Class 17 Worksheet

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11/26/2021

Covid Vaccination Rates Mini-Project

First, let's import the data.

```
# Import vaccination data
vax <- read.csv("vax_data.csv")
head(vax)
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction         county
## 1 2021-01-05                   92395            San Bernardino San Bernardino
## 2 2021-01-05                   93206                      Kern           Kern
## 3 2021-01-05                   91006               Los Angeles    Los Angeles
## 4 2021-01-05                   91901                 San Diego      San Diego
## 5 2021-01-05                   92230                 Riverside      Riverside
## 6 2021-01-05                   92662                    Orange         Orange
##   vaccine_equity_metric_quartile                vem_source
## 1                              1 Healthy Places Index Score
## 2                              1 Healthy Places Index Score
## 3                              3 Healthy Places Index Score
## 4                              3 Healthy Places Index Score
## 5                              1 Healthy Places Index Score
## 6                              4 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               35915.3                40888                       NA
## 2                1237.5                 1521                       NA
## 3               28742.7                31347                       19
## 4               15549.8                16905                       12
## 5                2320.2                 2526                       NA
## 6                2349.5                 2397                       NA
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                           NA                                     NA
## 2                           NA                                     NA
## 3                          873                                0.000606
## 4                          271                                0.000710
## 5                           NA                                     NA
## 6                           NA                                     NA
##   percent_of_population_partially_vaccinated
## 1                                         NA
## 2                                         NA
## 3                                   0.027850
## 4                                   0.016031
```

```
## 5                                          NA
## 6                                          NA
##   percent_of_population_with_1_plus_dose
## 1                                     NA
## 2                                     NA
## 3                                0.028456
## 4                                0.016741
## 5                                     NA
## 6                                     NA
##                                                                    redacted
## 1 Information redacted in accordance with CA state privacy requirements
## 2 Information redacted in accordance with CA state privacy requirements
## 3                                                                        No
## 4                                                                        No
## 5 Information redacted in accordance with CA state privacy requirements
## 6 Information redacted in accordance with CA state privacy requirements
```

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

the persons_fully_vaccinated column

Q2. What column details the Zip code tabulation area?

the zip_code_tabulation_area column

Q3. What is the earliest date in this dataset?

```
head(sort(vax$as_of_date))
```

```
## [1] "2021-01-05" "2021-01-05" "2021-01-05" "2021-01-05" "2021-01-05"
## [6] "2021-01-05"
```

5-01-2021.

Q4. What is the latest date in this dataset?

```
head(sort(vax$as_of_date, decreasing = TRUE))
```

```
## [1] "2021-11-23" "2021-11-23" "2021-11-23" "2021-11-23" "2021-11-23"
## [6] "2021-11-23"
```

11-23-2021.

Let's get a quick overview of the dataset.

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

Table 1: Data summary

Name	vax
Number of rows	82908
Number of columns	14
Column type frequency:	
character	5
numeric	9
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	47	0
local_health_jurisdiction	0	1	0	15	235	62	0
county	0	1	0	15	235	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_quartile	1089	0.95	2.44	1.11	1	1.00	2.00	3.00	4.0	
age12_plus_population	0	1.00	18895.04	18993.94	0	1346.95	13685.10	31756.12	88556.7	
age5_plus_population	0	1.00	20875.24	21106.04	0	1460.50	15364.00	34877.00	101902.0	
persons_fully_vaccinated	8355	0.90	9585.35	11609.12	11	516.00	4210.00	16095.00	71219.0	
persons_partially_vaccinated	8355	0.90	1894.87	2105.55	11	198.00	1269.00	2880.00	20159.0	
percent_of_population_fully_vaccinated	8355	0.90	0.43	0.27	0	0.20	0.44	0.63	1.0	
percent_of_population_partially_vaccinated	8355	0.90	0.10	0.10	0	0.06	0.07	0.11	1.0	
percent_of_population_with_1_plus_dose	8355	0.90	0.51	0.26	0	0.31	0.53	0.71	1.0	

Q5. How many numeric columns are in this dataset?

Nine.

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

```
sum(is.na(vax$persons_fully_vaccinated))
```

```
## [1] 8355
```

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

```
round(( sum(is.na(vax$persons_fully_vaccinated)) / nrow(vax) )* 100,2)
```

```
## [1] 10.08
```

Q8. [Optional]: Why might this data be missing?

"Information redacted in accordance with CA state privacy requirement..."

Working with Dates

```
# install.packages("lubridate")
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
today()
```

```
## [1] "2021-11-26"
```

```
# today() - vax$as_of_date[1]
vax$as_of_date <- ymd(vax$as_of_date)
```

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

```
## Time difference of 325 days
```

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

```
## Time difference of 322 days
```

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

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

```
## Time difference of 3 days
```

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

```
length(unique(vax$as_of_date))
```

```
## [1] 47
```

Working with ZIP Codes

```
# install.packages('zipcodeR')
library(zipcodeR)
```

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

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

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

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

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

```
## # A tibble: 2 x 24
##   zipcode zipcode_type major_city post_office_city common_city_list county state
##   <chr>   <chr>        <chr>      <chr>                     <blob> <chr>  <chr>
## 1 92037   Standard     La Jolla   La Jolla, CA           <raw 20 B> San D~ CA
## 2 92109   Standard     San Diego  San Diego, CA          <raw 21 B> San D~ CA
## # ... with 17 more variables: lat <dbl>, lng <dbl>, timezone <chr>,
## #   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>
```

```
# Pull data for all ZIP codes in the dataset
zipdata <- reverse_zipcode( vax$zip_code_tabulation_area )
```

Focus on the San Diego area

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

```
##    as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 4  2021-01-05                   91901                San Diego San Diego
## 14 2021-01-05                   91902                San Diego San Diego
## 21 2021-01-05                   92011                San Diego San Diego
## 22 2021-01-05                   92055                San Diego San Diego
## 25 2021-01-05                   92067                San Diego San Diego
## 33 2021-01-05                   92081                San Diego San Diego
##    vaccine_equity_metric_quartile               vem_source
## 4                               3 Healthy Places Index Score
## 14                              4 Healthy Places Index Score
## 21                              4 Healthy Places Index Score
## 22                              3    CDPH-Derived ZCTA Score
## 25                              4 Healthy Places Index Score
## 33                              2 Healthy Places Index Score
##    age12_plus_population age5_plus_population persons_fully_vaccinated
## 4                15549.8                16905                       12
## 14               16620.7                18026                       22
## 21               20503.6                23247                       NA
## 22               11548.0                11654                       NA
## 25                6973.9                 7480                       11
## 33               25558.0                27632                       14
##    persons_partially_vaccinated percent_of_population_fully_vaccinated
## 4                           271                                0.000710
## 14                          374                                0.001220
## 21                           NA                                      NA
## 22                           NA                                      NA
## 25                          241                                0.001471
## 33                          346                                0.000507
##    percent_of_population_partially_vaccinated
## 4                                    0.016031
## 14                                   0.020748
## 21                                         NA
## 22                                         NA
## 25                                   0.032219
## 33                                   0.012522
##    percent_of_population_with_1_plus_dose
## 4                                0.016741
## 14                               0.021968
## 21                                     NA
## 22                                     NA
## 25                               0.033690
## 33                               0.013029
##                                                                  redacted
## 4                                                                      No
## 14                                                                     No
## 21 Information redacted in accordance with CA state privacy requirements
## 22 Information redacted in accordance with CA state privacy requirements
## 25                                                                     No
## 33                                                                     No
```

```
nrow(sd)
```

```
## [1] 5029
```

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

```
length(unique(sd$zip_code_tabulation_area))
```

```
## [1] 107
```

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

```
sd[which.max(sd$age12_plus_population),]
```

```
##     as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 883 2021-01-05                   92154                San Diego San Diego
##     vaccine_equity_metric_quartile                vem_source
## 883                              2 Healthy Places Index Score
##     age12_plus_population age5_plus_population persons_fully_vaccinated
## 883               76365.2                82971                       33
##     persons_partially_vaccinated percent_of_population_fully_vaccinated
## 883                         1341                                0.000398
##     percent_of_population_partially_vaccinated
## 883                                   0.016162
##     percent_of_population_with_1_plus_dose redacted
## 883                                0.01656       No
```

zip code 92154

```
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.11.09.21 <- filter(vax, county == "San Diego" & as_of_date == "2021-11-09")
head(sd.11.09.21)
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 1 2021-11-09                   92081                San Diego San Diego
## 2 2021-11-09                   92058                San Diego San Diego
## 3 2021-11-09                   91902                San Diego San Diego
## 4 2021-11-09                   92140                San Diego San Diego
## 5 2021-11-09                   92124                San Diego San Diego
## 6 2021-11-09                   92135                San Diego San Diego
##   vaccine_equity_metric_quartile                vem_source
## 1                              2 Healthy Places Index Score
```

```
## 2                              1 Healthy Places Index Score
## 3                              4 Healthy Places Index Score
## 4                             NA            No VEM Assigned
## 5                              3 Healthy Places Index Score
## 6                             NA            No VEM Assigned
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               25558.0                27632                     17333
## 2               34956.0                39695                     13892
## 3               16620.7                18026                     13101
## 4                3747.7                 3737                        38
## 5               25422.4                29040                     16121
## 6                 635.0                  635                        NA
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                         2219                                0.627280
## 2                         2410                                0.349969
## 3                         1997                                0.726784
## 4                           14                                0.010169
## 5                         2060                                0.555131
## 6                           NA                                      NA
##   percent_of_population_partially_vaccinated
## 1                                   0.080305
## 2                                   0.060713
## 3                                   0.110784
## 4                                   0.003746
## 5                                   0.070937
## 6                                         NA
##   percent_of_population_with_1_plus_dose
## 1                               0.707585
## 2                               0.410682
## 3                               0.837568
## 4                               0.013915
## 5                               0.626068
## 6                                     NA
##                                                          redacted
## 1                                                              No
## 2                                                              No
## 3                                                              No
## 4                                                              No
## 5                                                              No
## 6 Information redacted in accordance with CA state privacy requirements
```

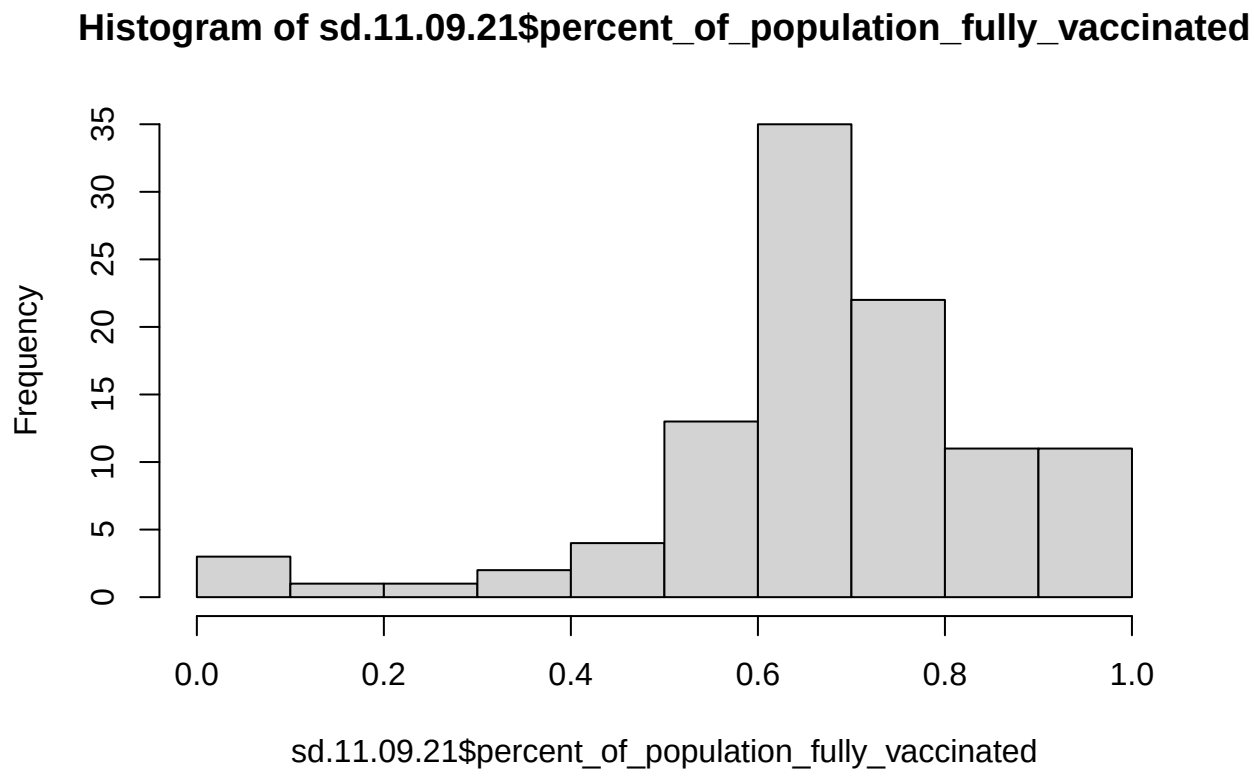
Q13. What is the overall average "Percent of Population Fully Vaccinated" value for all San Diego "County" as of "2021-11-09"?

```
mean(sd.11.09.21$percent_of_population_fully_vaccinated, na.rm = TRUE)
```

```
## [1] 0.6734714
```

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 "2021-11-09"?

```
hist(sd.11.09.21$percent_of_population_fully_vaccinated)
```



Focus on UCSD/La Jolla

UC San Diego resides in the 92037 ZIP code area and is listed with an age 5+ population size of 36,144.

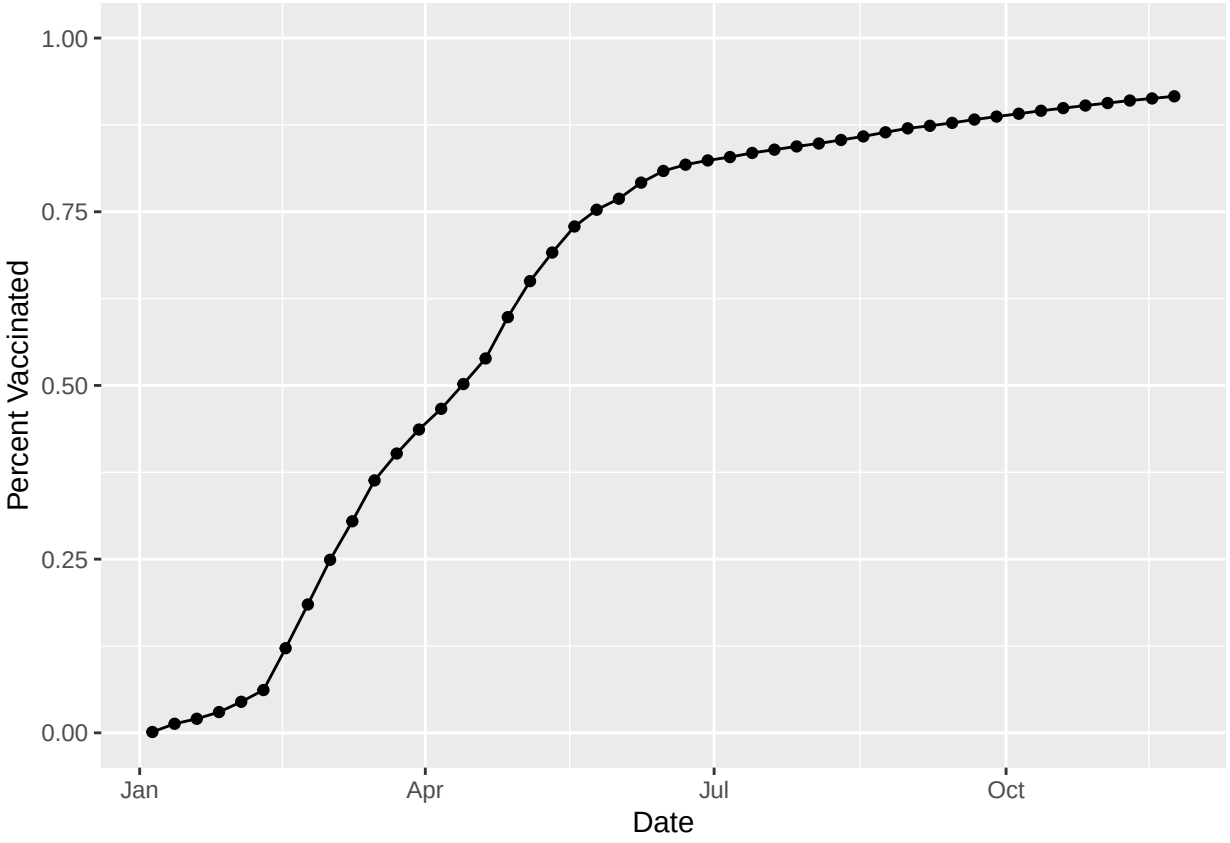
```
ucsd <- filter(sd, zip_code_tabulation_area=="92037")
ucsd[1,]$age5_plus_population
```

```
## [1] 36144
```

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

```
library(ggplot2)

ggplot(ucsd) +
  aes(ucsd$as_of_date,
      ucsd$percent_of_population_fully_vaccinated) +
  geom_point() +
  geom_line(group=1) +
  ylim(c(0,1)) +
  labs(x = "Date", y="Percent Vaccinated")
```

```
## Warning: Use of `ucsd$as_of_date` is discouraged. Use `as_of_date` instead.

## Warning: Use of `ucsd$percent_of_population_fully_vaccinated` is discouraged.
## Use `percent_of_population_fully_vaccinated` instead.

## Warning: Use of `ucsd$as_of_date` is discouraged. Use `as_of_date` instead.

## Warning: Use of `ucsd$percent_of_population_fully_vaccinated` is discouraged.
## Use `percent_of_population_fully_vaccinated` instead.
```



Comparing to similar sized areas

```
# Subset to all CA areas with a population as large as 92037
vax.36 <- filter(vax, age5_plus_population > 36144 &
                 as_of_date == "2021-11-16")

head(vax.36)
```

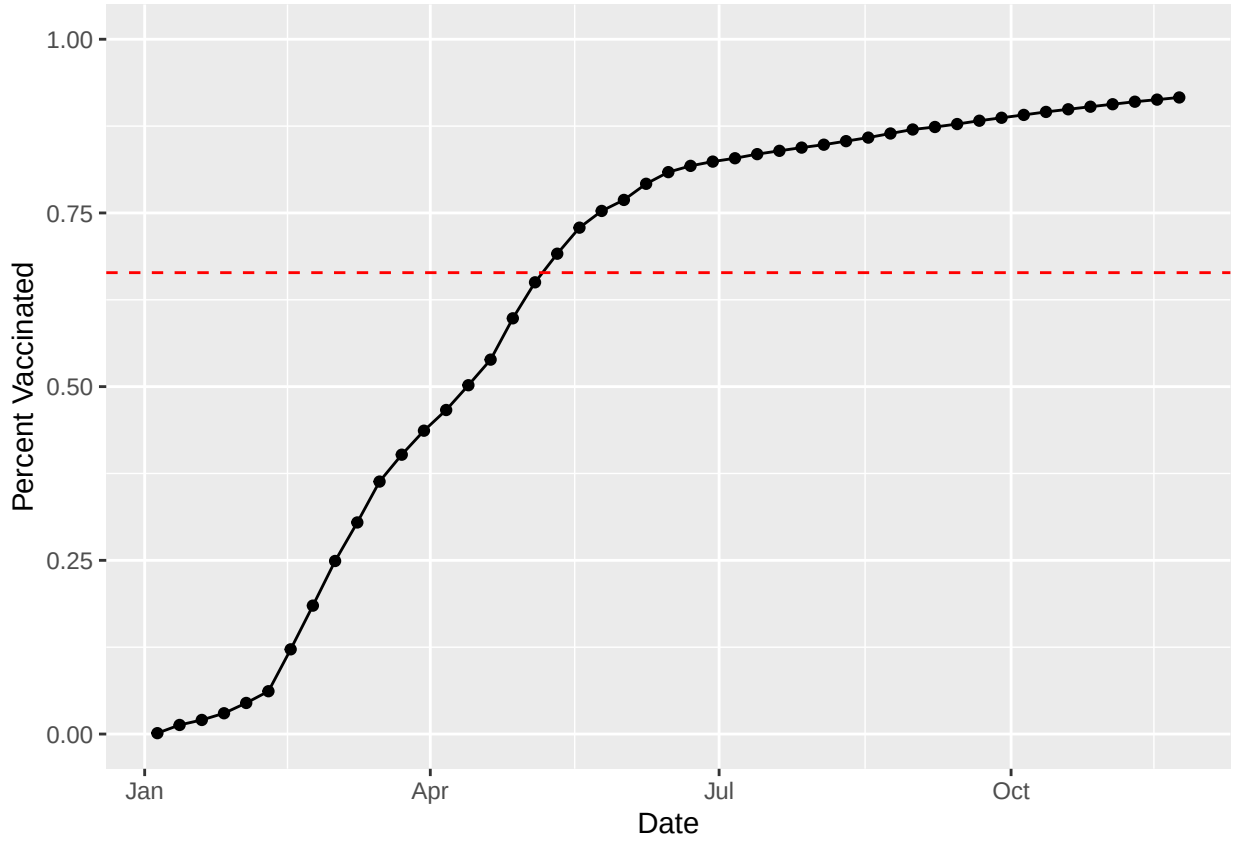
```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction         county
## 1 2021-11-16                   92020                San Diego      San Diego
## 2 2021-11-16                   92563                Riverside      Riverside
## 3 2021-11-16                   92806                   Orange         Orange
```

```
## 4 2021-11-16                    93291                   Tulare         Tulare
## 5 2021-11-16                    92335            San Bernardino San Bernardino
## 6 2021-11-16                    92618                   Orange         Orange
##   vaccine_equity_metric_quartile                vem_source
## 1                              2 Healthy Places Index Score
## 2                              3 Healthy Places Index Score
## 3                              2 Healthy Places Index Score
## 4                              1 Healthy Places Index Score
## 5                              1 Healthy Places Index Score
## 6                              4 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               49284.5                54991                     35128
## 2               55897.8                63794                     36051
## 3               33050.9                36739                     24810
## 4               46879.7                54254                     27936
## 5               79670.3                91867                     49820
## 6               40348.0                44304                     39695
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                         5161                                0.638795
## 2                         4224                                0.565116
## 3                         2355                                0.675304
## 4                         4012                                0.514911
## 5                         5970                                0.542306
## 6                         3936                                0.895969
##   percent_of_population_partially_vaccinated
## 1                                   0.093852
## 2                                   0.066213
## 3                                   0.064101
## 4                                   0.073948
## 5                                   0.064985
## 6                                   0.088841
##   percent_of_population_with_1_plus_dose redacted
## 1                               0.732647       No
## 2                               0.631329       No
## 3                               0.739405       No
## 4                               0.588859       No
## 5                               0.607291       No
## 6                               0.984810       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 "2021-11-16". Add this as a straight horizontal line to your plot from above with the geom_hline() function?

```
red_line <- mean(vax.36$percent_of_population_fully_vaccinated, na.rm = TRUE)
library(ggplot2)

ggplot(ucsd) +
  aes(ucsd$as_of_date,
      ucsd$percent_of_population_fully_vaccinated) +
  geom_point() +
  geom_line(group=1) + geom_hline(yintercept = red_line, linetype = 'dashed', color = 'red') +
  ylim(c(0,1)) +
  labs(x = "Date", y="Percent Vaccinated")
```

```
## Warning: Use of `ucsd$as_of_date` is discouraged. Use `as_of_date` instead.

## Warning: Use of `ucsd$percent_of_population_fully_vaccinated` is discouraged.
## Use `percent_of_population_fully_vaccinated` instead.

## Warning: Use of `ucsd$as_of_date` is discouraged. Use `as_of_date` instead.

## Warning: Use of `ucsd$percent_of_population_fully_vaccinated` is discouraged.
## Use `percent_of_population_fully_vaccinated` instead.
```



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 "2021-11-16"?

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

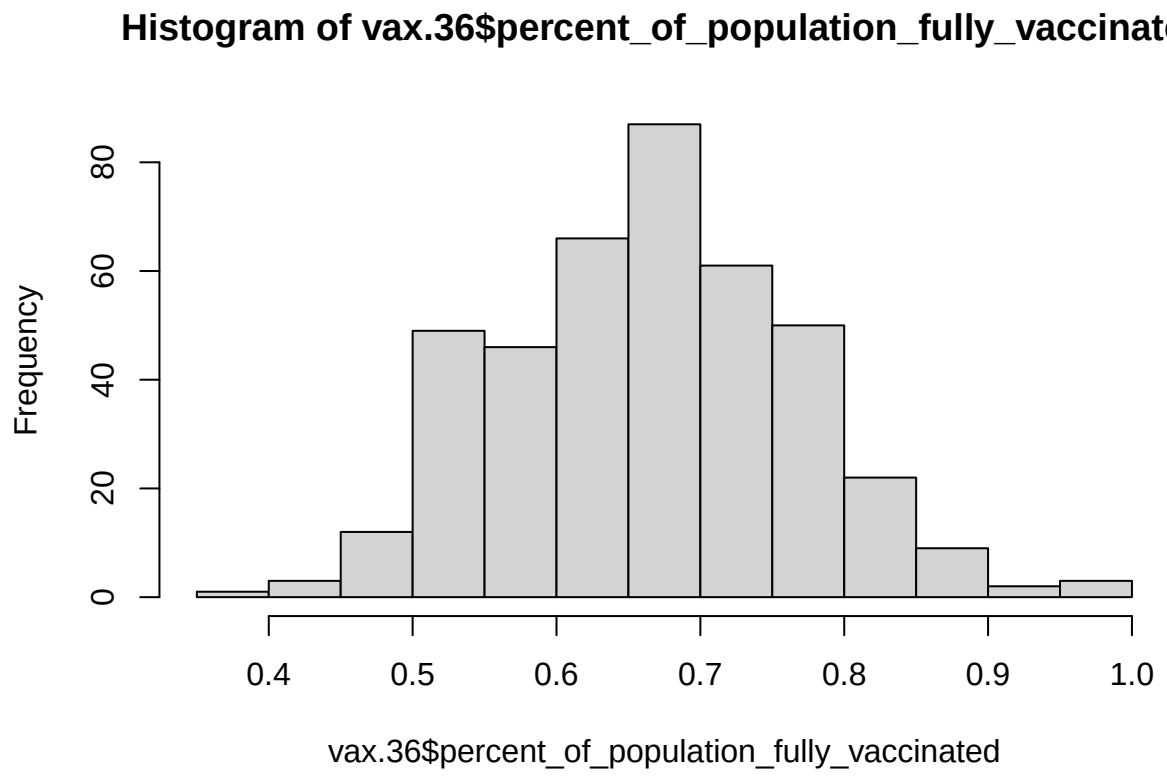
```
## [1] 0.3528910 0.5905170 0.6661630 0.7297545 1.0000000
```

```
mean(vax.36$percent_of_population_fully_vaccinated, na.rm = TRUE)
```

```
## [1] 0.6640413
```

Q18. Using ggplot generate a histogram of this data.

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




```
# ggplot(vax.36, aes(x = percent_of_population_fully_vaccinated)) +
  # geom_bar() +
  # labs(x = "Percent Vaccinated", y="Count")
```

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

```
vax %>% filter(as_of_date == "2021-11-16") %>%
  filter(zip_code_tabulation_area=="92040") %>%
  select(percent_of_population_fully_vaccinated)
```

```
##   percent_of_population_fully_vaccinated
## 1                               0.521047
```

```
vax %>% filter(as_of_date == "2021-11-16") %>%
  filter(zip_code_tabulation_area=="92109") %>%
  select(percent_of_population_fully_vaccinated)
```

```
##   percent_of_population_fully_vaccinated
## 1                                0.68863
```

zip code 92109 is above, but zip code 92040 is below

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

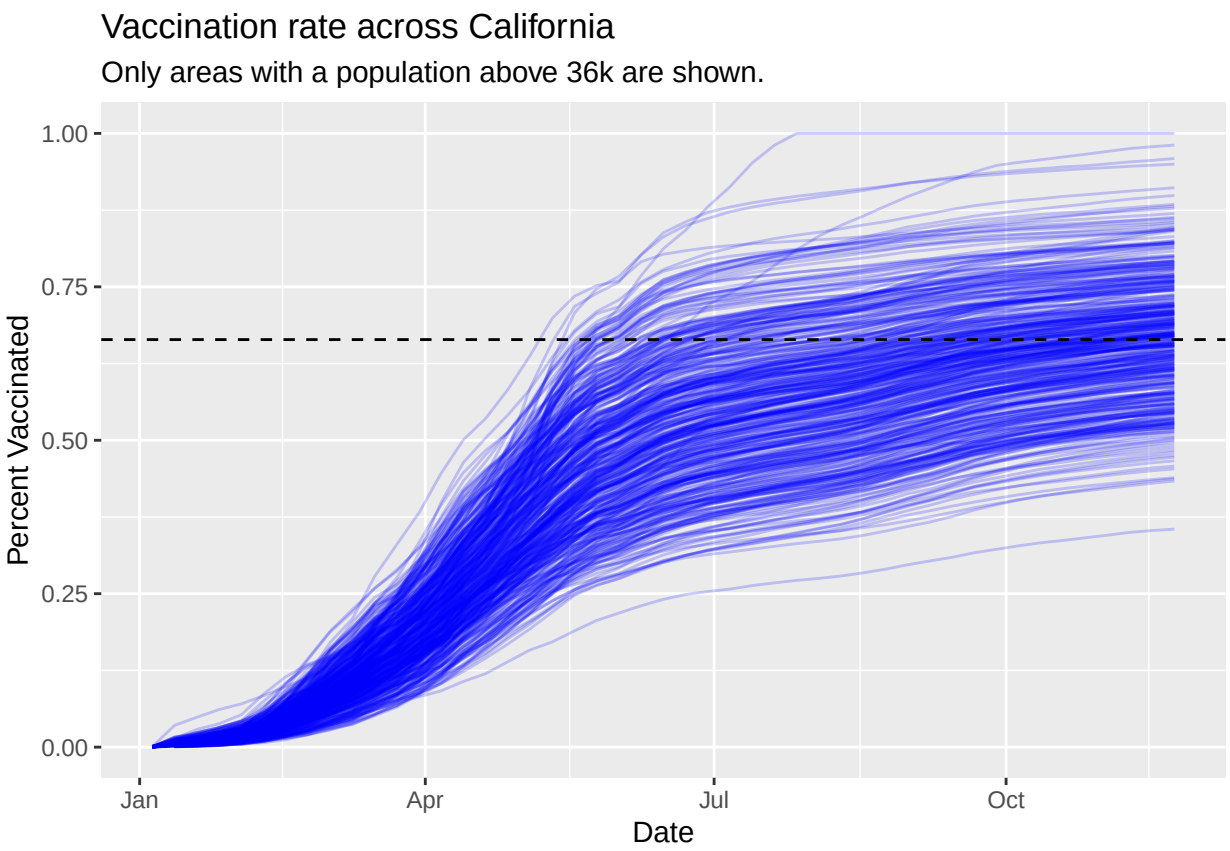
```
vax.36.all <- filter(vax, age5_plus_population > 36144)
head(vax.36.all)
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction         county
## 1 2021-01-05                   92395           San Bernardino San Bernardino
## 2 2021-01-05                   92410           San Bernardino San Bernardino
## 3 2021-01-05                   92646                   Orange         Orange
## 4 2021-01-05                   92886                   Orange         Orange
## 5 2021-01-05                   92545                Riverside      Riverside
## 6 2021-01-05                   92677                   Orange         Orange
##   vaccine_equity_metric_quartile               vem_source
## 1                              1 Healthy Places Index Score
## 2                              1 Healthy Places Index Score
## 3                              4 Healthy Places Index Score
## 4                              4 Healthy Places Index Score
## 5                              1 Healthy Places Index Score
## 6                              4 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               35915.3                40888                       NA
## 2               35012.3                41625                       NA
## 3               49327.5                53307                       18
## 4               43348.1                48075                       34
## 5               35528.1                39692                       NA
## 6               58070.9                63004                       19
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                           NA                                     NA
## 2                           NA                                     NA
## 3                         1083                                0.000338
## 4                         1057                                0.000707
## 5                           NA                                     NA
## 6                         1059                                0.000302
##   percent_of_population_partially_vaccinated
## 1                                         NA
## 2                                         NA
## 3                                   0.020316
## 4                                   0.021986
## 5                                         NA
## 6                                   0.016808
##   percent_of_population_with_1_plus_dose
## 1                                     NA
## 2                                     NA
## 3                               0.020654
## 4                               0.022693
## 5                                     NA
## 6                               0.017110
##                                                                redacted
## 1 Information redacted in accordance with CA state privacy requirements
## 2 Information redacted in accordance with CA state privacy requirements
```

```
## 3                                                                    No
## 4                                                                    No
## 5 Information redacted in accordance with CA state privacy requirements
## 6                                                                    No
```

```
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") +
  labs(x= "Date", y= "Percent Vaccinated",
       title="Vaccination rate across California",
       subtitle= "Only areas with a population above 36k are shown.") +
  geom_hline(yintercept = red_line, linetype= "dashed")
```

```
## Warning: Removed 176 row(s) containing missing values (geom_path).
```



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

I'm excited to be home for Thanksgiving. Either in-class or virtual next week works for me.