



RISE

The Impact of COVID-19

Insights from visualisation in R

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INTRODUCTION

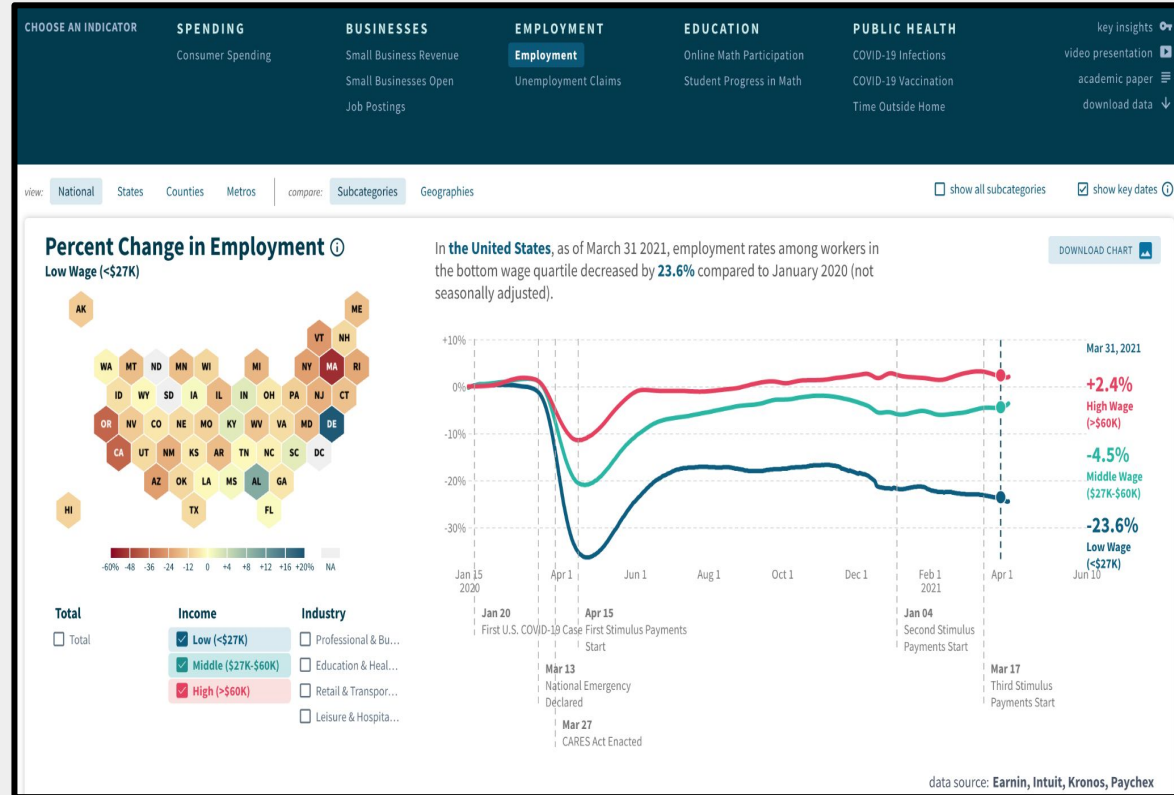
- ❑ The Covid-19 pandemic has caused a major loss of human lives worldwide. It has adversely affected healthcare and education systems, job sectors and employment opportunities. As of now, the United States records the highest number of cases and deaths.
- ❑ This presentation will highlight the rise of Covid-19 in the U.S with a closer look at its social and economic impacts with the help of data visualization.
- ❑ The information used is a combination of datasets at a national level and city level. For better understanding, we will be taking a closer look at the trends in these six cities: New York, Los Angeles, Charlotte, Chicago, Seattle and Oklahoma City. The cities were chosen mainly because of their demographic differences.

DATA SOURCES USED

- ❑ My findings have been based on the 'Opportunity Insights ECONOMIC TRACKER' developed by Raj Chetty along with the Opportunity Insights team.
- ❑ They provide a public database that tracks the economic impacts of Covid-19, interactive maps to select specific cities, a tracker dictionary and an academic paper that describes their findings in detail.

MORE ABOUT THE ECONOMIC TRACKER

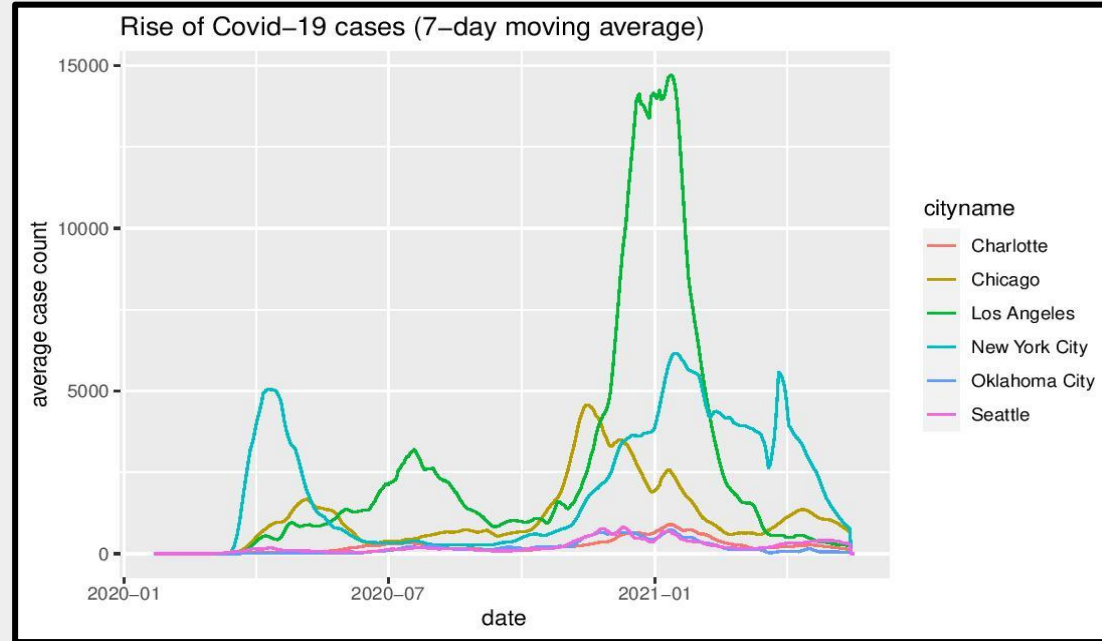
- ❑ This image shows an overview of the Economic Tracker.
- ❑ The map allows you to look at specific regions at different levels: national, state, county and city.
- ❑ The top panel gives a range of indicators to narrow down the particular information we want to explore.



RISE OF COVID-19 IN THE U.S

The six cities in my analysis have varying patterns in the rise of cases because of factors such as population size. The original dataset included 53 cities that were filtered for the chosen cities. The code that produces the corresponding graph :

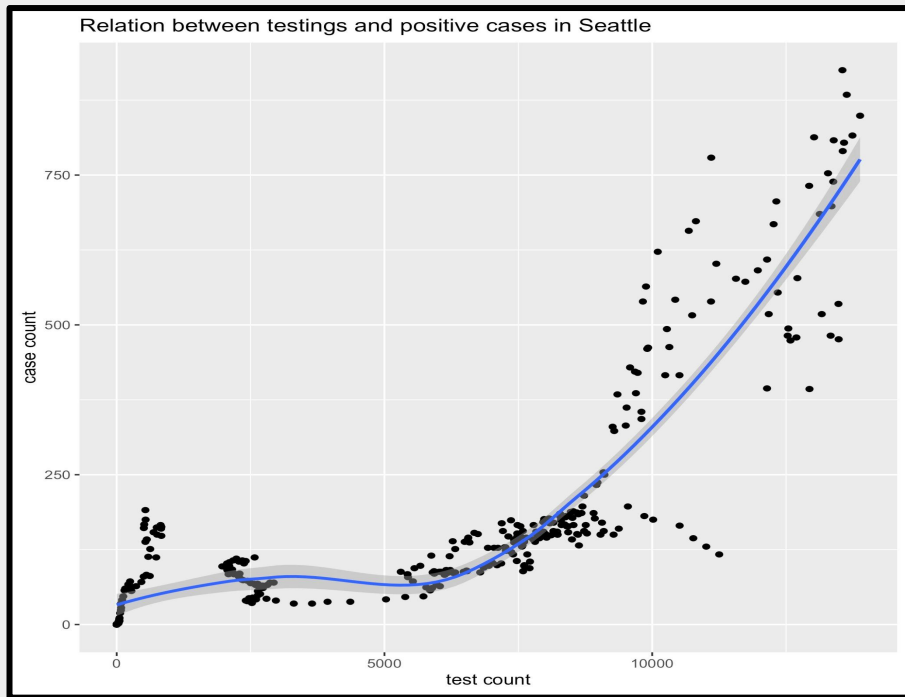
```
final_data %>%  
  group_by(cityname) %>%  
  mutate(average =  
rollmean(new_case_count, 7, fill = 0)) %>%  
ggplot() +  
  geom_line(mapping = aes(x = date, y =  
average, color = cityname)) +  
  labs(title = "Rise of Covid-19 cases  
(7-day moving average)", x = "date", y =  
"average case count")
```



RELATION BETWEEN COVID-19 TESTINGS AND CASES

There is a positive correlation between the number of testings and confirmed cases. We can observe that by looking at a specific city.

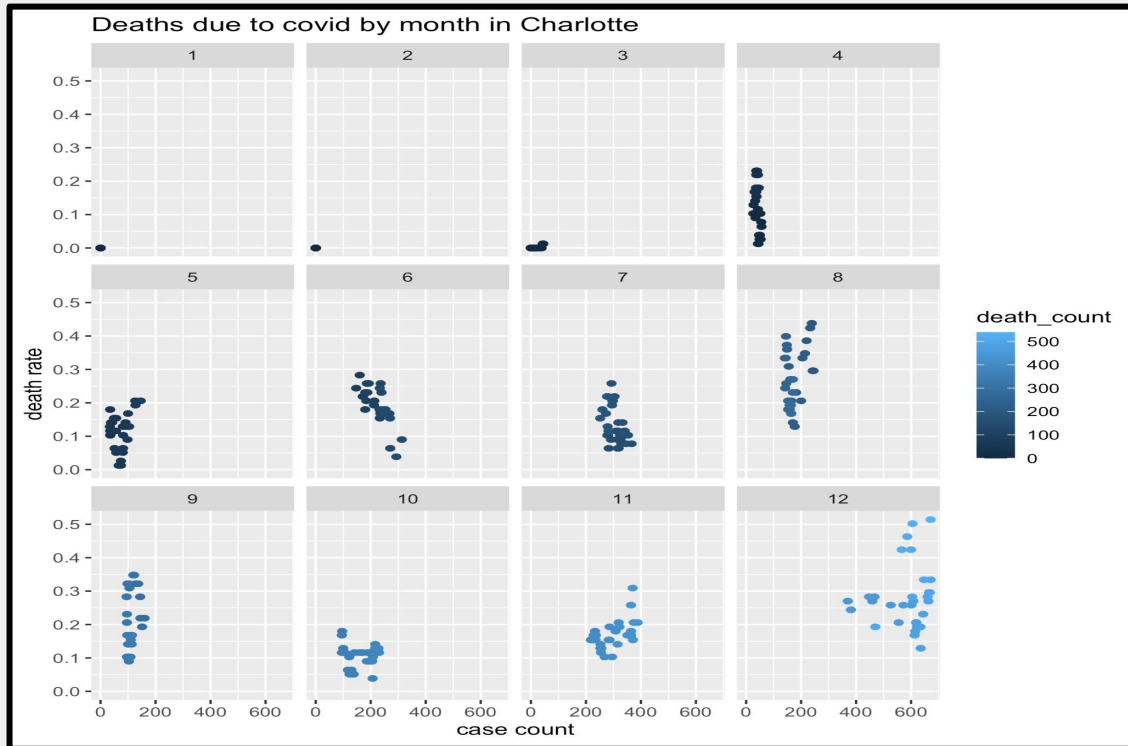
```
final_data %>%  
  filter(year == 2020, cityname == "Seattle") %>%  
  ggplot(mapping = aes(x = new_test_count, y =  
new_case_count)) +  
  geom_point() +  
  geom_smooth() +  
  labs(title = "Relation between testings and  
positive cases in Seattle", x = "test count", y =  
"case count")
```



DIFFERENT INTERPRETATION

Different trends can be analysed better by a different visualisation. For example, we can see the death rates in a city by observing every month at once.

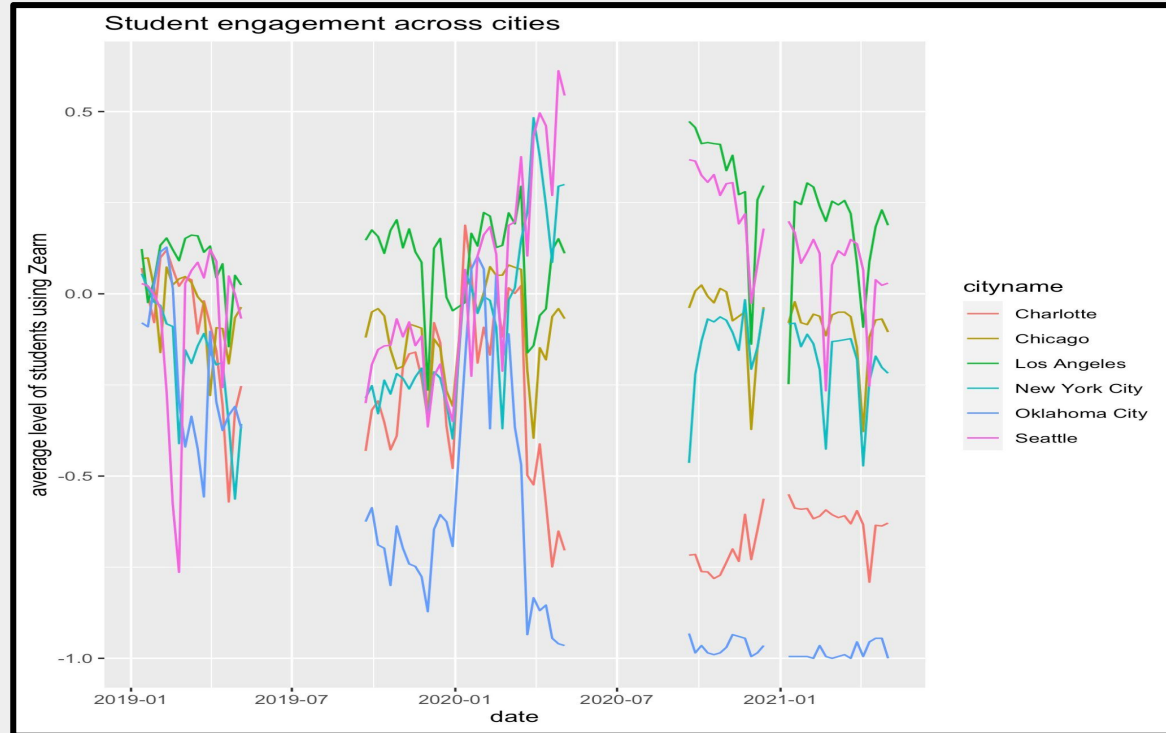
```
final_data %>%  
  filter(year == 2020, cityname ==  
    "Charlotte") %>%  
  ggplot(mapping = aes(x =  
    new_case_count, y = new_death_rate,  
    color = death_count)) +  
    geom_point() +  
    facet_wrap(~ month) +  
    labs(title = "Deaths due to  
covid by month in Charlotte", x =  
"case count", y = "death rate")
```



EDUCATIONAL PROGRESS DURING COVID

The shift to remote learning has impacted the student progress in academic work. This data set measures the student engagement through a math learning platform called Zearn.

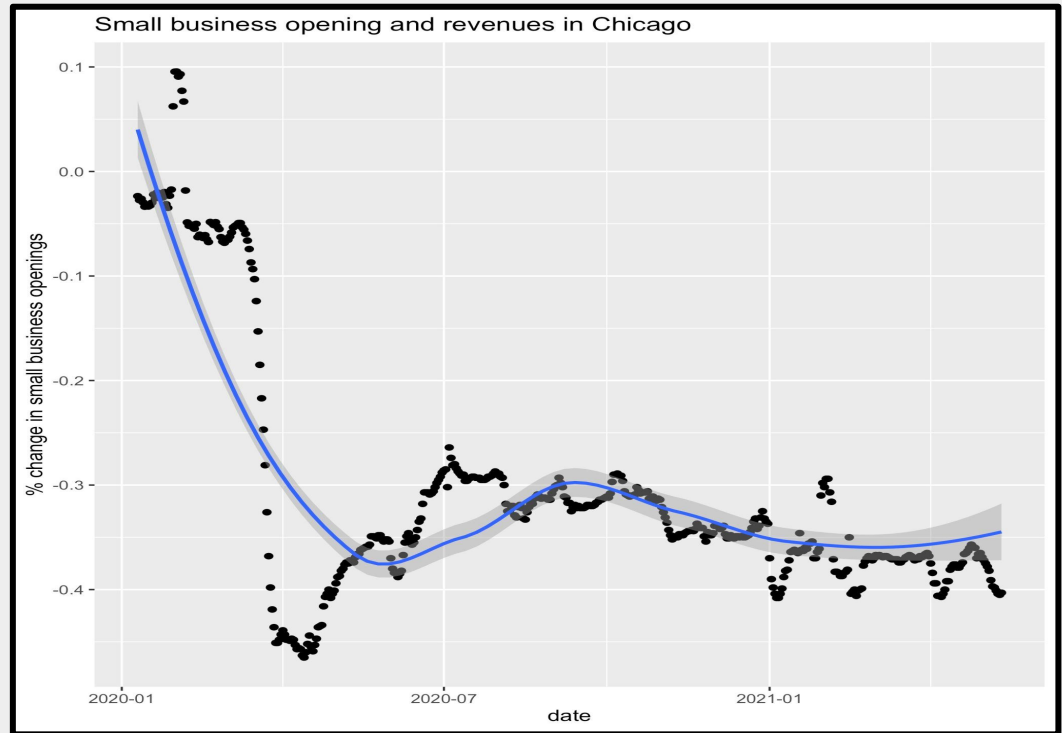
```
mutate(date = make_datetime(year,
month, day_endofweek)) %>%
  ggplot() +
    geom_line(mapping = aes(x = date, y
= as.numeric(engagement), color =
cityname),na.rm = TRUE) +
    labs(title = "Student engagement
across cities", x ="date", y ="average
level of students using Zearn")
## the gaps account for holiday breaks
```



IMPACT ON SMALL BUSINESSES

The change in small business openings and their net revenues can be observed with the dataset provided by Womply (a cloud-based management solution that helps small businesses). The `geom_smooth` line indicates the percentage change in net revenues.

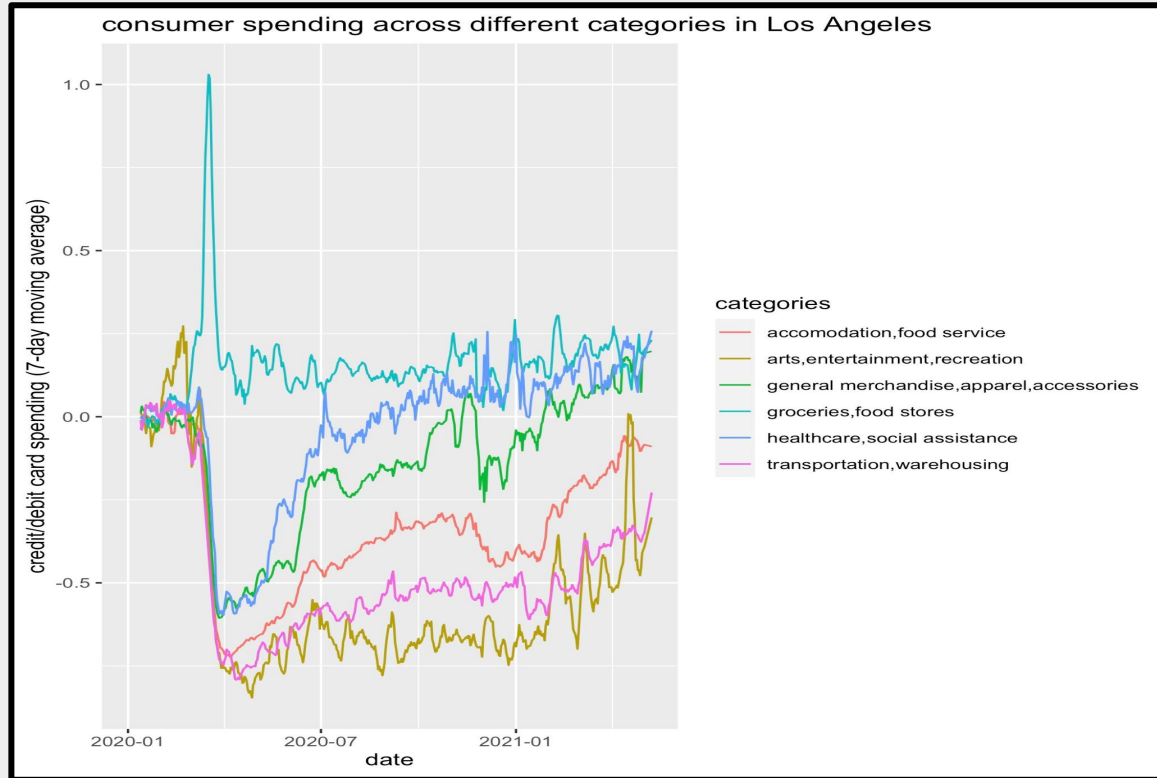
```
smallbusiness %>%  
  filter(cityname == "Chicago")  
%>%  
  mutate(date =  
make_datetime(year,month,day)) %>%  
  ggplot() +  
    geom_point(mapping = aes(x =  
date, y = merchants_all)) +  
    geom_smooth(mapping = aes(x =  
date, y = revenue_all)) +  
    labs(title = "Small business  
opening and revenues in Chicago",  
x = "date", y = "% change in small  
business openings")
```



CHANGES IN CONSUMER SPENDING

Loss of jobs and decrease in consumer income, among other factors, has impacted consumer spending across different categories.

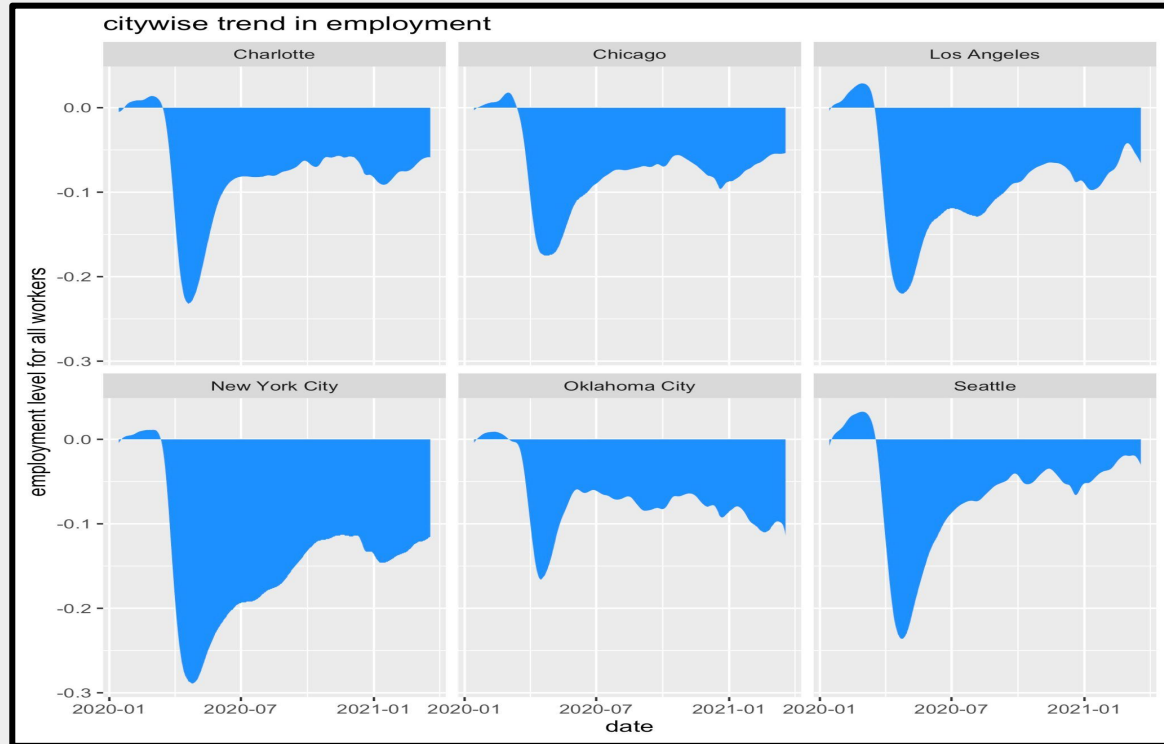
```
spending %>%  
  pivot_longer(cols  
=c(`spend_acf`, `spend_aer`, `spend_apg`,  
  `spend_grf`, `spend_hcs`, `spend_tws`),  
              names_to =  
"spending_category",  
              values_to =  
"adj_cred_deb_spending") %>%  
ggplot() +  
  geom_line(mapping = aes(x = date, y =  
as.numeric(adj_cred_deb_spending), color  
= categories))
```



EFFECT ON EMPLOYMENT

The changes in overall employment can be studied by multiple visualisations. The following representation shows the drastic decline in employment level in each city.

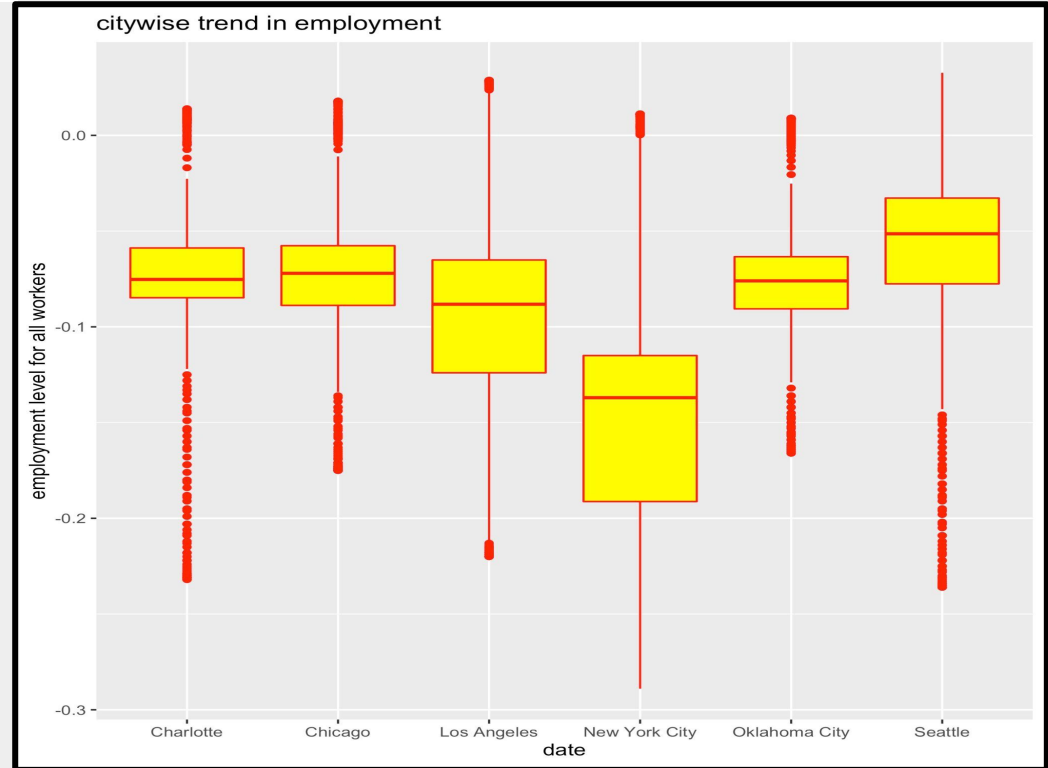
```
employment %>%  
  mutate(date =  
make_datetime(year,month,day)) %>%  
  ggplot() +  
    geom_area(mapping = aes(x = date,  
y = as.numeric(emp_combined)),fill  
= "dodgerblue") +  
    facet_wrap(~ cityname) +  
    labs(title = "citywise trend in  
employment", x = "date", y =  
"employment level for all workers")
```



BOXPLOT REPRESENTATION FOR EMPLOYMENT

The level of employment can also be observed with a boxplot for every city to effectively indicate how the values are distributed.

```
employment %>%  
mutate(date =  
make_datetime(year,month,day)) %>%  
  ggplot() +  
    geom_boxplot(mapping = aes(x = cityname,  
y = as.numeric(emp_combined)), fill =  
"yellow", color = "red") +  
  labs(title = "citywise trend in  
employment", x = "date", y = "employment  
level for all workers")
```

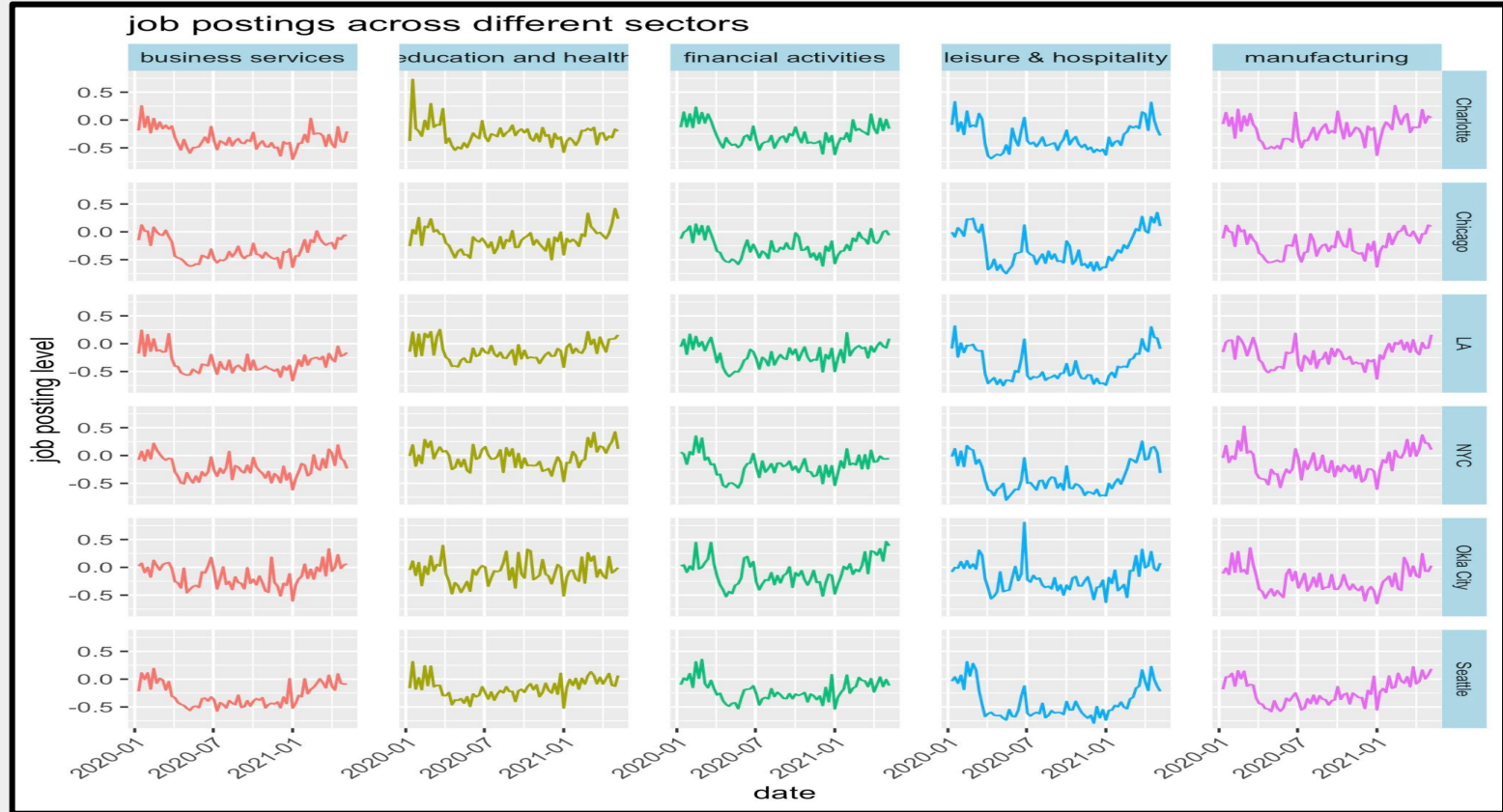


JOB OPPORTUNITIES DURING COVID

The pandemic has not only caused loss of jobs but also affected new job opportunities for workers. The job postings data from Burning glass technologies (a software company that provides real-time data on job growth and skills in demand) highlights these effects among various job sectors. The following code produces the graphs for each city and in each job sector.

```
jobposting %>%  
ggplot() +  
  geom_line(mapping = aes(x = date, y = as.numeric(job_postinglevel), color = sectors)) +  
  facet_grid(cities ~ sectors) +  
  theme(axis.text.x=element_text(angle = 45, hjust = 1),  
        strip.background = element_rect(fill="lightblue", size=5),  
        legend.position = "none") +  
  theme(strip.text.y = element_text(size = 7)) +  
  theme(panel.spacing.x = unit(.5, "cm")) +  
  theme(panel.spacing.y = unit(.3, "cm")) +  
  labs(title = "job postings across different sectors", y = "job posting level")
```

JOB POSTINGS: LINE GRAPH



ROAD TO RECOVERY

Although the pandemic persists, the supply of vaccines in 2021 has played a critical role in controlling the spread of the virus. The following graph shows the effect of vaccination on controlling the number of deaths in the U.S.

```
vaccinations %>%  
  ##filter(year == 2021) %>%  
  mutate(date = make_datetime(year, month, day))  
%>%  
  ggplot(aes(x = date)) +  
    geom_line(aes(y = new_death_count),color =  
"red",linetype =2) +  
    geom_line(aes(y =  
new_vaccine_count/571.4),color = "dark green") +  
    scale_y_continuous("deaths",sec.axis =  
sec_axis(~.*571.4,name = "vaccines"))+  
    labs(title = "The effect of vaccines on deaths  
by Covid-19")
```

