lab17

Nate Tran

Importing and Exploring Data

```r
vax <- read.csv("covid19vaccinesbyzipcode_test.csv")
head(vax)
```

```
  as_of_date zip_code_tabulation_area local_health_jurisdiction          county
1 2021-01-05                    93609                    Fresno          Fresno
2 2021-01-05                    94086               Santa Clara     Santa Clara
3 2021-01-05                    94304               Santa Clara     Santa Clara
4 2021-01-05                    94110             San Francisco   San Francisco
5 2021-01-05                    93420           San Luis Obispo San Luis Obispo
6 2021-01-05                    93454             Santa Barbara   Santa Barbara
  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                              2 Healthy Places Index Score
  age12_plus_population age5_plus_population tot_population
1                4396.3                 4839           5177
2               42696.0                46412          50477
3                3263.5                 3576           3852
4               64350.7                68320          72380
5               26694.9                29253          30740
6               32043.4                36446          40432
  persons_fully_vaccinated persons_partially_vaccinated
1                       NA                           NA
2                       11                          640
3                       NA                           NA
```

```
4                       18                         1262
5                       NA                           NA
6                       NA                           NA
  percent_of_population_fully_vaccinated
1                                     NA
2                               0.000218
3                                     NA
4                               0.000249
5                                     NA
6                                     NA
  percent_of_population_partially_vaccinated
1                                         NA
2                                   0.012679
3                                         NA
4                                   0.017436
5                                         NA
6                                         NA
  percent_of_population_with_1_plus_dose booster_recip_count
1                                     NA                  NA
2                               0.012897                  NA
3                                     NA                  NA
4                               0.017685                  NA
5                                     NA                  NA
6                                     NA                  NA
  bivalent_dose_recip_count eligible_recipient_count
1                        NA                        1
2                        NA                       11
3                        NA                        6
4                        NA                       18
5                        NA                        4
6                        NA                        5
                                                               redacted
1 Information redacted in accordance with CA state privacy requirements
2 Information redacted in accordance with CA state privacy requirements
3 Information redacted in accordance with CA state privacy requirements
4 Information redacted in accordance with CA state privacy requirements
5 Information redacted in accordance with CA state privacy requirements
6 Information redacted in accordance with CA state privacy requirements
```

```
tail(vax)
```

```
       as_of_date zip_code_tabulation_area local_health_jurisdiction
```

```
201091 2023-03-07                    93662                  Fresno
201092 2023-03-07                    94801            Contra Costa
201093 2023-03-07                    93668                  Fresno
201094 2023-03-07                    93704                  Fresno
201095 2023-03-07                    94510                  Solano
201096 2023-03-07                    93726                  Fresno
             county vaccine_equity_metric_quartile                 vem_source
201091       Fresno                              1 Healthy Places Index Score
201092 Contra Costa                              1 Healthy Places Index Score
201093       Fresno                              1    CDPH-Derived ZCTA Score
201094       Fresno                              1 Healthy Places Index Score
201095       Solano                              4 Healthy Places Index Score
201096       Fresno                              1 Healthy Places Index Score
       age12_plus_population age5_plus_population tot_population
201091               24501.3                28311          30725
201092               25273.6                29040          31210
201093                1013.4                 1199           1219
201094               24803.5                27701          29740
201095               24819.2                27056          28350
201096               33707.7                39067          42824
       persons_fully_vaccinated persons_partially_vaccinated
201091                    20088                         2150
201092                    27375                         2309
201093                      644                           74
201094                    17887                         1735
201095                    22648                         2264
201096                    24121                         2682
       percent_of_population_fully_vaccinated
201091                               0.653800
201092                               0.877123
201093                               0.528302
201094                               0.601446
201095                               0.798871
201096                               0.563259
       percent_of_population_partially_vaccinated
201091                                   0.069976
201092                                   0.073983
201093                                   0.060705
201094                                   0.058339
201095                                   0.079859
201096                                   0.062628
       percent_of_population_with_1_plus_dose booster_recip_count
201091                               0.723776               10072
```

```
201092                               0.951106               14782
201093                               0.589007                 312
201094                               0.659785               10435
201095                               0.878730               16092
201096                               0.625887               12104
       bivalent_dose_recip_count eligible_recipient_count redacted
201091                      2578                    20066       No
201092                      5342                    27282       No
201093                        66                      644       No
201094                      4154                    17822       No
201095                      8797                    22501       No
201096                      3585                    24062       No
```

Q1

persons_fully_vaccinated column

Q2

zip_code_tabulation_area column

Q3

Earliest date is 01/05/2021 or 2021-01-05

Q4

Latest date is 03/07/2023 or 2023-03-07

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

Table 1: Data summary

Name	vax
Number of rows	201096
Number of columns	18
Column type frequency:	
character	5
numeric	13

Table 1: Data summary

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	114	0
local_health_jurisdiction	0	1	0	15	570	62	0
county	0	1	0	15	570	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	1817.38	90001	92257.75	93658.50	95380.50	97635.0	
vaccine_equity_metric_quartile	9918	0.95	2.44	1.11	1	1.00	2.00	3.00	4.0	
age12_plus_population	0	1.00	18895.04	18993.87	0	1346.95	13685.10	31756.12	88556.7	
age5_plus_population	0	1.00	20875.24	21105.97	0	1460.50	15364.00	34877.00	101902.0	
tot_population	9804	0.95	23372.77	22628.50	12	2126.00	18714.00	38168.00	111165.0	
persons_fully_vaccinated	16621	0.92	13990.39	15073.66	11	932.00	8589.00	23346.00	87575.0	
persons_partially_vaccinated	16621	0.92	1702.31	2033.32	11	165.00	1197.00	2536.00	39973.0	
percent_of_population_fully_vaccinated	20965	0.90	0.57	0.25	0	0.42	0.61	0.74	1.0	
percent_of_population_partially_vaccinated	20965	0.90	0.08	0.09	0	0.05	0.06	0.08	1.0	
percent_of_population_with_1_plus_dose	22009	0.89	0.63	0.24	0	0.49	0.67	0.81	1.0	
booster_recip_count	72997	0.64	5882.76	7219.00	11	300.00	2773.00	9510.00	59593.0	
bivalent_dose_recip_count	158776	0.21	2978.23	3633.03	11	193.00	1467.50	4730.25	27694.0	
eligible_recipient_count	0	1.00	12830.83	14928.64	0	507.00	6369.00	22014.00	87248.0	

Q5

There are 13 numeric columns

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

```
[1] 16621
```

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

```
[1] 0.08265207
```

Q6

There are 16621 NA values in persons_fully_vaccinated column

Q7

8.3% of persons_fully_vaccinated values are missing

Q8

The data might be missing because some counties may not have had statistics taken at certain earlier dates e.g. 2021

Working with Dates

```
library(lubridate)
```

```

Attaching package: 'lubridate'

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

    date, intersect, setdiff, union
```

Converting date data into lubridate format

```
vax$as_of_date <-  ymd(vax$as_of_date)
```

Performing math with dates is possible now!

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

```
Time difference of 794 days
```

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

```
Time difference of 791 days
```

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

```
[1] 114
```

Q9

791 days have passed since the last update.

Q10

There are 114 unique dates.

Working with ZIP Codes

Using zipcodeR package for analysis of zip code data

```
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_~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, ...
```

Pulling data for all zip codes in dataset

```
#data_zip <- reverse_zipcode(vax$zip_code_tabulation_area)
```

Focus on the SD Area

Using 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
```

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

nrow(sd)
```

```
[1] 12198
```

```r
sd_10k_pop <- filter(vax, county == "San Diego" & vax$age5_plus_population > 10000)
```

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

```
[1] 107
```

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

```
[1] 92154
```

Q11

There are 107 distinct zip codes listed for SD county.

Q12

92154 has the largest 12+ population.

```r
sd_2_28 <- filter(sd, sd$as_of_date == "2023-02-28")
```

```r
sd_2_28_zeros <- sd_2_28
sd_2_28_zeros[is.na(sd_2_28$percent_of_population_fully_vaccinated),]$percent_of_populatio
```

```r
mean(sd_2_28_zeros$percent_of_population_fully_vaccinated)
```

```
[1] 0.684829
```

Q13

The average percent of population fully vaccinated is 68.48%.

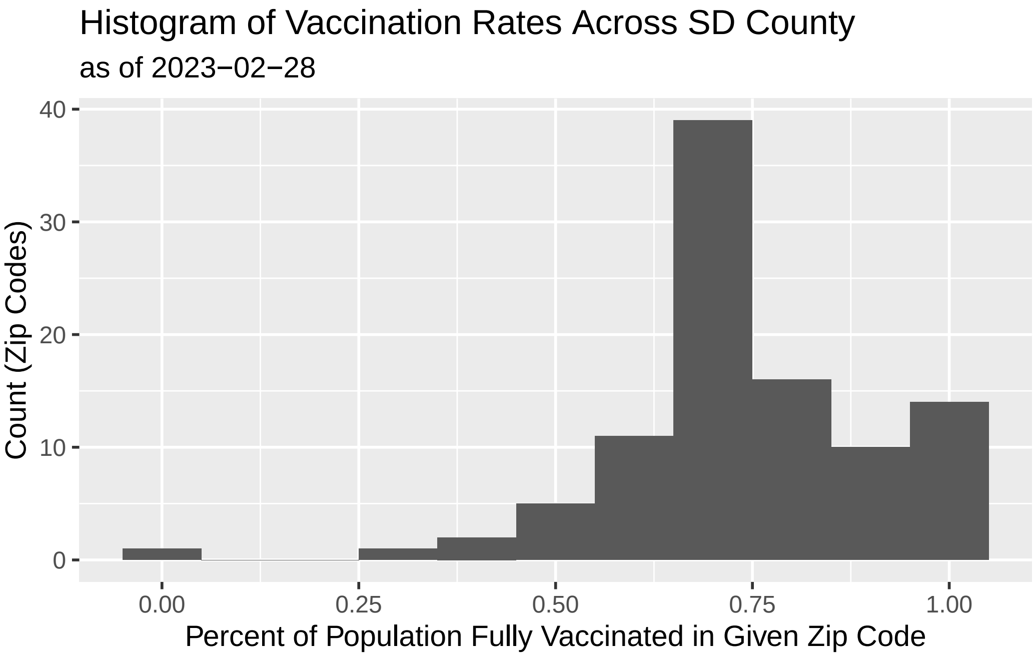
Q14

Summary figure below

```
library(ggplot2)
```

```
ggplot(sd_2_28) +
  aes(percent_of_population_fully_vaccinated) +
  geom_histogram(binwidth = .10) +
  labs(title = "Histogram of Vaccination Rates Across SD County", subtitle = "as of 2023-0
  xlab("Percent of Population Fully Vaccinated in Given Zip Code") +
  ylab("Count (Zip Codes)")
```

```
Warning: Removed 8 rows containing non-finite values (`stat_bin()`).
```



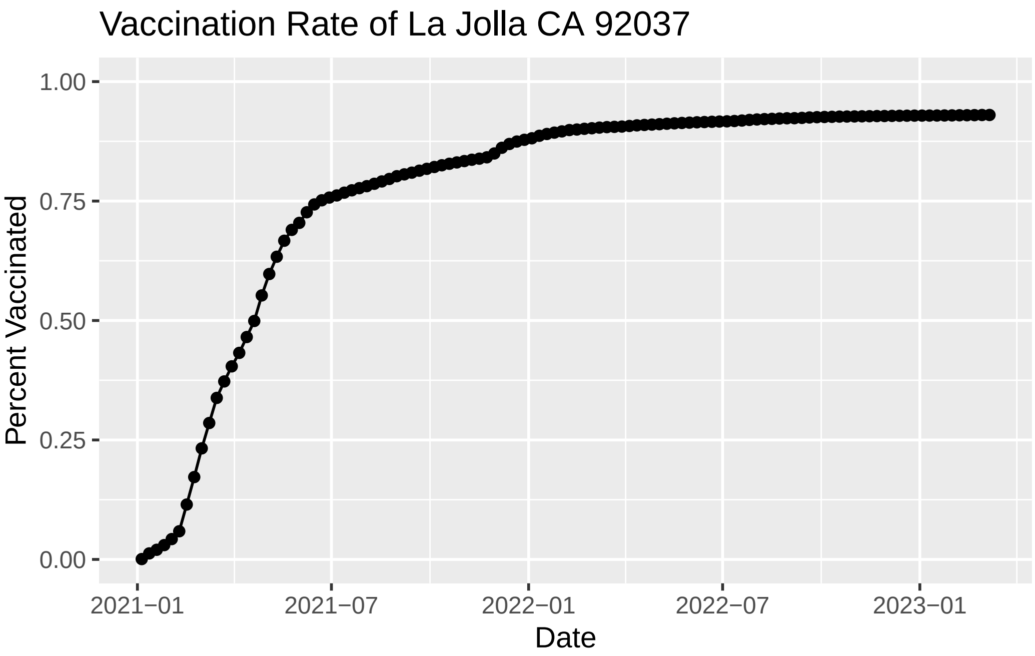
Focus on UCSD/La Jolla

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

Q15

Graph below

```
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 of La Jolla CA 92037")
```



Comparing UCSD to Similar Sized Areas

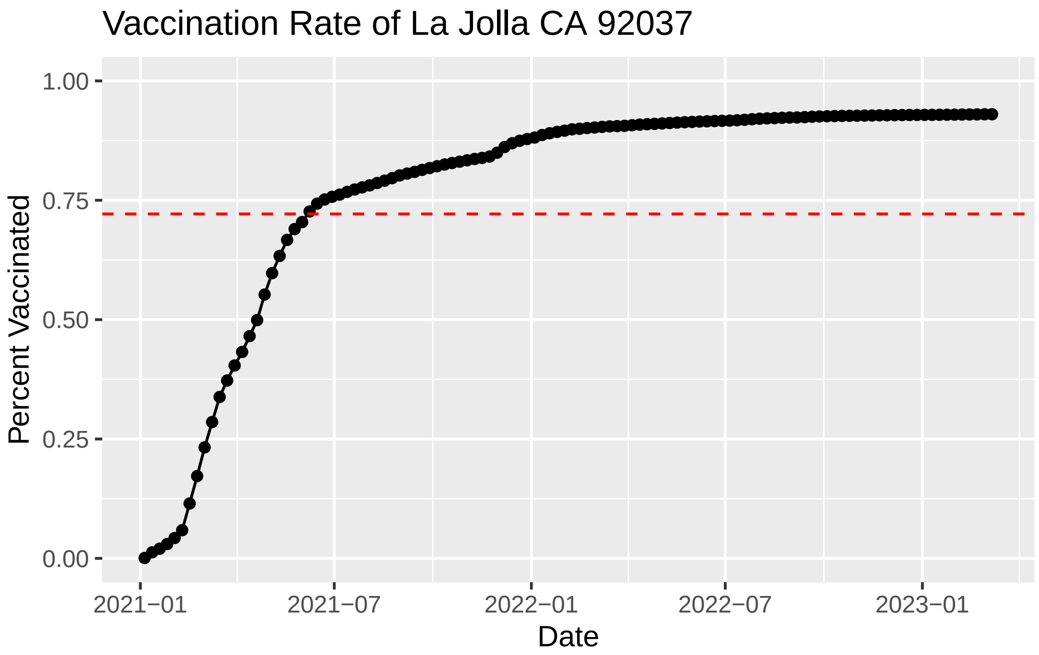
```
vax_compare <- filter(vax, vax$age5_plus_population > 36144 & as_of_date == "2023-02-28")
mean(vax_compare$percent_of_population_fully_vaccinated)
```

```
[1] 0.7213907
```

Q16

See below

```
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 of La Jolla CA 92037") +
  geom_hline(yintercept = 0.7213907, linetype="dashed", col="red")
```



```
skimr::skim(vax_compare)
```

Table 4: Data summary

Name	vax_compare
Number of rows	411
Number of columns	18
Column type frequency:	
character	4
Date	1
numeric	13
Group variables	None

Variable type: character

skim_variable	n_missing	complete_rate	min	max	empty	n_unique	whitespace
local_health_jurisdiction	0	1	4	15	0	37	0
county	0	1	4	15	0	36	0
vem_source	0	1	26	26	0	1	0
redacted	0	1	2	2	0	1	0

Variable type: Date

skim_variable	n_missing	complete_rate	min	max	median	n_unique
as_of_date	0	1	2023-02-28	2023-02-28	2023-02-28	1

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
zip_code_tabulation_area	0	1	92862.11	1716.60	90001.00	91761.50	92646.00	94517.00	96003.0	
vaccine_equity_metric_quartile	0	1	2.35	1.11	1.00	1.00	2.00	3.00	4.0	
age12_plus_population	0	1	46847.41	12057.32	21650.90	37693.54	43985.40	53931.58	88556.7	
age5_plus_population	0	1	52012.31	13620.13	36181.00	41612.50	48573.00	59167.50	101902.0	
tot_population	0	1	55640.91	14745.13	38007.00	44393.00	52212.00	62910.00	111165.0	
persons_fully_vaccinated	0	1	40059.20	11757.95	17511.00	32167.50	37243.00	45326.00	87563.0	
persons_partially_vaccinated	0	1	4210.93	2736.58	1794.00	2927.00	3600.00	4809.00	39909.0	

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
percent_of_population_fully_vaccinated	0	1	0.72	0.11	0.38	0.65	0.72	0.79	1.0	
percent_of_population_partially_vaccinated	0	1	0.08	0.05	0.04	0.06	0.07	0.08	1.0	
percent_of_population_with_1_plus_dose	0	1	0.79	0.11	0.44	0.71	0.79	0.87	1.0	
booster_recip_count	0	1	23889.67	8175.49	9012.00	17857.50	22562.00	28577.00	59382.0	
bivalent_dose_recip_count	0	1	9102.94	4362.06	2706.00	5856.00	8076.00	11454.00	27483.0	
eligible_recipient_count	0	1	39928.45	11702.39	17436.00	32080.00	37158.00	45186.00	87248.0	

Q17

Min:38.04%, 1st quartile: 64.58%, mean: 72.14%, median: 71.81%, 3rd quartile: 79.07%, Max: 100%

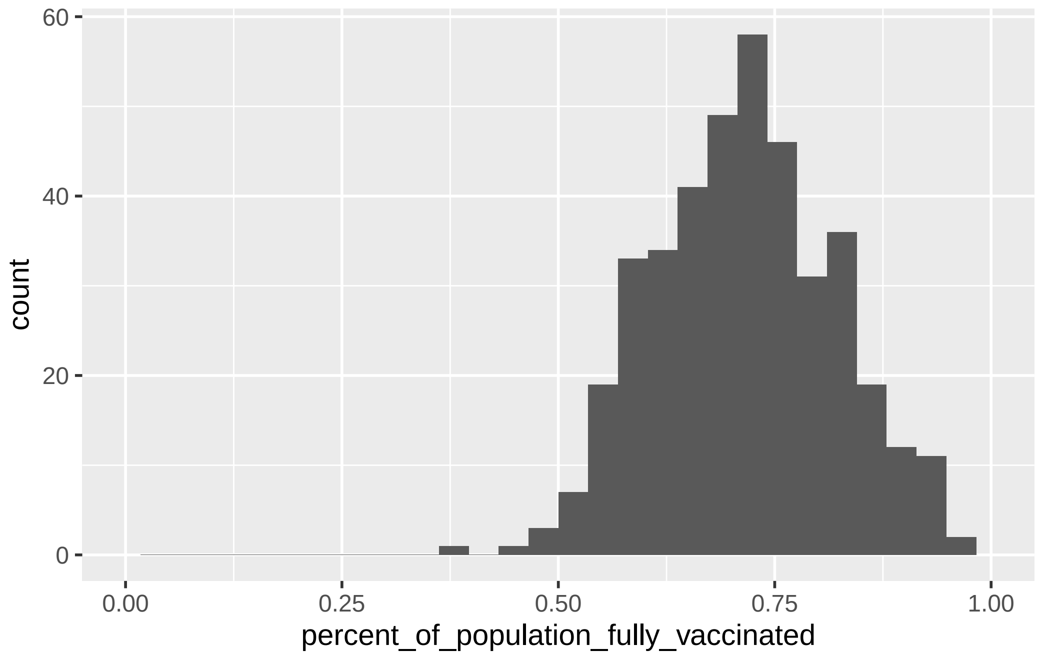
Q18

See below

```r
ggplot(vax_compare) +
  aes(percent_of_population_fully_vaccinated) +
  geom_histogram() +
  xlim(c(0,1))
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
Warning: Removed 2 rows containing missing values (`geom_bar()`).
```



```
vax %>% filter(as_of_date == "2023-02-28") %>%
  filter(zip_code_tabulation_area=="92040") %>%
  select(percent_of_population_fully_vaccinated)
```

```
  percent_of_population_fully_vaccinated
1                               0.550469
```

```
vax %>% filter(as_of_date == "2023-02-28") %>%
  filter(zip_code_tabulation_area=="92109") %>%
  select(percent_of_population_fully_vaccinated)
```

```
  percent_of_population_fully_vaccinated
1                                0.69453
```

Q19

They are below the average value calculated

Q20

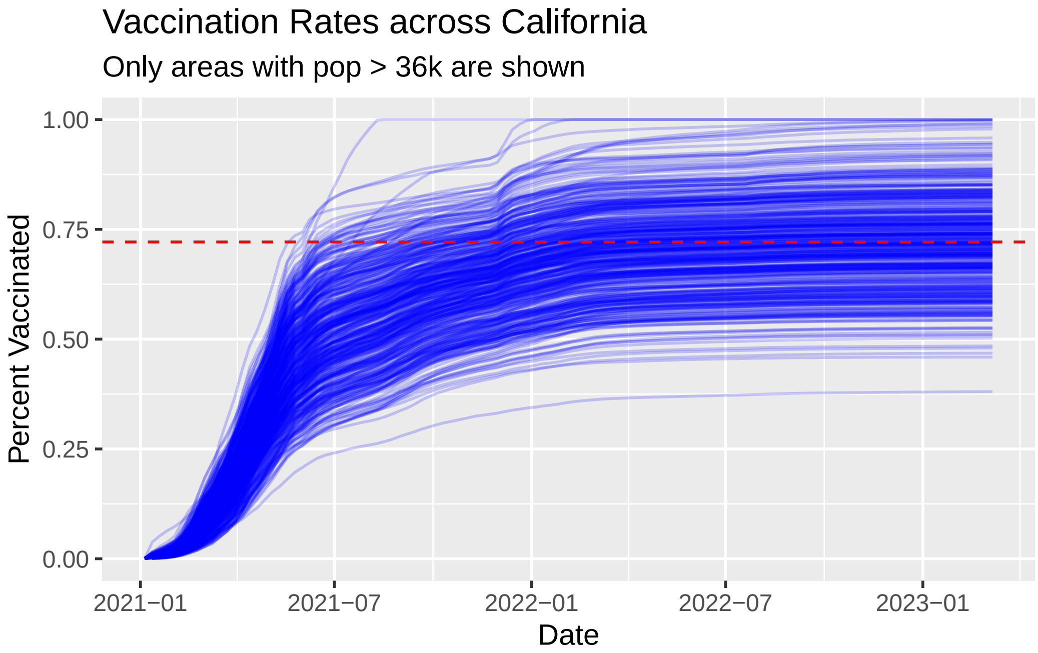
See below

```
vax_compare_all <- filter(vax, vax$age5_plus_population > 36144)
```

Plotting using ggplot

```
ggplot(vax_compare_all) +
  aes(as_of_date, percent_of_population_fully_vaccinated, group=zip_code_tabulation_area)
  geom_line(alpha=0.2, col="blue") +
  ylim(c(0,1)) +
  labs(x="Date", y="Percent Vaccinated", title="Vaccination Rates across California", subt
  geom_hline(yintercept=0.7214, linetype="dashed", col = "red")
```

```
Warning: Removed 183 rows containing missing values (`geom_line()`).
```



Q21

Time to mask up after Spring Break :^)