Manuscript for a Data Analysis Project

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2/9/23

The structure below is one possible setup for a data analysis project (including the course project). For a manuscript, adjust as needed. You don’t need to have exactly these sections, but the content covering those sections should be addressed.

This uses MS Word as output format. [See here](https://quarto.org/docs/output-formats/ms-word.html) for more information. You can switch to other formats, like html or pdf. See [the Quarto documentation](https://quarto.org/) for other formats.

Warning: package 'here' was built under R version 4.2.2

Warning: package 'knitr' was built under R version 4.2.2

Warning: package 'tidyverse' was built under R version 4.2.2

Warning: package 'ggplot2' was built under R version 4.2.2

Warning: package 'stringr' was built under R version 4.2.2

## 0.1 Importing and viewing data

## Loading the full-raw data set...  
Raw\_USVac <- read\_csv(here("data", "raw\_data" , "COVID-19\_Vaccinations\_in\_the\_United\_States\_Jurisdiction.csv"))

Rows: 37528 Columns: 109  
── Column specification ────────────────────────────────────────────────────────  
Delimiter: ","  
chr (2): Date, Location  
dbl (23): MMWR\_week, Administered\_Dose1\_Pop\_Pct, Administered\_Dose1\_Recip\_5P...  
  
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.

# Check data  
str(Raw\_USVac)

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 $ Administered\_18Plus : num [1:37528] 6.01e+08 1.12e+07 2.46e+07 6.39e+06 4.19e+06 ...  
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 .. )  
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summary(Raw\_USVac)

Date MMWR\_week Location Distributed   
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 Class :character 1st Qu.:11.00 Class :character 1st Qu.: 954505   
 Mode :character Median :21.00 Mode :character Median : 3748198   
 Mean :23.73 Mean : 15047660   
 3rd Qu.:37.00 3rd Qu.: 9844140   
 Max. :53.00 Max. :953826425   
   
 Distributed\_Janssen Distributed\_Moderna Distributed\_Pfizer   
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 21875 1st Qu.: 215100 1st Qu.: 215479   
 Median : 170200 Median : 1452340 Median : 1974570   
 Mean : 681609 Mean : 5682231 Mean : 8477837   
 3rd Qu.: 453600 3rd Qu.: 3899490 3rd Qu.: 5392396   
 Max. :32496900 Max. :346671620 Max. :574615505   
   
 Distributed\_Novavax Distributed\_Unk\_Manuf Dist\_Per\_100K   
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 2500 1st Qu.: 0 1st Qu.: 75415   
 Median : 7400 Median : 0 Median :134822   
 Mean : 26473 Mean : 2135 Mean :129839   
 3rd Qu.: 20000 3rd Qu.: 0 3rd Qu.:191434   
 Max. :1071000 Max. :8282150 Max. :398262   
 NA's :35800   
 Distributed\_Per\_100k\_5Plus Distributed\_Per\_100k\_12Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 0 1st Qu.: 0   
 Median : 0 Median :155810   
 Mean : 90236 Mean :138378   
 3rd Qu.:204922 3rd Qu.:225862   
 Max. :417703 Max. :451059   
 NA's :448   
 Distributed\_Per\_100k\_18Plus Distributed\_Per\_100k\_65Plus Administered   
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 86515 1st Qu.: 397897 1st Qu.: 721516   
 Median :172049 Median : 797982 Median : 2906114   
 Mean :164604 Mean : 819607 Mean : 11769479   
 3rd Qu.:249074 3rd Qu.:1156742 3rd Qu.: 7749338   
 Max. :487292 Max. :5808810 Max. :668814259   
   
 Administered\_5Plus Administered\_12Plus Administered\_18Plus  
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 0 1st Qu.: 0 1st Qu.: 548382   
 Median : 0 Median : 2115232 Median : 2634802   
 Mean : 7705232 Mean : 10705808 Mean : 10795703   
 3rd Qu.: 4477376 3rd Qu.: 7203311 3rd Qu.: 7129840   
 Max. :664929916 Max. :641488452 Max. :601312279   
 NA's :448   
 Administered\_65Plus Administered\_Janssen Administered\_Moderna  
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 46298 1st Qu.: 11951 1st Qu.: 314026   
 Median : 797464 Median : 89529 Median : 1193506   
 Mean : 3114070 Mean : 396225 Mean : 4575183   
 3rd Qu.: 2228530 3rd Qu.: 258200 3rd Qu.: 3011256   
 Max. :181667783 Max. :18963745 Max. :250310595   
   
 Administered\_Pfizer Administered\_Novavax Administered\_Unk\_Manuf  
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 382134 1st Qu.: 63 1st Qu.: 57   
 Median : 1593670 Median : 285 Median : 672   
 Mean : 6786634 Mean : 1348 Mean : 11375   
 3rd Qu.: 4533555 3rd Qu.: 936 3rd Qu.: 3511   
 Max. :398659220 Max. :75156 Max. :805543   
 NA's :35807 NA's :3   
 Admin\_Per\_100K Admin\_Per\_100k\_5Plus Admin\_Per\_100k\_12Plus  
 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 55107 1st Qu.: 0 1st Qu.: 0   
 Median :110572 Median : 0 Median :129002   
 Mean :103851 Mean : 71769 Mean :109102   
 3rd Qu.:150457 3rd Qu.:160038 3rd Qu.:173107   
 Max. :295259 Max. :311292 Max. :323927   
 NA's :448   
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 Min. : 0 Min. : 0 Min. : 0   
 1st Qu.: 63261 1st Qu.: 97811 1st Qu.: 541601   
 Median :133695 Median :174209 Median : 2809872   
 Mean :121797 Mean :161175 Mean : 11656373   
 3rd Qu.:178481 3rd Qu.:242000 3rd Qu.: 7556954   
 Max. :326172 Max. :446529 Max. :668814259   
   
 Administered\_Dose1\_Recip Administered\_Dose1\_Pop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 318966 1st Qu.: 33.20   
 Median : 1464456 Median : 58.45   
 Mean : 5781601 Mean : 50.99   
 3rd Qu.: 3850833 3rd Qu.: 71.72   
 Max. :268927705 Max. :100.00   
   
 Administered\_Dose1\_Recip\_5Plus Administered\_Dose1\_Recip\_5PlusPop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 0 1st Qu.: 0.00   
 Median : 0 Median : 0.00   
 Mean : 3538338 Mean :32.57   
 3rd Qu.: 2112440 3rd Qu.:73.90   
 Max. :266943958 Max. :99.90   
 NA's :448 NA's :448   
 Administered\_Dose1\_Recip\_12Plus Administered\_Dose1\_Recip\_12PlusPop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 0 1st Qu.: 0.00   
 Median : 1056025 Median :68.00   
 Mean : 5195847 Mean :52.01   
 3rd Qu.: 3511201 3rd Qu.:82.20   
 Max. :255559863 Max. :99.90   
   
 Administered\_Dose1\_Recip\_18Plus Administered\_Dose1\_Recip\_18PlusPop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 304564 1st Qu.:39.10   
 Median : 1402773 Median :70.50   
 Mean : 5320772 Mean :58.89   
 3rd Qu.: 3588642 3rd Qu.:84.00   
 Max. :237385153 Max. :99.90   
   
 Administered\_Dose1\_Recip\_65Plus Administered\_Dose1\_Recip\_65PlusPop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 18486 1st Qu.: 57.60   
 Median : 377567 Median : 89.60   
 Mean : 1407402 Mean : 69.19   
 3rd Qu.: 994024 3rd Qu.: 95.00   
 Max. :58687210 Max. :109.00   
   
 Series\_Complete\_Yes Series\_Complete\_Pop\_Pct Series\_Complete\_5Plus  
 Min. : 0 Min. : 0.00 Min. : 0   
 1st Qu.: 132812 1st Qu.:22.48 1st Qu.: 0   
 Median : 1113276 Median :50.40 Median : 0   
 Mean : 4786184 Mean :42.60 Mean : 3010912   
 3rd Qu.: 3209233 3rd Qu.:61.70 3rd Qu.: 1774908   
 Max. :229619755 Max. :90.20 Max. :228601233   
 NA's :448   
 Series\_Complete\_5PlusPop\_Pct Series\_Complete\_12Plus  
 Min. : 0.00 Min. : 0   
 1st Qu.: 0.00 1st Qu.: 0   
 Median : 0.00 Median : 883492   
 Mean :28.13 Mean : 4431721   
 3rd Qu.:63.40 3rd Qu.: 3042282   
 Max. :95.00 Max. :219249483   
 NA's :448   
 Series\_Complete\_12PlusPop\_Pct Series\_Complete\_18Plus  
 Min. : 0.0 Min. : 0   
 1st Qu.: 0.0 1st Qu.: 123207   
 Median : 58.8 Median : 1056472   
 Mean : 45.3 Mean : 4422065   
 3rd Qu.: 70.9 3rd Qu.: 3035077   
 Max. :100.0 Max. :203679913   
   
 Series\_Complete\_18PlusPop\_Pct Series\_Complete\_65Plus  
 Min. : 0.00 Min. : 0   
 1st Qu.:24.60 1st Qu.: 16448   
 Median :61.40 Median : 314940   
 Mean :50.07 Mean : 1207585   
 3rd Qu.:72.70 3rd Qu.: 892385   
 Max. :99.90 Max. :51594617   
   
 Series\_Complete\_65PlusPop\_Pct Series\_Complete\_Janssen Series\_Complete\_Moderna  
 Min. : 0.00 Min. : 0 Min. : 0   
 1st Qu.:36.80 1st Qu.: 10598 1st Qu.: 49997   
 Median :80.80 Median : 83665 Median : 437611   
 Mean :62.66 Mean : 373172 Mean : 1756205   
 3rd Qu.:88.10 3rd Qu.: 241548 3rd Qu.: 1240472   
 Max. :99.90 Max. :17157260 Max. :79661736   
   
 Series\_Complete\_Pfizer Series\_Complete\_Novavax Series\_Complete\_Unk\_Manuf  
 Min. : 0 Min. : 0.0 Min. : 0   
 1st Qu.: 68455 1st Qu.: 15.0 1st Qu.: 3   
 Median : 599746 Median : 84.5 Median : 200   
 Mean : 2653495 Mean : 405.1 Mean : 3022   
 3rd Qu.: 1786745 3rd Qu.: 273.5 3rd Qu.: 978   
 Max. :132188786 Max. :22614.0 Max. :227587   
 NA's :35808 NA's :4   
 Series\_Complete\_Janssen\_5Plus Series\_Complete\_Moderna\_5Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 53794 1st Qu.: 238686   
 Median : 164058 Median : 876620   
 Mean : 525060 Mean : 2385237   
 3rd Qu.: 323471 3rd Qu.: 1534229   
 Max. :17154084 Max. :79117599   
 NA's :21016 NA's :21016   
 Series\_Complete\_Pfizer\_5Plus Series\_Complete\_Unk\_Manuf\_5Plus  
 Min. : 0 Min. : 0.0   
 1st Qu.: 373941 1st Qu.: 115.0   
 Median : 1236216 Median : 583.5   
 Mean : 3846362 Mean : 4723.4   
 3rd Qu.: 2507710 3rd Qu.: 2091.0   
 Max. :132080967 Max. :226116.0   
 NA's :21016 NA's :21020   
 Series\_Complete\_Janssen\_12Plus Series\_Complete\_Moderna\_12Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 0 1st Qu.: 0   
 Median : 61984 Median : 347958   
 Mean : 353865 Mean : 1642234   
 3rd Qu.: 234719 3rd Qu.: 1172247   
 Max. :17151988 Max. :79055913   
   
 Series\_Complete\_Pfizer\_12Plus Series\_Complete\_Unk\_Manuf\_12Plus  
 Min. : 0 Min. : 0.0   
 1st Qu.: 0 1st Qu.: 0.0   
 Median : 480778 Median : 118.0   
 Mean : 2432749 Mean : 2855.2   
 3rd Qu.: 1672183 3rd Qu.: 865.2   
 Max. :122803146 Max. :216569.0   
 NA's :4   
 Series\_Complete\_Janssen\_18Plus Series\_Complete\_Moderna\_18Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 10580 1st Qu.: 49997   
 Median : 83472 Median : 436864   
 Mean : 371998 Mean : 1751449   
 3rd Qu.: 241175 3rd Qu.: 1239355   
 Max. :17123948 Max. :78948565   
   
 Series\_Complete\_Pfizer\_18Plus Series\_Complete\_Unk\_Manuf\_18Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 65828 1st Qu.: 3   
 Median : 546864 Median : 186   
 Mean : 2295693 Mean : 2900   
 3rd Qu.: 1615915 3rd Qu.: 906   
 Max. :107386494 Max. :200109   
 NA's :4   
 Series\_Complete\_Janssen\_65Plus Series\_Complete\_Moderna\_65Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 623 1st Qu.: 6717   
 Median : 13607 Median : 148160   
 Mean : 55994 Mean : 577529   
 3rd Qu.: 37210 3rd Qu.: 426559   
 Max. :2371698 Max. :26213750   
   
 Series\_Complete\_Pfizer\_65Plus Series\_Complete\_Unk\_Manuf\_65Plus  
 Min. : 0 Min. : 0   
 1st Qu.: 9075 1st Qu.: 0   
 Median : 149080 Median : 69   
 Mean : 574138 Mean : 1517   
 3rd Qu.: 436096 3rd Qu.: 415   
 Max. :27935710 Max. :2349816   
 NA's :9   
 Additional\_Doses Additional\_Doses\_Vax\_Pct Additional\_Doses\_5Plus  
 Min. : 0 Min. : 0.00 Min. : 10232   
 1st Qu.: 17984 1st Qu.: 0.00 1st Qu.: 339986   
 Median : 457790 Median : 0.00 Median : 1007566   
 Mean : 2124313 Mean :17.07 Mean : 3518827   
 3rd Qu.: 1466001 3rd Qu.:38.80 3rd Qu.: 2386778   
 Max. :116950366 Max. :67.30 Max. :116907849   
 NA's :16348 NA's :325 NA's :35544   
 Additional\_Doses\_5Plus\_Vax\_Pct Additional\_Doses\_12Plus  
 Min. :24.0 Min. : 1411   
 1st Qu.:43.7 1st Qu.: 291734   
 Median :48.8 Median : 906835   
 Mean :48.9 Mean : 3147633   
 3rd Qu.:55.4 3rd Qu.: 2145654   
 Max. :67.4 Max. :114765825   
 NA's :35544 NA's :26456   
 Additional\_Doses\_12Plus\_Vax\_Pct Additional\_Doses\_18Plus  
 Min. : 0.00 Min. : 0   
 1st Qu.:40.20 1st Qu.: 0   
 Median :46.20 Median : 0   
 Mean :45.82 Mean : 1168818   
 3rd Qu.:53.30 3rd Qu.: 589267   
 Max. :70.60 Max. :109671906   
 NA's :26456 NA's :325   
 Additional\_Doses\_18Plus\_Vax\_Pct Additional\_Doses\_50Plus  
 Min. : 0.0 Min. : 0   
 1st Qu.: 0.0 1st Qu.: 0   
 Median : 0.0 Median : 0   
 Mean :18.4 Mean : 764058   
 3rd Qu.:41.6 3rd Qu.: 414961   
 Max. :72.3 Max. :68673483   
 NA's :325 NA's :325   
 Additional\_Doses\_50Plus\_Vax\_Pct Additional\_Doses\_65Plus  
 Min. : 0.00 Min. : 0   
 1st Qu.: 0.00 1st Qu.: 0   
 Median : 0.00 Median : 0   
 Mean :23.17 Mean : 437806   
 3rd Qu.:53.50 3rd Qu.: 250393   
 Max. :81.10 Max. :37905004   
 NA's :325   
 Additional\_Doses\_65Plus\_Vax\_Pct Additional\_Doses\_Moderna  
 Min. : 0.00 Min. : 0   
 1st Qu.: 0.00 1st Qu.: 0   
 Median : 0.00 Median : 0   
 Mean :27.19 Mean : 516069   
 3rd Qu.:62.90 3rd Qu.: 258928   
 Max. :87.90 Max. :48457827   
 NA's :325 NA's :325   
 Additional\_Doses\_Pfizer Additional\_Doses\_Janssen Additional\_Doses\_Unk\_Manuf  
 Min. : 0 Min. : 0 Min. : 0.0   
 1st Qu.: 0 1st Qu.: 0 1st Qu.: 0.0   
 Median : 0 Median : 0 Median : 0.0   
 Mean : 673634 Mean : 17564 Mean : 376.1   
 3rd Qu.: 334857 3rd Qu.: 7936 3rd Qu.: 64.0   
 Max. :66859891 Max. :1559350 Max. :67309.0   
 NA's :325 NA's :327 NA's :331   
 Second\_Booster Second\_Booster\_50Plus Second\_Booster\_50Plus\_Vax\_Pct  
 Min. : 6065193 Min. : 0 Min. : 0.00   
 1st Qu.:11361385 1st Qu.: 43554 1st Qu.:14.30   
 Median :15358240 Median : 131544 Median :21.30   
 Mean :19131361 Mean : 534398 Mean :24.04   
 3rd Qu.:23144127 3rd Qu.: 357797 3rd Qu.:31.50   
 Max. :46743769 Max. :35538213 Max. :66.30   
 NA's :37440 NA's :31896 NA's :31896   
 Second\_Booster\_65Plus Second\_Booster\_65Plus\_Vax\_Pct Second\_Booster\_Janssen  
 Min. : 0 Min. : 0.00 Min. : 0.0   
 1st Qu.: 31317 1st Qu.:18.60 1st Qu.: 44.0   
 Median : 94215 Median :27.20 Median : 115.0   
 Mean : 362817 Mean :29.65 Mean : 521.8   
 3rd Qu.: 251503 3rd Qu.:38.60 3rd Qu.: 305.5   
 Max. :22418331 Max. :74.40 Max. :22839.0   
 NA's :31896 NA's :31896 NA's :31905   
 Second\_Booster\_Moderna Second\_Booster\_Pfizer Second\_Booster\_Unk\_Manuf  
 Min. : 1 Min. : 4 Min. : 0.0   
 1st Qu.: 21048 1st Qu.: 24659 1st Qu.: 3.0   
 Median : 63184 Median : 75610 Median : 25.0   
 Mean : 274605 Mean : 326352 Mean : 452.7   
 3rd Qu.: 173262 3rd Qu.: 204656 3rd Qu.: 165.0   
 Max. :19426517 Max. :27259966 Max. :29151.0   
 NA's :31896 NA's :31896 NA's :31907   
 Administered\_Bivalent Admin\_Bivalent\_PFR Admin\_Bivalent\_MOD Dist\_Bivalent\_PFR   
 Min. : 1542847 Min. : 2684374 Min. : 1668599 Min. :21531300   
 1st Qu.:18207022 1st Qu.:13466327 1st Qu.: 7649078 1st Qu.:43528490   
 Median :36587686 Median :24193929 Median :13584644 Median :59402350   
 Mean :31690100 Mean :21255341 Mean :12021457 Mean :54510907   
 3rd Qu.:46263325 3rd Qu.:29749058 3rd Qu.:16884984 3rd Qu.:67478530   
 Max. :51769310 Max. :33027605 Max. :18741705 Max. :75502210   
 NA's :37508 NA's :37509 NA's :37509 NA's :37509   
 Dist\_Bivalent\_MOD Bivalent\_Booster\_5Plus Bivalent\_Booster\_5Plus\_Pop\_Pct  
 Min. : 5864600 Min. : 0 Min. : 0.00   
 1st Qu.:19564500 1st Qu.: 126374 1st Qu.: 6.70   
 Median :28462850 Median : 311924 Median :10.70   
 Mean :25353139 Mean : 1242281 Mean :11.49   
 3rd Qu.:32583650 3rd Qu.: 900581 3rd Qu.:15.90   
 Max. :36181900 Max. :51400164 Max. :32.90   
 NA's :37509 NA's :36568 NA's :36568   
 Bivalent\_Booster\_12Plus Bivalent\_Booster\_12Plus\_Pop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 115268 1st Qu.: 6.60   
 Median : 296055 Median :11.20   
 Mean : 1174901 Mean :11.97   
 3rd Qu.: 838479 3rd Qu.:16.80   
 Max. :50290384 Max. :34.50   
 NA's :36504 NA's :36504   
 Bivalent\_Booster\_18Plus Bivalent\_Booster\_18Plus\_Pop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 112205 1st Qu.: 7.10   
 Median : 288125 Median :11.90   
 Mean : 1138800 Mean :12.72   
 3rd Qu.: 814286 3rd Qu.:17.80   
 Max. :48571899 Max. :35.60   
 NA's :36504 NA's :36504   
 Bivalent\_Booster\_65Plus Bivalent\_Booster\_65Plus\_Pop\_Pct  
 Min. : 0 Min. : 0.00   
 1st Qu.: 49083 1st Qu.:16.70   
 Median : 153110 Median :28.50   
 Mean : 535052 Mean :27.94   
 3rd Qu.: 405194 3rd Qu.:39.50   
 Max. :21987172 Max. :65.80   
 NA's :36504 NA's :36504

# 1. Summary/Abstract

*Write a summary of your project.*

# 2. Introduction

## 2.1 General Background Information

*Provide enough background on your topic that others can understand the why and how of your analysis*

## 2.2 Description of data and data source

This dataset contains US COVID-19 vaccine deliveries and administration data at national and jurisdiction level from all vaccine partners, including jurisdictional partner clinics, retail pharmacies, long-term care facilities, dialysis centers, Federal Emergency Management Agency and Health Resources and Services Administration partner sites, and federal entity facilities. It was obtained from https://data.cdc.gov/Vaccinations/COVID-19-Vaccinations-in-the-United-States-Jurisdi/unsk-b7fc. It has 109 columns and 37,500 rows of administration, distribution, and series data of COVID-19 vaccinations across the US.

## 2.3 Questions/Hypotheses to be addressed

Question: What/Which COVID-19 vaccine was most popular in each region of the United States? Hypotheses: H0 - There is not a difference in COVID-19 vaccine (across manufacturers) popularity across all the regions in the United States. HA - There is differences in COVID-19 vaccine (manufacturer) popularity across the regions in the United States.

To cite other work (important everywhere, but likely happens first in introduction), make sure your references are in the bibtex file specified in the YAML header above (here dataanalysis\_template\_references.bib) and have the right bibtex key. Then you can include like this:

Examples of reproducible research projects can for instance be found in (McKay, Ebell, Billings, et al., 2020; McKay, Ebell, Dale, Shen, & Handel, 2020)

# 3. Methods

*Describe your methods. That should describe the data, the cleaning processes, and the analysis approaches. You might want to provide a shorter description here and all the details in the supplement.*

## 3.1 Data aquisition

*As applicable, explain where and how you got the data. If you directly import the data from an online source, you can combine this section with the next.*

## 3.2 Data import and cleaning

*Write code that reads in the file and cleans it so it’s ready for analysis. Since this will be fairly long code for most datasets, it might be a good idea to have it in one or several R scripts. If that is the case, explain here briefly what kind of cleaning/processing you do, and provide more details and well documented code somewhere (e.g. as supplement in a paper). All materials, including files that contain code, should be commented well so everyone can follow along.*

## 3.3 Statistical analysis

After placing each state in a region of the US, we will conduct a time series analysis to determine the change in popularity over time. Further, we intended to plot overall administration of manufacturer-specific vaccines in each region to determine popularity after adjusting for distribution and time.

# 4. Results

## 4.1 Exploratory/Descriptive analysis

*Use a combination of text/tables/figures to explore and describe your data. Show the most important descriptive results here. Additional ones should go in the supplement. Even more can be in the R and Quarto files that are part of your project.*

**?@tbl-summarytable** shows a summary of the data.

Note the loading of the data providing a **relative** path using the ../../ notation. (Two dots means a folder up). You never want to specify an **absolute** path like C:\ahandel\myproject\results\ because if you share this with someone, it won’t work for them since they don’t have that path. You can also use the here R package to create paths. See examples of that below.

## 4.2 Basic statistical analysis

*To get some further insight into your data, if reasonable you could compute simple statistics (e.g. simple models with 1 predictor) to look for associations between your outcome(s) and each individual predictor variable. Though note that unless you pre-specified the outcome and main exposure, any “p<0.05 means statistical significance” interpretation is not valid.*

**?@fig-result** shows a scatterplot figure produced by one of the R scripts.

## 4.3 Full analysis

*Use one or several suitable statistical/machine learning methods to analyze your data and to produce meaningful figures, tables, etc. This might again be code that is best placed in one or several separate R scripts that need to be well documented. You want the code to produce figures and data ready for display as tables, and save those. Then you load them here.*

Example **?@tbl-resulttable2** shows a summary of a linear model fit.

# 5. Discussion

## 5.1 Summary and Interpretation

*Summarize what you did, what you found and what it means.*

## 5.2 Strengths and Limitations

*Discuss what you perceive as strengths and limitations of your analysis.*

## 5.3 Conclusions

*What are the main take-home messages?*

*Include citations in your Rmd file using bibtex, the list of references will automatically be placed at the end*

This paper (Leek & Peng, 2015) discusses types of analyses.

These papers (McKay, Ebell, Billings, et al., 2020; McKay, Ebell, Dale, et al., 2020) are good examples of papers published using a fully reproducible setup similar to the one shown in this template.

Note that this cited reference will show up at the end of the document, the reference formatting is determined by the CSL file specified in the YAML header. Many more style files for almost any journal [are available](https://www.zotero.org/styles). You also specify the location of your bibtex reference file in the YAML. You can call your reference file anything you like, I just used the generic word references.bib but giving it a more descriptive name is probably better.

# 6. References

Leek, J. T., & Peng, R. D. (2015). Statistics. What is the question? *Science (New York, N.Y.)*, *347*(6228), 1314–1315. <https://doi.org/10.1126/science.aaa6146>

McKay, B., Ebell, M., Billings, W. Z., Dale, A. P., Shen, Y., & Handel, A. (2020). Associations Between Relative Viral Load at Diagnosis and Influenza A Symptoms and Recovery. *Open Forum Infectious Diseases*, *7*(11), ofaa494. <https://doi.org/10.1093/ofid/ofaa494>

McKay, B., Ebell, M., Dale, A. P., Shen, Y., & Handel, A. (2020). Virulence-mediated infectiousness and activity trade-offs and their impact on transmission potential of influenza patients. *Proceedings. Biological Sciences*, *287*(1927), 20200496. <https://doi.org/10.1098/rspb.2020.0496>