class17:covid-19 vaccination rate mini project

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#background

```
vax <- read.csv("covid19vac.csv")
head(vax)
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 1 2021-01-05                   92804                    Orange    Orange
## 2 2021-01-05                   92626                    Orange    Orange
## 3 2021-01-05                   92250                  Imperial  Imperial
## 4 2021-01-05                   92637                    Orange    Orange
## 5 2021-01-05                   92155                 San Diego San Diego
## 6 2021-01-05                   92259                  Imperial  Imperial
##   vaccine_equity_metric_quartile                vem_source
## 1                              2 Healthy Places Index Score
## 2                              3 Healthy Places Index Score
## 3                              1 Healthy Places Index Score
## 4                              3 Healthy Places Index Score
## 5                             NA            No VEM Assigned
## 6                              1    CDPH-Derived ZCTA Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               76455.9                84200                       19
## 2               44238.8                47883                       NA
## 3                7098.5                 8026                       NA
## 4               16027.4                16053                       NA
## 5                 456.0                  456                       NA
## 6                 119.0                  121                       NA
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                         1282                                0.000226
## 2                           NA                                      NA
## 3                           NA                                      NA
## 4                           NA                                      NA
## 5                           NA                                      NA
## 6                           NA                                      NA
##   percent_of_population_partially_vaccinated
## 1                                   0.015226
## 2                                         NA
## 3                                         NA
## 4                                         NA
## 5                                         NA
## 6                                         NA
##   percent_of_population_with_1_plus_dose
```

```
## 1                                0.015452
## 2                                      NA
## 3                                      NA
## 4                                      NA
## 5                                      NA
## 6                                      NA
##                                                                    redacted
## 1                                                                        No
## 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
```

#Q1:the column 9 "persons_fully_vaccinated"

```
head(vax[,9])
```

```
## [1] 19 NA NA NA NA NA
```

#Q2:second column "zip_code_tabulation_area"

#Q3:2021-01-05

#Q4:2021-01-05

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

Table 1: Data summary

Name	vax
Number of rows	81144
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	46	0
local_health_jurisdiction	0	1	0	15	230	62	0
county	0	1	0	15	230	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	1002	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	21106.05	0	1460.50	15364.00	34877.00	101902.0	
persons_fully_vaccinated	8256	0.90	9456.49	11498.25	11	506.00	4105.00	15859.00	71078.0	
persons_partially_vaccinated	8256	0.90	1900.61	2113.07	11	200.00	1271.00	2893.00	20185.0	
percent_of_population_fully_vaccinated	8256	0.90	0.42	0.27	0	0.19	0.44	0.62	1.0	
percent_of_population_partially_vaccinated	8256	0.90	0.10	0.10	0	0.06	0.07	0.11	1.0	
percent_of_population_with_1_plus_dose	8256	0.90	0.50	0.26	0	0.30	0.53	0.70	1.0	

#Q5:9 numeric columns

#Q6: 8256 missing values

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

```
## [1] 8256
```

#Q7: 10% of value is missing

```
8256/81144
```

```
## [1] 0.101745
```

#Q8: the zip code area has no data to report.

```
library(lubridate)
```

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

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

#Q: how many days since last entry

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

```
## Time difference of 12 days
```

#Q9: 315 days.

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

```
## Time difference of 315 days
```

#Q10: 46 unique dates.

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

```
## [1] 46
```

```
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>
```

```
table(vax$county)
```

```
##
##                      Alameda          Alpine          Amador           Butte
##            230           2254              46             552             828
##       Calaveras          Colusa    Contra Costa       Del Norte       El Dorado
##             828             322            1978             184            1012
##          Fresno           Glenn        Humboldt        Imperial           Inyo
##            2530             276            1610             690             460
##           Kern           Kings            Lake          Lassen     Los Angeles
##            2254             322             644             598           13340
##          Madera          Marin        Mariposa       Mendocino          Merced
##             552            1288             368            1196             874
##          Modoc            Mono       Monterey            Napa         Nevada
##             506             322            1288             460             552
##         Orange          Placer          Plumas       Riverside      Sacramento
##           4048            1334             736            3220            2484
##      San Benito  San Bernardino       San Diego   San Francisco     San Joaquin
```

```
##             184            4094            4922            1242            1472
## San Luis Obispo       San Mateo   Santa Barbara     Santa Clara      Santa Cruz
##            1012            1334            1058            2668             782
##          Shasta          Sierra        Siskiyou          Solano          Sonoma
##            1196             322             966             690            1656
##      Stanislaus          Sutter          Tehama         Trinity          Tulare
##            1104             414             598             598            1518
##        Tuolumne         Ventura            Yolo            Yuba
##             598            1242             782             506
```

subset with base R

```
inds <- vax$county == "San Diego"
head(vax[inds,])
```

```
##    as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 5  2021-01-05                   92155                San Diego San Diego
## 14 2021-01-05                   92147                San Diego San Diego
## 16 2021-01-05                   92124                San Diego San Diego
## 24 2021-01-05                   92145                San Diego San Diego
## 34 2021-01-05                   91935                San Diego San Diego
## 36 2021-01-05                   92102                San Diego San Diego
##    vaccine_equity_metric_quartile               vem_source
## 5                              NA            No VEM Assigned
## 14                             NA            No VEM Assigned
## 16                              3 Healthy Places Index Score
## 24                             NA            No VEM Assigned
## 34                              3 Healthy Places Index Score
## 36                              1 Healthy Places Index Score
##    age12_plus_population age5_plus_population persons_fully_vaccinated
## 5                  456.0                  456                       NA
## 14                 518.0                  518                       NA
## 16               25422.4                29040                       29
## 24                1603.5                 1821                       NA
## 34                7390.0                 8101                       NA
## 36               37042.3                41033                       29
##    persons_partially_vaccinated percent_of_population_fully_vaccinated
## 5                            NA                                     NA
## 14                           NA                                     NA
## 16                          573                                0.000999
## 24                           NA                                     NA
## 34                           NA                                     NA
## 36                         1495                                0.000707
##    percent_of_population_partially_vaccinated
## 5                                          NA
## 14                                         NA
## 16                                   0.019731
## 24                                         NA
## 34                                         NA
## 36                                   0.036434
##    percent_of_population_with_1_plus_dose
## 5                                      NA
## 14                                     NA
```

```
## 16                                0.020730
## 24                                      NA
## 34                                      NA
## 36                                0.037141
##                                                                        redacted
## 5  Information redacted in accordance with CA state privacy requirements
## 14 Information redacted in accordance with CA state privacy requirements
## 16                                                                           No
## 24 Information redacted in accordance with CA state privacy requirements
## 34 Information redacted in accordance with CA state privacy requirements
## 36                                                                           No
```

use **dplyr** and its filter()

```
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")
head(sd)
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 1 2021-01-05                   92155                San Diego San Diego
## 2 2021-01-05                   92147                San Diego San Diego
## 3 2021-01-05                   92124                San Diego San Diego
## 4 2021-01-05                   92145                San Diego San Diego
## 5 2021-01-05                   91935                San Diego San Diego
## 6 2021-01-05                   92102                San Diego San Diego
##   vaccine_equity_metric_quartile               vem_source
## 1                             NA           No VEM Assigned
## 2                             NA           No VEM Assigned
## 3                              3 Healthy Places Index Score
## 4                             NA           No VEM Assigned
## 5                              3 Healthy Places Index Score
## 6                              1 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1                 456.0                  456                       NA
## 2                 518.0                  518                       NA
## 3               25422.4                29040                       29
## 4                1603.5                 1821                       NA
## 5                7390.0                 8101                       NA
## 6               37042.3                41033                       29
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
```

```
## 1                            NA                                    NA
## 2                            NA                                    NA
## 3                           573                                0.000999
## 4                            NA                                    NA
## 5                            NA                                    NA
## 6                          1495                                0.000707
##   percent_of_population_partially_vaccinated
## 1                                         NA
## 2                                         NA
## 3                                   0.019731
## 4                                         NA
## 5                                         NA
## 6                                   0.036434
##   percent_of_population_with_1_plus_dose
## 1                                     NA
## 2                                     NA
## 3                                0.020730
## 4                                     NA
## 5                                     NA
## 6                                0.037141
##                                                                  redacted
## 1 Information redacted in accordance with CA state privacy requirements
## 2 Information redacted in accordance with CA state privacy requirements
## 3                                                                     No
## 4 Information redacted in accordance with CA state privacy requirements
## 5 Information redacted in accordance with CA state privacy requirements
## 6                                                                     No
```

```
nrow(sd)
```

```
## [1] 4922
```

#Q11: 106 distinct zip codes

```
length(unique(sd$age12_plus_population))
```

```
## [1] 106
```

#Q12: it is 92154

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

```
##    as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 23 2021-01-05                   92154                San Diego San Diego
##    vaccine_equity_metric_quartile               vem_source
## 23                              2 Healthy Places Index Score
##    age12_plus_population age5_plus_population persons_fully_vaccinated
## 23               76365.2                82971                       32
##    persons_partially_vaccinated percent_of_population_fully_vaccinated
## 23                         1336                                0.000386
##    percent_of_population_partially_vaccinated
```

```
## 23                                  0.016102
##    percent_of_population_with_1_plus_dose redacted
## 23                              0.016488       No
```

```
filter(sd, zip_code_tabulation_area == "92037")[1,]
```

```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 1 2021-01-05                   92037                San Diego San Diego
##   vaccine_equity_metric_quartile                vem_source
## 1                              4 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               33675.6                36144                       44
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                         1265                                0.001217
##   percent_of_population_partially_vaccinated
## 1                                   0.034999
##   percent_of_population_with_1_plus_dose redacted
## 1                              0.036216       No
```

#Q13: 67.27%

```
sd.now <- filter(sd, as_of_date == "2021-11-09")

mean(sd.now$percent_of_population_fully_vaccinated, na.rm=T)
```

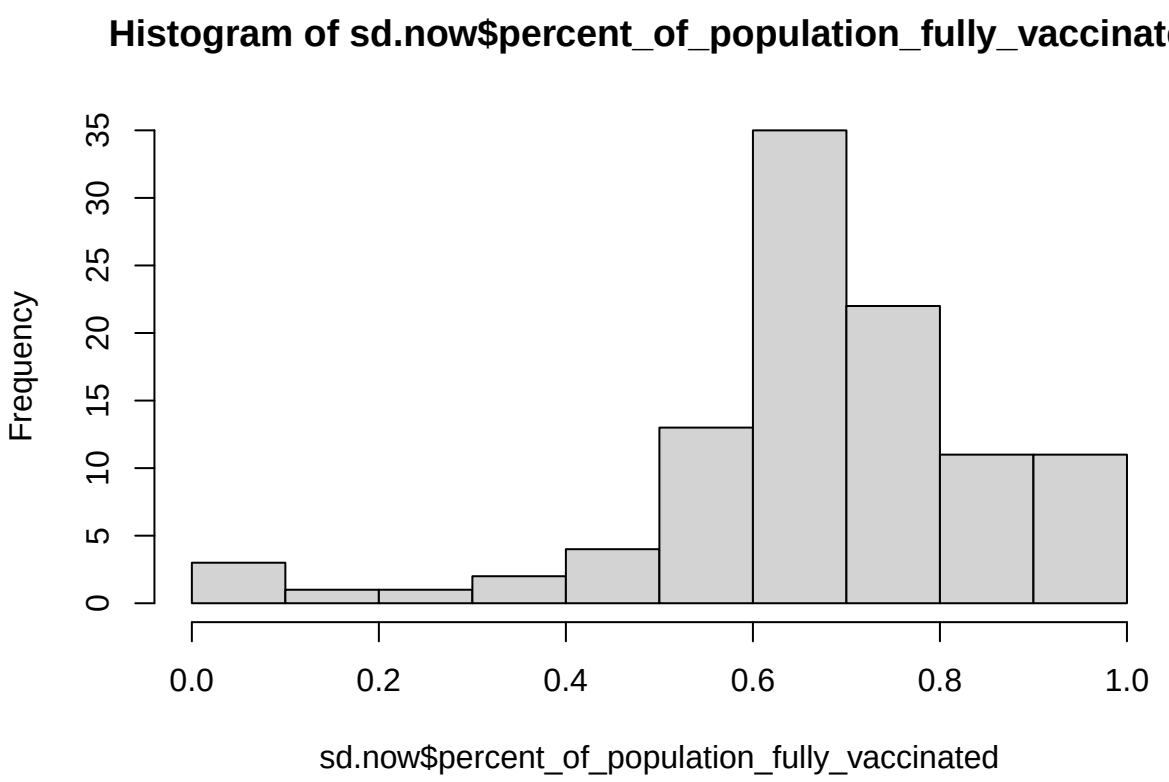
```
## [1] 0.6727567
```

```
summary(sd.now$percent_of_population_fully_vaccinated)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
## 0.01017 0.60776 0.67700 0.67276 0.76164 1.00000       4
```

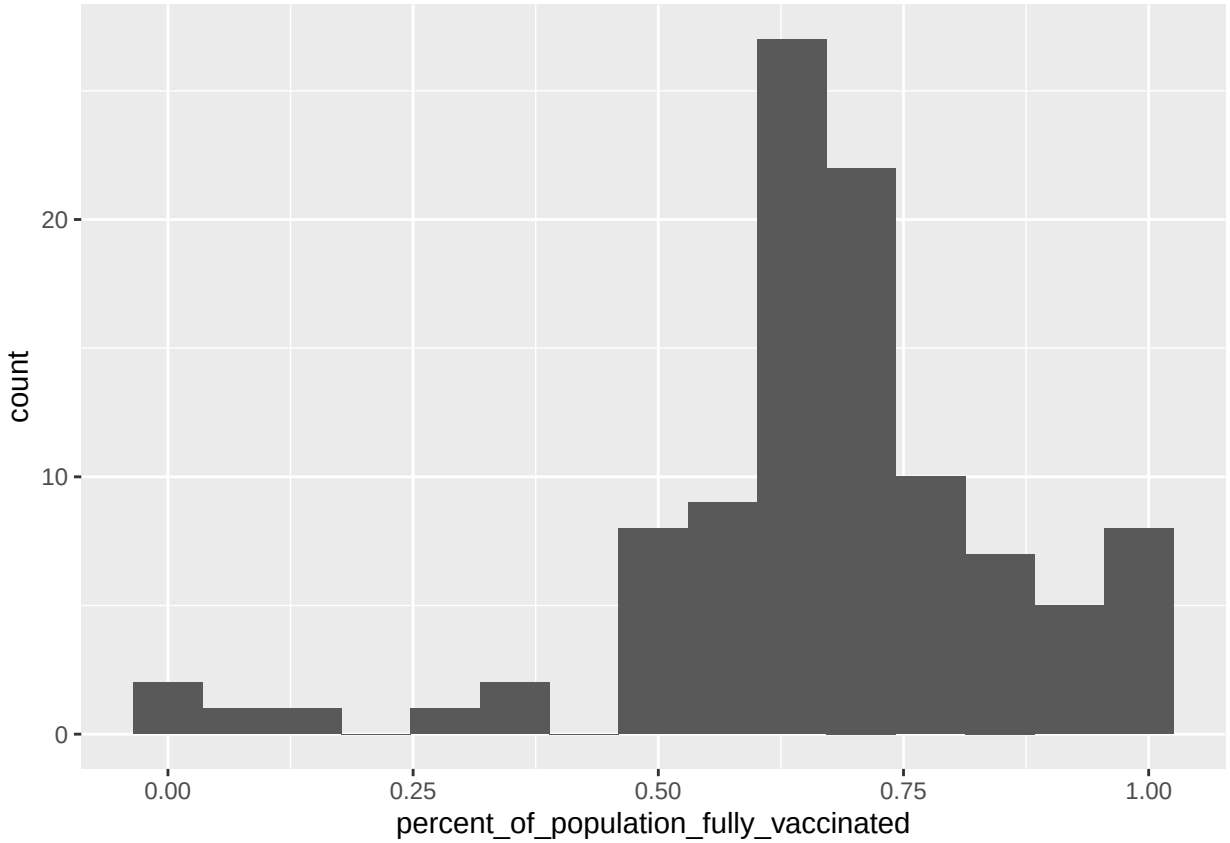
#Q14:

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




```
library(ggplot2)
ggplot(sd.now)+aes(percent_of_population_fully_vaccinated)+geom_histogram(bins=15)
```

```
## Warning: Removed 4 rows containing non-finite values (stat_bin).
```



92037-la jolla/ucsd

```
filter(sd.now, zip_code_tabulation_area == "92037")
```

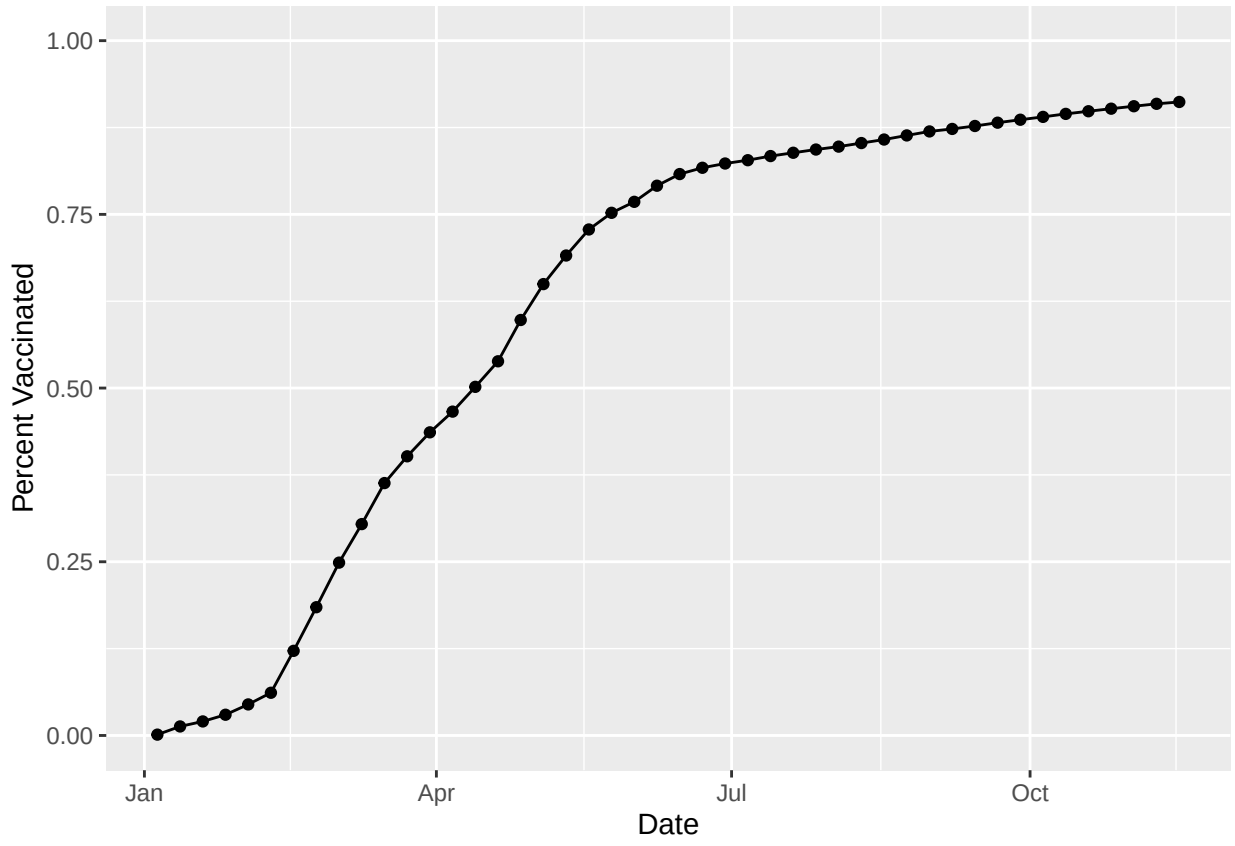
```
##   as_of_date zip_code_tabulation_area local_health_jurisdiction    county
## 1 2021-11-09                   92037                San Diego San Diego
##   vaccine_equity_metric_quartile                vem_source
## 1                              4 Healthy Places Index Score
##   age12_plus_population age5_plus_population persons_fully_vaccinated
## 1               33675.6                36144                    32859
##   persons_partially_vaccinated percent_of_population_fully_vaccinated
## 1                         6354                                0.909114
##   percent_of_population_partially_vaccinated
## 1                                   0.175797
##   percent_of_population_with_1_plus_dose redacted
## 1                                      1       No
```

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

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

#Q15

```
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")
```

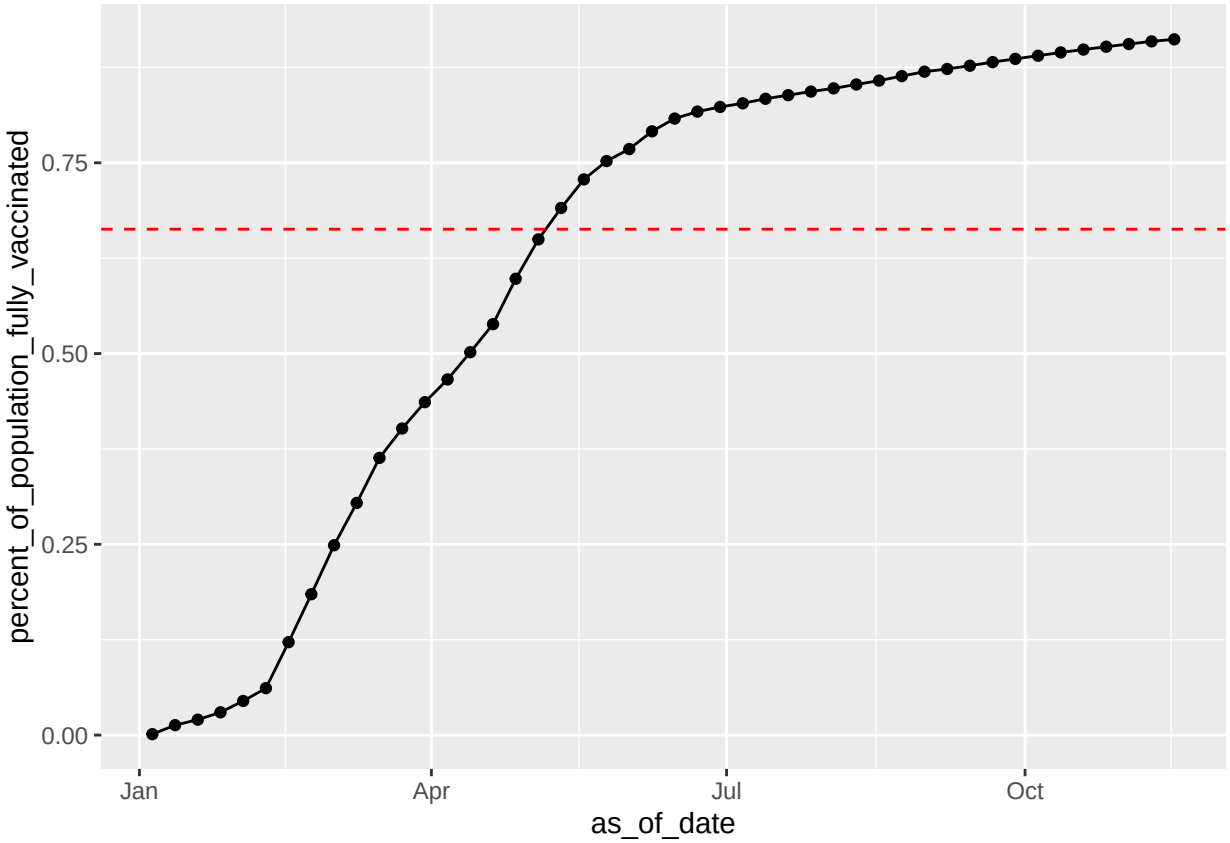



```
vax.36 <- filter(vax, age5_plus_population > 36144 &
                 as_of_date == "2021-11-16")
mean(vax.36$percent_of_population_fully_vaccinated, na.rm=T)
```

```
## [1] 0.6629812
```

#Q16:

```
ggplot(ucsd)+
  aes(as_of_date, percent_of_population_fully_vaccinated)+
  geom_point()+
  geom_line(group=1)+
  geom_hline(yintercept=0.6629812, col="red", linetype=2)
```



#Q17:

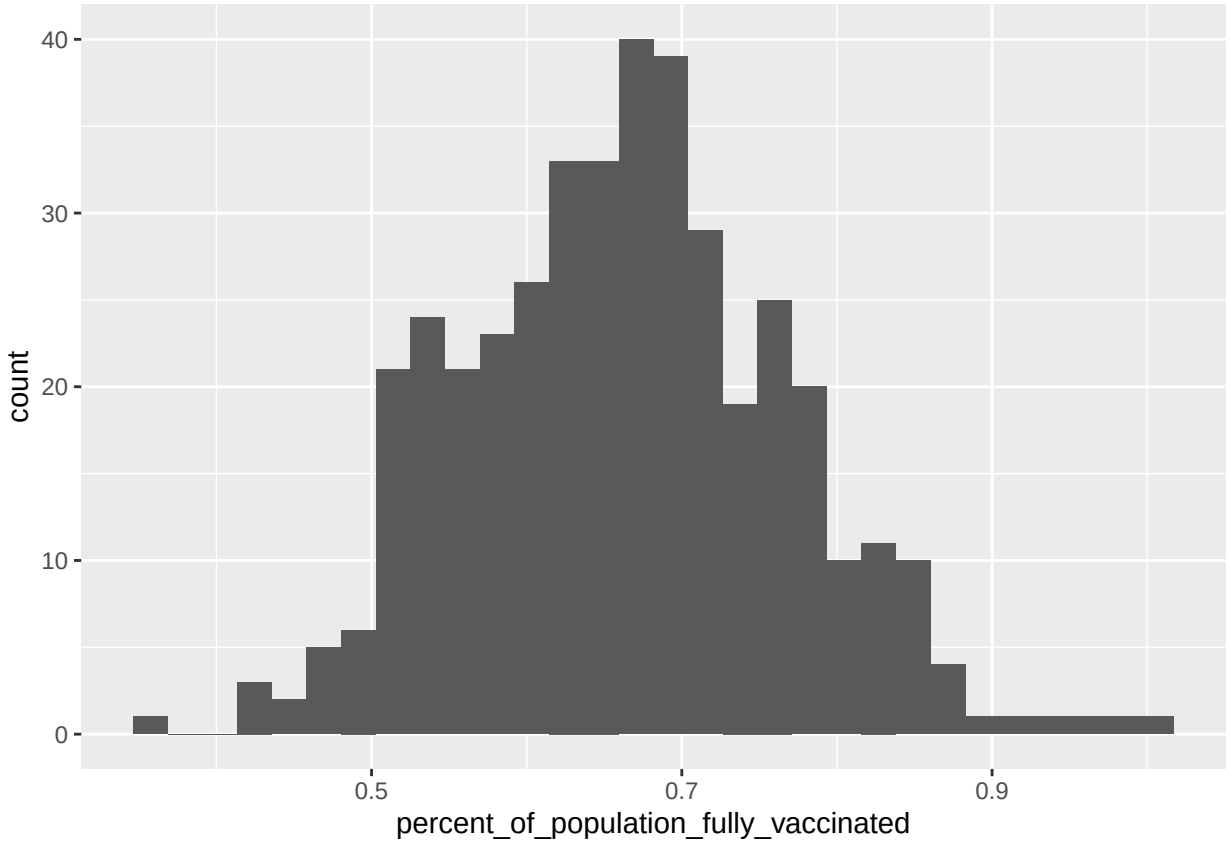
```
summary(vax.36$percent_of_population_fully_vaccinated)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.3519  0.5891  0.6649  0.6630  0.7286  1.0000
```

#Q18:

```
ggplot(vax.36)+
  aes(percent_of_population_fully_vaccinated)+
  geom_histogram()
```

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



#Q19: 92040 is below the averageof vax.36, but the 92109 is above the average of vax.36.

```
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                               0.520463
```

```
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                               0.687763
```

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

```
## [1] 18906
```

```
length(unique(vax.36.all$zip_code_tabulation_area))
```

```
## [1] 411
```

#Q20:

```
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 accross California",subtitle="Only areas
  geom_hline(yintercept= 0.66,col="red", linetype=2)
```

```
## Warning: Removed 180 row(s) containing missing values (geom_path).
```