax$county == "San Diego" , ]
```

or, use the dplyr package

```
library(dplyr)
```

```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

```
sd <- filter(vax, county == "San Diego")

nrow(sd)
```

```
[1] 10593
```

```
sd.10 <- filter(vax, county == "San Diego" &
                age5_plus_population > 10000)
```

```
filter (vax, county == "San Diego" &
          age12_plus_population > 70000 &
          as_of_date == "2022-11-15")
```

```
  as_of_date zip_code_tabulation_area local_health_jurisdiction    county
1 2022-11-15                    92126                 San Diego San Diego
2 2022-11-15                    91911                 San Diego San Diego
3 2022-11-15                    92154                 San Diego San Diego
  vaccine_equity_metric_quartile                 vem_source
1                              4 Healthy Places Index Score
2                              2 Healthy Places Index Score
3                              2 Healthy Places Index Score
  age12_plus_population age5_plus_population tot_population
1               71820.2                77775          82658
2               71642.8                79225          84026
3               76365.2                82971          88979
  persons_fully_vaccinated persons_partially_vaccinated
1                    60484                         5255
2                    83188                        16550
3                    87151                        17243
  percent_of_population_fully_vaccinated
1                               0.731738
2                               0.990027
3                               0.979456
  percent_of_population_partially_vaccinated
1                                   0.063575
2                                   0.196963
3                                   0.193787
  percent_of_population_with_1_plus_dose booster_recip_count
1                               0.795313               39544
2                               1.000000               44281
3                               1.000000               45961
  bivalent_dose_recip_count eligible_recipient_count redacted
1                     10069                    59905       No
2                      6992                    82731       No
3                      7033                    86696       No
```

> Q11. How many distinct zip codes are listed for San Diego County?

107

> Q12. What San Diego County Zip code area has the largest 12 + Population in this dataset?

92154

```r
sd.11 <- filter(vax, county == "San Diego" &
         as_of_date == "2022-11-15")

fullyVaccPercent <- sd.11$percent_of_population_fully_vaccinated

mean(fullyVaccPercent[!is.na(fullyVaccPercent)])
```

```
[1] 0.7369099
```

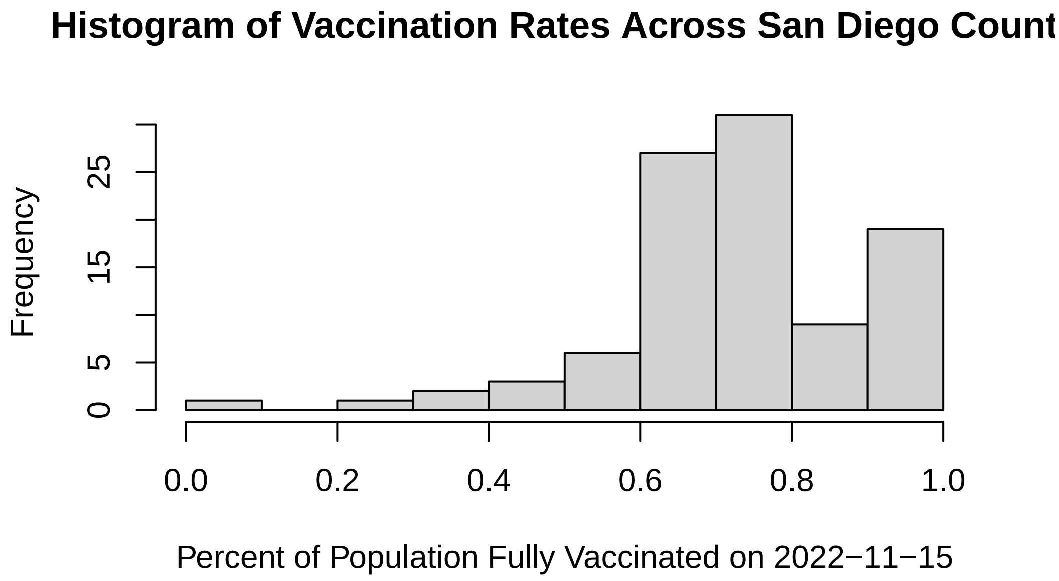
> Q13. What is the overall average “Percent of Population Fully Vaccinated” value for all San Diego “County” as of “2022-11-15”?

73.69%

> Q14. Using either ggplot or base R graphics make a summary figure that shows the distribution of Percent of Population Fully Vaccinated values as of “2022-11-15”?

```r
library(ggplot2)

hist(fullyVaccPercent,
     main = "Histogram of Vaccination Rates Across San Diego County",
     xlab = "Percent of Population Fully Vaccinated on 2022-11-15")
```



Focus on UCSD/La Jolla

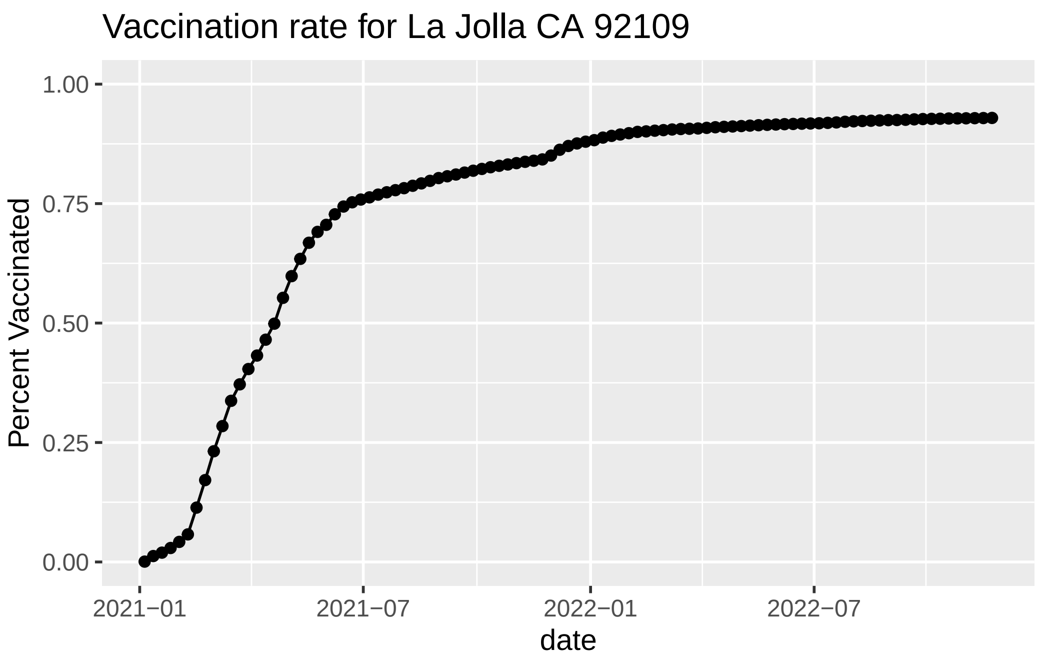
```
ucsd <- filter(sd, zip_code_tabulation_area=="92037")

ucsd[1,]$age5_plus_population
```

```
[1] 36144
```

> Q15. Using ggplot make a graph of the vaccination rate time course for the 92037 ZIP code area:

```
ggplot(ucsd) +
  aes(as_of_date,
      percent_of_population_fully_vaccinated) +
  geom_point() +
  geom_line(group=1) +
  ylim(c(0,1)) +
  labs(x = "date", y="Percent Vaccinated",
       title = "Vaccination rate for La Jolla CA 92109")
```



Comparing to Similar Sized Area

```
# Subset to all CA areas with a population as large as 92037
vax.36 <- filter(vax, age5_plus_population > 36144 &
                as_of_date == "2022-11-15")

head(vax.36)
```

```
  as_of_date zip_code_tabulation_area local_health_jurisdiction        county
1 2022-11-15                    92236                 Riverside     Riverside
2 2022-11-15                    92130                 San Diego     San Diego
3 2022-11-15                    94121             San Francisco San Francisco
4 2022-11-15                    94551                   Alameda       Alameda
5 2022-11-15                    94112             San Francisco San Francisco
6 2022-11-15                    94303               Santa Clara   Santa Clara
  vaccine_equity_metric_quartile                 vem_source
1                              1 Healthy Places Index Score
2                              4 Healthy Places Index Score
3                              4 Healthy Places Index Score
4                              4 Healthy Places Index Score
5                              3 Healthy Places Index Score
6                              3 Healthy Places Index Score
```

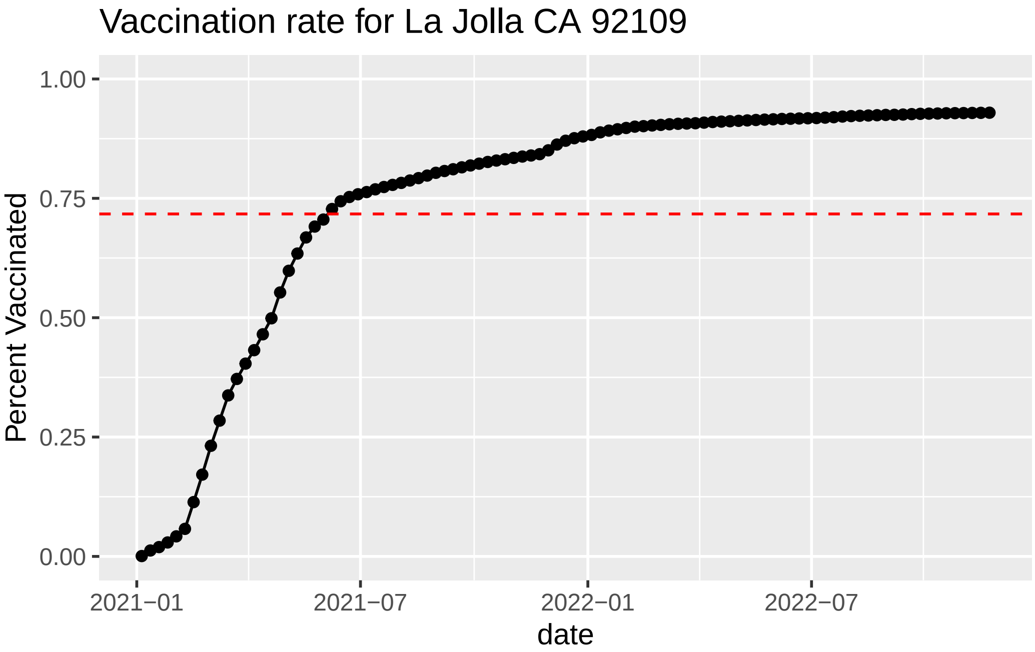
```
  age12_plus_population age5_plus_population tot_population
1               38505.3                42923          45477
2               46300.3                53102          56134
3               39105.0                41363          43616
4               38947.9                43399          47227
5               75681.8                81107          84707
6               40033.3                44989          48244
  persons_fully_vaccinated persons_partially_vaccinated
1                    30465                         3858
2                    52380                         5751
3                    36566                         2373
4                    32557                         2333
5                    78358                         4646
6                    41275                         4175
  percent_of_population_fully_vaccinated
1                               0.669899
2                               0.933124
3                               0.838362
4                               0.689373
5                               0.925048
6                               0.855547
  percent_of_population_partially_vaccinated
1                                   0.084834
2                                   0.102451
3                                   0.054407
4                                   0.049400
5                                   0.054848
6                                   0.086539
  percent_of_population_with_1_plus_dose booster_recip_count
1                               0.754733               12943
2                               1.000000               34821
3                               0.892769               28345
4                               0.738773               20223
5                               0.979896               56744
6                               0.942086               26288
  bivalent_dose_recip_count eligible_recipient_count redacted
1                      1395                    30375       No
2                     11203                    51780       No
3                     10994                    36013       No
4                      5568                    32234       No
5                     16019                    77580       No
6                      8573                    40853       No
```

Q16. Calculate the mean "Percent of Population Fully Vaccinated" for ZIP code areas with a population as large as 92037 (La Jolla) as_of_date "2022-11-15". Add this as a straight horizontal line to your plot from above with the geom_hline() function?

```
mean(vax.36$percent_of_population_fully_vaccinated)
```

```
[1] 0.7172851
```

```
ggplot(ucsd) +
  aes(as_of_date,
      percent_of_population_fully_vaccinated) +
  geom_point() +
  geom_line(group=1) +
  ylim(c(0,1)) +
  geom_hline(yintercept = 0.7172851, linetype = "dashed", col = "red") +
  labs(x = "date", y="Percent Vaccinated",
       title = "Vaccination rate for La Jolla CA 92109")
```



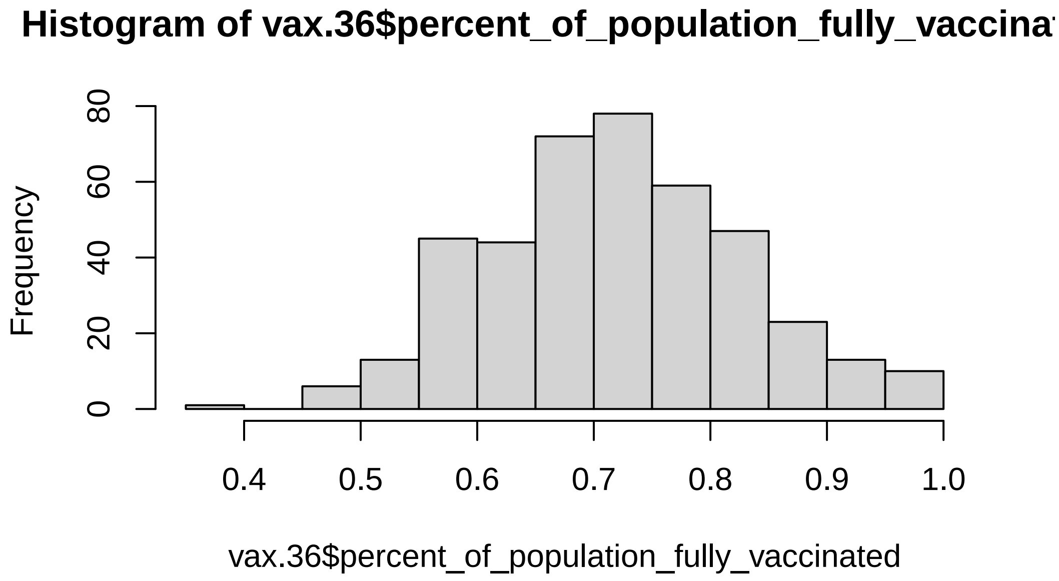
Q17. What is the 6 number summary (Min, 1st Qu., Median, Mean, 3rd Qu., and Max) of the "Percent of Population Fully Vaccinated" values for ZIP code areas with a population as large as 92037 (La Jolla) as_of_date "2022-11-15"?

```
summary(vax.36$percent_of_population_fully_vaccinated)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
 0.3785  0.6396  0.7155  0.7173  0.7880  1.0000 
```

Q18. Using ggplot generate a histogram of this data.

```
hist(vax.36$percent_of_population_fully_vaccinated)
```



Q19. Is the 92109 and 92040 ZIP code areas above or below the average value you calculated for all these above?

```
filter(vax, zip_code_tabulation_area == "92109", as_of_date == "2022-11-15")$percent_of_po
```

```
[1] 0.693299
```

```
filter(vax, zip_code_tabulation_area == "92040", as_of_date == "2022-11-15")$percent_of_po
```

```
[1] 0.546646
```

Both of these area codes are below the average.

```
vax %>% filter(as_of_date == "2022-11-15") %>%
  filter(zip_code_tabulation_area=="92040") %>%
  select(percent_of_population_fully_vaccinated)
```

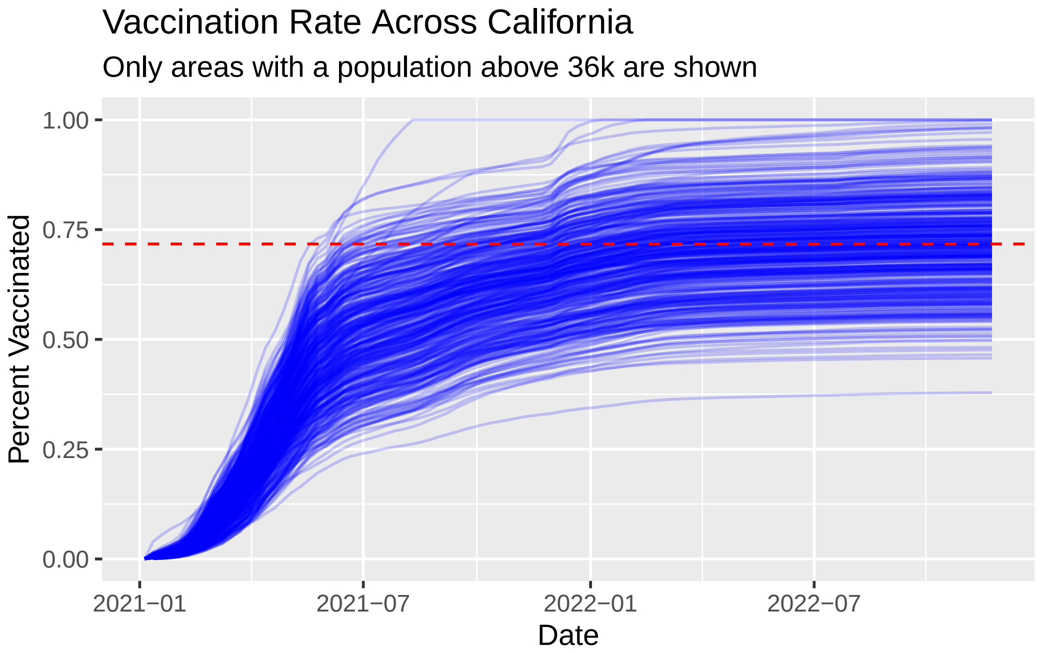
```
  percent_of_population_fully_vaccinated
1                               0.546646
```

> Q20. Finally make a time course plot of vaccination progress for all areas in the full dataset with a age5_plus_population > 36144.

```
vax.36.all <- filter(vax, age5_plus_population > 36144)


ggplot(vax.36.all) +
  aes(as_of_date,
      percent_of_population_fully_vaccinated,
      group=zip_code_tabulation_area) +
  geom_line(alpha=0.2, color="blue") +
  ylim(c(0,1)) +
  labs(x = "Date", y = "Percent Vaccinated",
       title = "Vaccination Rate Across California",
       subtitle = "Only areas with a population above 36k are shown") +
  geom_hline(yintercept = 0.7172851, linetype="dashed", col = "red")
```

```
Warning: Removed 184 rows containing missing values (`geom_line()`).
```



Q21. How do you feel about traveling for Thanksgiving Break and meeting for in-person class afterwards?

Great.