A Descriptive Analysis of County-level Confirmed COVID-19 Cases in U.S.

NYU A3SR

```
if(!requireNamespace("dplyr"))
  install.packages("dplyr", repos = "https://cloud.r-project.org")
if(!requireNamespace("data.table"))
  install.packages("data.table", repos = "https://cloud.r-project.org")
if(!requireNamespace("here"))
  install.packages("here", repos = "https://cloud.r-project.org")
if(!requireNamespace("ggplot2"))
  install.packages("ggplot2", repos = "https://cloud.r-project.org")
require(data.table)
require(dplyr)
library(here)
require(ggplot2)
```

Introduction

This descriptive analysis illustrates how county-level confirmed COVID-19 cases were developed in the United States, starting from January, 2020. The data we used in this study come from USA FACTS. The data files are updated on a daily basis and are stored in time stamp formats. We applied multiple statistical tools to analyze and visualize the outbreak development.

Creating Data Files

Through data processing, we created two data files for the analysis:

1. Daily nation-wide total confirmed cases
2. Most recent confirmed cases by county (as of 03-28-2020)

Descriptive Analysis

Data Structure

Data are ordered in time series. Starting from Jan. 22, 2020 (1/22/2020), county-level confirmed cases were recorded daily. Each value time stamp variables is cumulative. For example, the value of confirmed cases in Queens, NY on Mar. 28, 2020 is calculated by adding cumulative confirmed cases on Mar. 27, 2020 with new cases confirmed on Mar. 28. Therefore, to get daily new cases, we can simply subtract the value on a particular day with the value in the previous day.

Overview Top 5 rows of raw data

```
head(dat, 5)
```

```
##    countyFIPS           County Name State stateFIPS 1/22/2020 1/23/2020
## 1:          0 Statewide Unallocated    AL         1         0         0
## 2:       1001        Autauga County    AL         1         0         0
## 3:       1003        Baldwin County    AL         1         0         0
## 4:       1005        Barbour County    AL         1         0         0
## 5:       1007           Bibb County    AL         1         0         0
##    1/24/2020 1/25/2020 1/26/2020 1/27/2020 1/28/2020 1/29/2020 1/30/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    1/31/2020 2/1/2020 2/2/2020 2/3/2020 2/4/2020 2/5/2020 2/6/2020 2/7/2020
## 1:         0        0        0        0        0        0        0        0
## 2:         0        0        0        0        0        0        0        0
## 3:         0        0        0        0        0        0        0        0
## 4:         0        0        0        0        0        0        0        0
## 5:         0        0        0        0        0        0        0        0
##    2/8/2020 2/9/2020 2/10/2020 2/11/2020 2/12/2020 2/13/2020 2/14/2020
## 1:        0        0         0         0         0         0         0
## 2:        0        0         0         0         0         0         0
## 3:        0        0         0         0         0         0         0
## 4:        0        0         0         0         0         0         0
## 5:        0        0         0         0         0         0         0
##    2/15/2020 2/16/2020 2/17/2020 2/18/2020 2/19/2020 2/20/2020 2/21/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    2/22/2020 2/23/2020 2/24/2020 2/25/2020 2/26/2020 2/27/2020 2/28/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    2/29/2020 3/1/2020 3/2/2020 3/3/2020 3/4/2020 3/5/2020 3/6/2020 3/7/2020
## 1:         0        0        0        0        0        0        0        0
## 2:         0        0        0        0        0        0        0        0
## 3:         0        0        0        0        0        0        0        0
## 4:         0        0        0        0        0        0        0        0
## 5:         0        0        0        0        0        0        0        0
##    3/8/2020 3/9/2020 3/10/2020 3/11/2020 3/12/2020 3/13/2020 3/14/2020
## 1:        0        0         0         0         0         0         0
## 2:        0        0         0         0         0         0         0
## 3:        0        0         0         0         0         0         1
## 4:        0        0         0         0         0         0         0
## 5:        0        0         0         0         0         0         0
##    3/15/2020 3/16/2020 3/17/2020 3/18/2020 3/19/2020 3/20/2020 3/21/2020
## 1:         0         0         0         0         0         0         0
```

```
## 2:         0         0         0         0         0         0         0
## 3:         1         1         1         1         1         2         2
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    3/22/2020 3/23/2020 3/24/2020 3/25/2020 3/26/2020 3/27/2020 3/28/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         1         4         6         6         6
## 3:         3         3         4         4         5         5        10
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
```

Bottom 5 rows of raw data

```
tail(dat, 5)
```

```
##    countyFIPS       County Name State stateFIPS 1/22/2020 1/23/2020 1/24/2020
## 1:      56037 Sweetwater County    WY        56         0         0         0
## 2:      56039      Teton County    WY        56         0         0         0
## 3:      56041      Uinta County    WY        56         0         0         0
## 4:      56043   Washakie County    WY        56         0         0         0
## 5:      56045     Weston County    WY        56         0         0         0
##    1/25/2020 1/26/2020 1/27/2020 1/28/2020 1/29/2020 1/30/2020 1/31/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    2/1/2020 2/2/2020 2/3/2020 2/4/2020 2/5/2020 2/6/2020 2/7/2020 2/8/2020
## 1:        0        0        0        0        0        0        0        0
## 2:        0        0        0        0        0        0        0        0
## 3:        0        0        0        0        0        0        0        0
## 4:        0        0        0        0        0        0        0        0
## 5:        0        0        0        0        0        0        0        0
##    2/9/2020 2/10/2020 2/11/2020 2/12/2020 2/13/2020 2/14/2020 2/15/2020
## 1:        0         0         0         0         0         0         0
## 2:        0         0         0         0         0         0         0
## 3:        0         0         0         0         0         0         0
## 4:        0         0         0         0         0         0         0
## 5:        0         0         0         0         0         0         0
##    2/16/2020 2/17/2020 2/18/2020 2/19/2020 2/20/2020 2/21/2020 2/22/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    2/23/2020 2/24/2020 2/25/2020 2/26/2020 2/27/2020 2/28/2020 2/29/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    3/1/2020 3/2/2020 3/3/2020 3/4/2020 3/5/2020 3/6/2020 3/7/2020 3/8/2020
## 1:        0        0        0        0        0        0        0        0
```

```
## 2:         0         0         0         0         0         0         0         0
## 3:         0         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0         0
##    3/9/2020 3/10/2020 3/11/2020 3/12/2020 3/13/2020 3/14/2020 3/15/2020
## 1:        0         0         0         0         0         0         0
## 2:        0         0         0         0         0         0         0
## 3:        0         0         0         0         0         0         0
## 4:        0         0         0         0         0         0         0
## 5:        0         0         0         0         0         0         0
##    3/16/2020 3/17/2020 3/18/2020 3/19/2020 3/20/2020 3/21/2020 3/22/2020
## 1:         0         0         0         0         0         0         0
## 2:         0         0         1         1         2         2         2
## 3:         0         0         0         0         0         0         0
## 4:         0         0         0         0         0         0         0
## 5:         0         0         0         0         0         0         0
##    3/23/2020 3/24/2020 3/25/2020 3/26/2020 3/27/2020 3/28/2020
## 1:         0         1         1         1         1         1
## 2:         2         3         6         8        12        14
## 3:         0         0         0         0         0         0
## 4:         0         0         0         0         1         1
## 5:         0         0         0         0         0         0
```

Daily Nation-wide Total A summary table of nation-wide daily total confirmed cases is attached.

```
# Create a table showing daily total confirmed cases, nation-wide
confirmed_cases_per_day <- dat[, 5:71]
date <- as.Date(paste("0", colnames(confirmed_cases_per_day) , sep = ""), "%m/%d/%y")

total_confirmed_daily <- lapply(dat[, 5:71], FUN = sum)
total_confirmed_daily <- t(as.matrix(as.data.frame(total_confirmed_daily)))
total_confirmed_daily <- data.frame(date = date,
                                    total_confirmed = total_confirmed_daily)
row.names(total_confirmed_daily) <- NULL

total_confirmed_daily
```

```
##          date total_confirmed
## 1  2020-01-22               1
## 2  2020-01-23               1
## 3  2020-01-24               2
## 4  2020-01-25               2
## 5  2020-01-26               5
## 6  2020-01-27               5
## 7  2020-01-28               5
## 8  2020-01-29               5
## 9  2020-01-30               5
## 10 2020-01-31               7
## 11 2020-02-01               8
## 12 2020-02-02               8
## 13 2020-02-03              11
## 14 2020-02-04              11
## 15 2020-02-05              11
```

```
## 16 2020-02-06             11
## 17 2020-02-07             11
## 18 2020-02-08             11
## 19 2020-02-09             11
## 20 2020-02-10             11
## 21 2020-02-11             12
## 22 2020-02-12             12
## 23 2020-02-13             13
## 24 2020-02-14             13
## 25 2020-02-15             13
## 26 2020-02-16             13
## 27 2020-02-17             13
## 28 2020-02-18             13
## 29 2020-02-19             13
## 30 2020-02-20             13
## 31 2020-02-21             15
## 32 2020-02-22             15
## 33 2020-02-23             15
## 34 2020-02-24             15
## 35 2020-02-25             15
## 36 2020-02-26             15
## 37 2020-02-27             16
## 38 2020-02-28             16
## 39 2020-02-29             24
## 40 2020-03-01             30
## 41 2020-03-02             53
## 42 2020-03-03             72
## 43 2020-03-04            103
## 44 2020-03-05            171
## 45 2020-03-06            211
## 46 2020-03-07            360
## 47 2020-03-08            477
## 48 2020-03-09            727
## 49 2020-03-10            997
## 50 2020-03-11           1325
## 51 2020-03-12           1713
## 52 2020-03-13           2242
## 53 2020-03-14           2841
## 54 2020-03-15           3643
## 55 2020-03-16           4602
## 56 2020-03-17           6113
## 57 2020-03-18           8997
## 58 2020-03-19          13975
## 59 2020-03-20          18837
## 60 2020-03-21          26184
## 61 2020-03-22          33469
## 62 2020-03-23          43544
## 63 2020-03-24          53552
## 64 2020-03-25          68245
## 65 2020-03-26          84677
## 66 2020-03-27         102269
## 67 2020-03-28         122714
```

```r
# Create a tidy datafile to include only
# county, state, and most recent confirmed cases.
total_cases <- total_confirmed_daily[nrow(total_confirmed_daily), 2]
dat_most_recent <- dat %>%
  select(
    "county" = "County Name",
    "state" = "State",
    "most_recent" = "3/27/2020"
  ) %>%
  group_by(state) %>%
  arrange(desc(most_recent)) %>%
  mutate(
    percentage_of_total = round(most_recent / total_cases, digits = 3)
  )

dat_most_recent
```

Most Recent by County

```
## # A tibble: 3,197 x 4
## # Groups:   state [51]
##    county                state most_recent percentage_of_total
##    <chr>                 <chr>       <int>               <dbl>
##  1 Queens County         NY           8214               0.067
##  2 Westchester County    NY           7187               0.059
##  3 Kings County          NY           6750               0.055
##  4 Nassau County         NY           4657               0.038
##  5 Bronx County          NY           4655               0.038
##  6 New York County       NY           4478               0.036
##  7 Suffolk County        NY           3386               0.028
##  8 Cook County           IL           2239               0.018
##  9 Statewide Unallocated NJ           1984               0.016
## 10 King County           WA           1828               0.015
## # ... with 3,187 more rows
```

```r
# Get an overview on the data
glimpse_dat <- glimpse(dat)
```

Raw Data

```
## Observations: 3,197
## Variables: 71
## $ countyFIPS    <int> 0, 1001, 1003, 1005, 1007, 1009, 1011, 1013, 1015, 10...
## $ `County Name` <chr> "Statewide Unallocated", "Autauga County", "Baldwin C...
## $ State         <chr> "AL", "AL", "AL", "AL", "AL", "AL", "AL", "AL", "AL",...
## $ stateFIPS     <int> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,...
## $ `1/22/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/23/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
```

```
## $ `1/24/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/25/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/26/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/27/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/28/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/29/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/30/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `1/31/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/1/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/2/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/3/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/4/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/5/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/6/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/7/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/8/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/9/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/10/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/11/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/12/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/13/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/14/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/15/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/16/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/17/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/18/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/19/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/20/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/21/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/22/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/23/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/24/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/25/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/26/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/27/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/28/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `2/29/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/1/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/2/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/3/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/4/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/5/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/6/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/7/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/8/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/9/2020`    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/10/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/11/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/12/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/13/2020`   <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/14/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/15/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/16/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/17/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
```

```
## $ `3/18/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/19/2020`   <int> 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/20/2020`   <int> 0, 0, 2, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/21/2020`   <int> 0, 0, 2, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/22/2020`   <int> 0, 0, 3, 0, 0, 0, 0, 0, 2, 2, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/23/2020`   <int> 0, 0, 3, 0, 0, 0, 0, 0, 2, 2, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/24/2020`   <int> 0, 1, 4, 0, 0, 0, 0, 0, 2, 5, 0, 0, 0, 0, 0, 0, 0, 0,...
## $ `3/25/2020`   <int> 0, 4, 4, 0, 0, 1, 0, 1, 2, 10, 1, 1, 0, 0, 1, 1, 0, 1...
## $ `3/26/2020`   <int> 0, 6, 5, 0, 0, 2, 2, 1, 2, 13, 1, 4, 1, 0, 1, 1, 0, 1...
## $ `3/27/2020`   <int> 0, 6, 5, 0, 0, 5, 2, 1, 3, 15, 1, 7, 1, 0, 1, 3, 0, 1...
## $ `3/28/2020`   <int> 0, 6, 10, 0, 0, 5, 3, 1, 3, 17, 1, 7, 1, 0, 2, 4, 0, ...
```

```
glimpse_dat
```

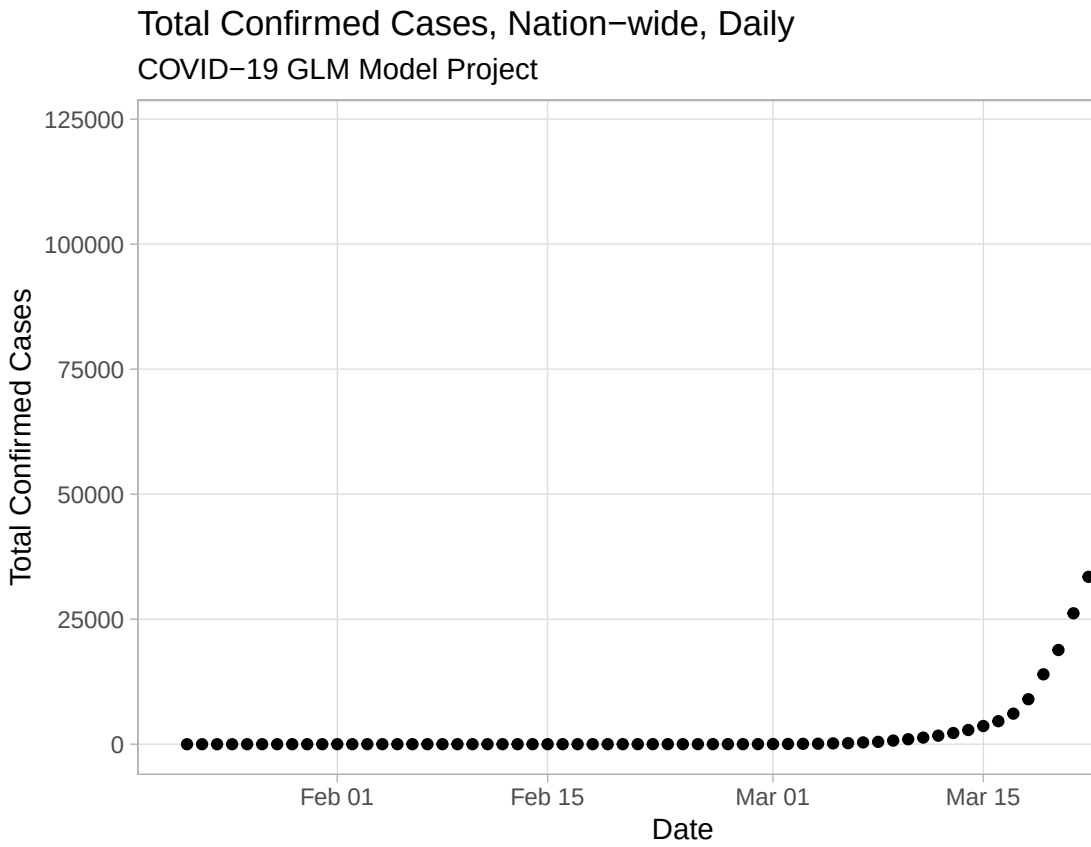
```
##       countyFIPS           County Name State stateFIPS 1/22/2020 1/23/2020
##    1:          0 Statewide Unallocated    AL         1         0         0
##    2:       1001        Autauga County    AL         1         0         0
##    3:       1003        Baldwin County    AL         1         0         0
##    4:       1005        Barbour County    AL         1         0         0
##    5:       1007           Bibb County    AL         1         0         0
##   ---
## 3193:      56037     Sweetwater County    WY        56         0         0
## 3194:      56039          Teton County    WY        56         0         0
## 3195:      56041          Uinta County    WY        56         0         0
## 3196:      56043       Washakie County    WY        56         0         0
## 3197:      56045         Weston County    WY        56         0         0
##       1/24/2020 1/25/2020 1/26/2020 1/27/2020 1/28/2020 1/29/2020 1/30/2020
##    1:         0         0         0         0         0         0         0
##    2:         0         0         0         0         0         0         0
##    3:         0         0         0         0         0         0         0
##    4:         0         0         0         0         0         0         0
##    5:         0         0         0         0         0         0         0
##   ---
## 3193:         0         0         0         0         0         0         0
## 3194:         0         0         0         0         0         0         0
## 3195:         0         0         0         0         0         0         0
## 3196:         0         0         0         0         0         0         0
## 3197:         0         0         0         0         0         0         0
##       1/31/2020 2/1/2020 2/2/2020 2/3/2020 2/4/2020 2/5/2020 2/6/2020 2/7/2020
##    1:         0        0        0        0        0        0        0        0
##    2:         0        0        0        0        0        0        0        0
##    3:         0        0        0        0        0        0        0        0
##    4:         0        0        0        0        0        0        0        0
##    5:         0        0        0        0        0        0        0        0
##   ---
## 3193:         0        0        0        0        0        0        0        0
## 3194:         0        0        0        0        0        0        0        0
## 3195:         0        0        0        0        0        0        0        0
## 3196:         0        0        0        0        0        0        0        0
## 3197:         0        0        0        0        0        0        0        0
##       2/8/2020 2/9/2020 2/10/2020 2/11/2020 2/12/2020 2/13/2020 2/14/2020
##    1:        0        0         0         0         0         0         0
##    2:        0        0         0         0         0         0         0
##    3:        0        0         0         0         0         0         0
```

```
##    4:        0        0        0        0        0        0        0
##    5:        0        0        0        0        0        0        0
##   ---
## 3193:        0        0        0        0        0        0        0
## 3194:        0        0        0        0        0        0        0
## 3195:        0        0        0        0        0        0        0
## 3196:        0        0        0        0        0        0        0
## 3197:        0        0        0        0        0        0        0
##       2/15/2020 2/16/2020 2/17/2020 2/18/2020 2/19/2020 2/20/2020 2/21/2020
##    1:         0         0         0         0         0         0         0
##    2:         0         0         0         0         0         0         0
##    3:         0         0         0         0         0         0         0
##    4:         0         0         0         0         0         0         0
##    5:         0         0         0         0         0         0         0
##   ---
## 3193:         0         0         0         0         0         0         0
## 3194:         0         0         0         0         0         0         0
## 3195:         0         0         0         0         0         0         0
## 3196:         0         0         0         0         0         0         0
## 3197:         0         0         0         0         0         0         0
##       2/22/2020 2/23/2020 2/24/2020 2/25/2020 2/26/2020 2/27/2020 2/28/2020
##    1:         0         0         0         0         0         0         0
##    2:         0         0         0         0         0         0         0
##    3:         0         0         0         0         0         0         0
##    4:         0         0         0         0         0         0         0
##    5:         0         0         0         0         0         0         0
##   ---
## 3193:         0         0         0         0         0         0         0
## 3194:         0         0         0         0         0         0         0
## 3195:         0         0         0         0         0         0         0
## 3196:         0         0         0         0         0         0         0
## 3197:         0         0         0         0         0         0         0
##       2/29/2020 3/1/2020 3/2/2020 3/3/2020 3/4/2020 3/5/2020 3/6/2020 3/7/2020
##    1:         0        0        0        0        0        0        0        0
##    2:         0        0        0        0        0        0        0        0
##    3:         0        0        0        0        0        0        0        0
##    4:         0        0        0        0        0        0        0        0
##    5:         0        0        0        0        0        0        0        0
##   ---
## 3193:         0        0        0        0        0        0        0        0
## 3194:         0        0        0        0        0        0        0        0
## 3195:         0        0        0        0        0        0        0        0
## 3196:         0        0        0        0        0        0        0        0
## 3197:         0        0        0        0        0        0        0        0
##       3/8/2020 3/9/2020 3/10/2020 3/11/2020 3/12/2020 3/13/2020 3/14/2020
##    1:        0        0         0         0         0         0         0
##    2:        0        0         0         0         0         0         0
##    3:        0        0         0         0         0         0         1
##    4:        0        0         0         0         0         0         0
##    5:        0        0         0         0         0         0         0
##   ---
## 3193:        0        0         0         0         0         0         0
## 3194:        0        0         0         0         0         0         0
## 3195:        0        0         0         0         0         0         0
```

```
## 3196:          0          0          0          0          0          0          0
## 3197:          0          0          0          0          0          0          0
##        3/15/2020 3/16/2020 3/17/2020 3/18/2020 3/19/2020 3/20/2020 3/21/2020
##    1:          0          0          0          0          0          0          0
##    2:          0          0          0          0          0          0          0
##    3:          1          1          1          1          1          2          2
##    4:          0          0          0          0          0          0          0
##    5:          0          0          0          0          0          0          0
##   ---
## 3193:          0          0          0          0          0          0          0
## 3194:          0          0          0          1          1          2          2
## 3195:          0          0          0          0          0          0          0
## 3196:          0          0          0          0          0          0          0
## 3197:          0          0          0          0          0          0          0
##        3/22/2020 3/23/2020 3/24/2020 3/25/2020 3/26/2020 3/27/2020 3/28/2020
##    1:          0          0          0          0          0          0          0
##    2:          0          0          1          4          6          6          6
##    3:          3          3          4          4          5          5         10
##    4:          0          0          0          0          0          0          0
##    5:          0          0          0          0          0          0          0
##   ---
## 3193:          0          0          1          1          1          1          1
## 3194:          2          2          3          6          8         12         14
## 3195:          0          0          0          0          0          0          0
## 3196:          0          0          0          0          0          1          1
## 3197:          0          0          0          0          0          0          0
```

Basic Visualization

```
ggplot(total_confirmed_daily, aes(x = date, y = total_confirmed)) +
  geom_point() +
  theme_light() +
  theme(
    panel.grid.minor = element_blank(),
  ) +
  ggtitle(
    label = "Total Confirmed Cases, Nation-wide, Daily",
    subtitle = "COVID-19 GLM Model Project"
  ) +
  xlab("Date") +
  ylab("Total Confirmed Cases")
```



Daily Nation-wide Total