COVID-19 vs. Social Distancing Measures

STA 3920

Team ID: 2

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The current COVID-19 epidemic we are all experiencing has put a toll on a majority of lives globally. The outbreak began in Wuhan, a city in the Hubei province of China, around December 2019. It did not take long for the deadly disease to make its way to hundreds of countries around the globe. This

virus did make the world realize, however, how unprepared governments and societies are to successfully contain the spread of a disease and offer help to those affected by it. As the number of COVID-19 cases climbed over the past four months, we have seen ventilators, hospital beds, ICU's, masks, gloves, and other personal protective equipment become extremely scarce. Social distancing is a measure that has been adopted by a multitude of countries in order to slow the spread of the virus so that the healthcare capacity is not burdened. This involves closing down many buildings and events where people can gather and encouraging people to stay home unless necessary.

Some of the countries that have taken notable measures due to COVID-19 are the United States, India, Italy, and Spain. Since each country has adopted different methods to slow the spread of the disease, we have decided to analyze the number of COVID-19 cases and deaths in these four geographic regions over the course of January 2020 to April 2020. We would like to compare the numbers across these countries and see how they vary. Based on this, as well as the social distancing measures in the countries, we will determine which country has taken the best measures. Following this, we will compare the results of the countries to the United States in order to see how the U.S. can improve its own policies to slow the spread of the virus.

In order to complete our project, we are using a dataset found on Kaggle. The dataset includes ten variables which are: daterep, day, month, year, cases, deaths, countriesandterritories, geoid, countryterritorycode, and popdata2018, respectively. The last variable tells the population of a nation as of 2018. This dataset shows how many cases and subsequent deaths have occurred due to COVID-19 based on geographic location over the months of January, February, March, and April. The size of the dataset is 448 kilobytes. We will not be using all the variables in the data as we will mostly just be working with daterep, month, cases, deaths, and countriesandterritories.

The target audience for our project are the governors of the United States so that they can see how the measures other countries are taking to socially distance are affecting their numbers of cases and deaths. This could inspire governors to be stricter with the rules they set for their state. The target audience is also simply just members of society who are hesitant to stay home during the pandemic.

Perhaps by seeing the effects of COVID-19 with social distancing, it could motivate them to stay home in order to contribute positively to slowing the coronavirus.

Our goal for this research project is to develop and compare models of data that accurately depict the coronavirus pandemic infection rate and death statistics. In order to achieve our goals for the project, we plan to build several displays of data through charts and graphs. We would be using data mining methods such as linear regression, cross validation, and choosing the most accurate models and representation of the information. All of this information is included in our R code. We intend to chart the rates from several countries and compare them to the United States. Given this, we would then strive to predict the infection and death rates given the four month period.

The first country we observed is the United States, where there has not been a federal lockdown of the entire nation as many other countries have had to endure. Instead, the governor of each state decides what policies are put into place. The Center for Disease Control (CDC) recommends individuals stay six feet away from each other, do not gather in groups, and stay out of crowded places. Individuals are also required to wear some sort of face mask if they need to go outside. In New York specifically, Andrew Cuomo has issued a “pause” on economic activity until May 15, 2020. This means that clubs and bars are closed while businesses such as restaurants and retailers are only open for pick-up. So far, New York itself had about 184,000 cases with 21,478 deaths, which explains why the suggested rules for social distancing are much stricter in NY. Other states in the United States, however, are not taking the “stay at home order” as seriously since their overall numbers have been lower. Less crowded states such as Missouri, Colorado, and Washington have been protesting for weeks that the lockdown suggestions be lifted by gathering in large masses. These gatherings and lack of regard for safety measures could cause a spike in coronavirus cases. According to Figure 1, the US cases to death ratio has had a major spike the last 4 months. In Figure 2, you can see the spike and all-time high death rate occurred in April, which is later than most countries, but still surpassed every other country's statistics. Measures in the U.S. weren’t taken early enough or seriously enough.

The second country we observed, Italy, has been severely ravished by the coronavirus. It was the most-affected country in Europe and outside of Asia. Unlike the suggested lockdown order in the United States, Italy had to endure a government-mandated total lockdown. Every single business has been shut down except for grocery stores, banks, pharmacies, and healthcare facilities. According to Figure 4, the deaths in Italy over the past 4 months had a major spike starting in the beginning of March and reached their peak around the end of March. Comparing this chart to that of the U.S. in Figure 2, you can clearly see that efforts in Italy were taken seriously in order to 'flatten the curve.' These measures show that social distancing delayed and reduced the peak of the epidemic, which especially caused a drastic change in Lodi, Northern Italy. When comparing the ratio of cases to deaths in Italy (Figure 3) to those of the US (Figure 1), you can see that Italy has more deaths for the amount of cases. The US has overall mild cases compared to those of Italy, and it can be due to a variety of factors. Many of the deaths in Italy are those of the elderly, seeing that the elderly are more vulnerable to coronavirus. The median age in Italy is 47.3, while the median age in the US is 38.3.

The third country we observed was India. India is the second most populated country in the world. In villages, people live as a community in small houses where families share a single water source and work together on farms. This is clearly less urbanized than other countries. While comparing the number of cases to deaths of India in Figure 5 to that of the U.S. in Figure 1, you can see India still has drastically less cases and deaths in the past four months. Figure 6 shows that the spike India had in deaths is mediocre compared to the huge spike the U.S. had. The reason for this can be the fact that India called its strict lockdown at a very early time, ahead of its case and death curves. These other countries had more than 500 cases when they called their strictest lockdown, while India had 320. On top of getting a head start, several Indian states are delivering groceries and food to homes while others are taking up more violent acts of having police officers beat people who are not obeying the lockdown. Nevertheless, these actions are motivating people to stay indoors.

The fourth country we observed was Spain. As you can see in Figure 9, it had the second highest death rate after Italy. The mortality rate, based on Figure 7, is about 10%. Spain declared its state of

emergency on March 14, 2020 and since then, the number of those infected has been increasing. Spain was hit so hard because it was not prepared enough to fight a disease of this caliber and therefore, was slow to respond. In addition to that, Spain has a high elderly population, which is the most vulnerable demographic. People are following lockdown rules as much as they can but their hospitals lack sanitary products. This puts the doctors and nurses in danger. According to Figure 8, the number of deaths have been rising exponentially since March. It is important to understand that although many have recovered, over 20,000 deaths are not to be taken lightly.

By comparing these four countries, we see that the worst hit countries were the USA, Spain and Italy. There is not too much difference in the growth of each country's death rate. However, between the three countries, the U.S. does have the least number of deaths, which is promising. Looking at India, the number of deaths are significantly lower than the other three countries. Looking forward, India's infection rate might increase. The reason for such low death and infection rates could be the fact that India was strategic in locking down the country early and strictly enforcing the rules. As of now, our goal and every country's goal is to flatten the curve. The U.S. should continue to enforce social distancing rules and be prepared to provide hospitals with necessary equipment. It also may be effective to issue a stricter lockdown, as India did, to keep the number of cases low. This could involve delivering groceries to people’s homes so they have less incentive to go outside and fining people who are not obeying the policies. We have to assume that there will be plenty more cases in order to provide proper care and treatment to those most vulnerable.

Figure 1: A scatter plot of the deaths that have occurred in the U.S. against the amount of covid-19 cases.

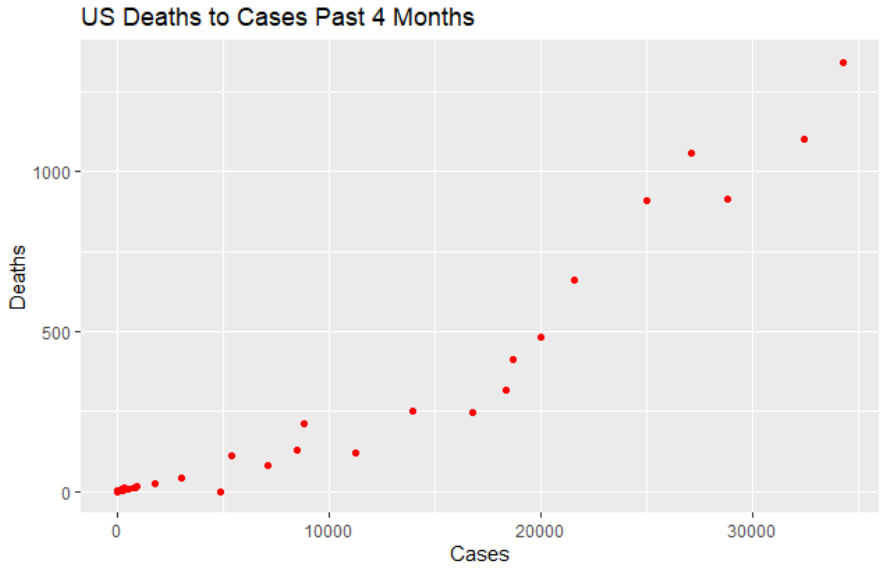


Figure 2: A scatter plot of the amount of deaths that have occurred daily in the U.S. over the course of four months due to covid-19.

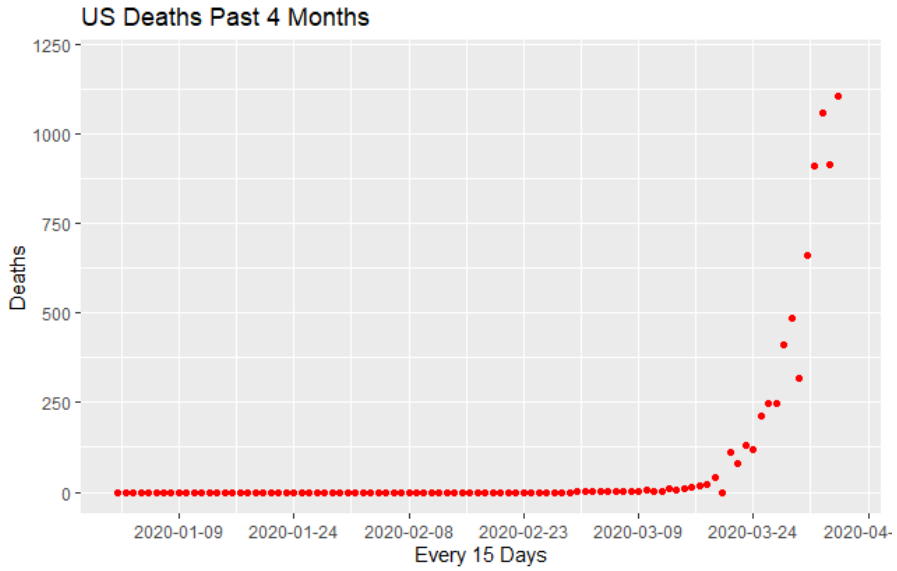


Figure 3: A scatter plot of the deaths that have occurred in Italy against the amount of covid-19 cases.

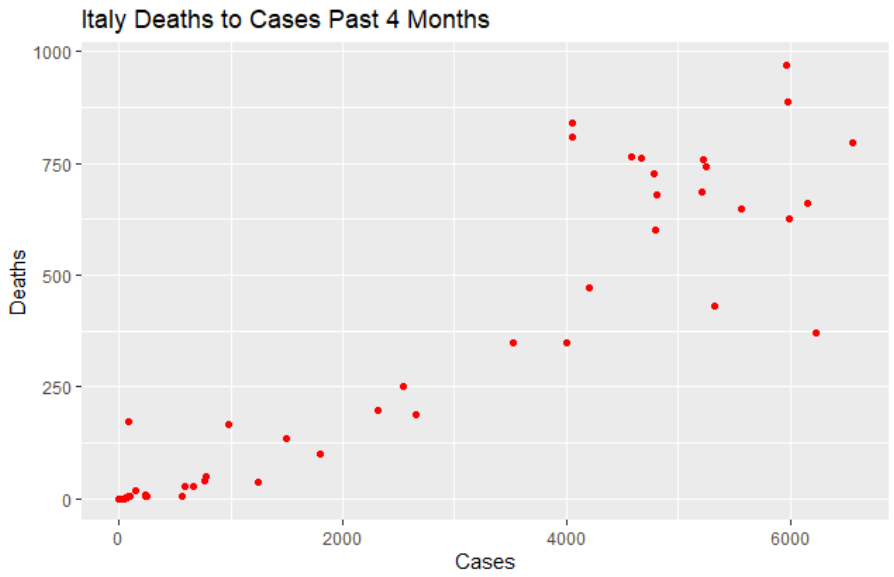


Figure 4: A scatter plot of the amount of deaths that have occurred daily in Italy over the course of four months due to covid-19.

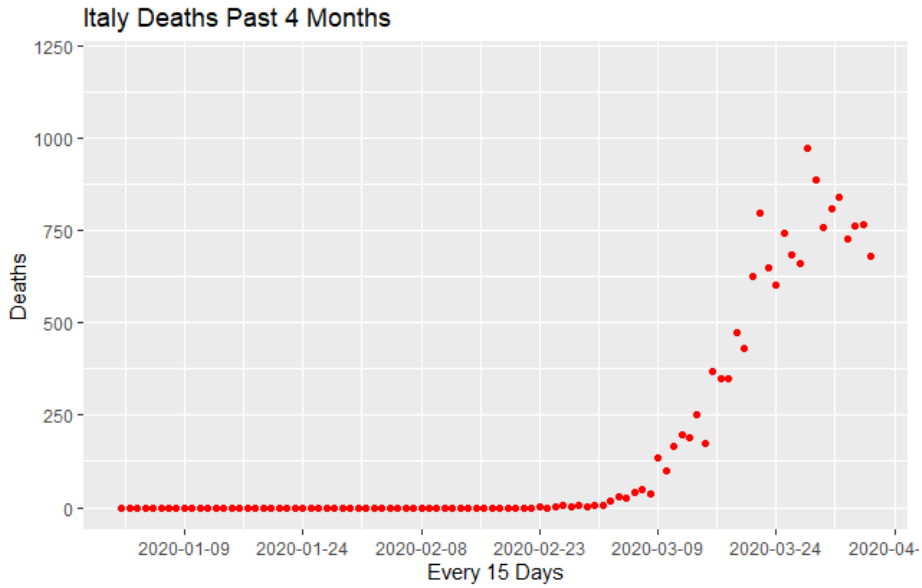


Figure 5: A scatter plot of the deaths that have occurred in India against the amount of covid-19 cases.

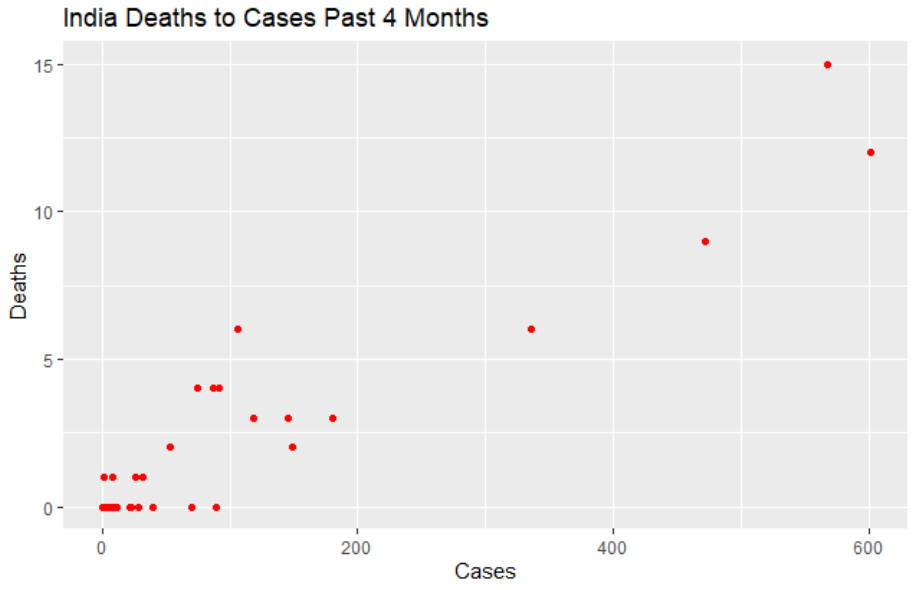


Figure 6: A scatter plot of the amount of deaths that have occurred daily in India over the course of four months due to covid-19.

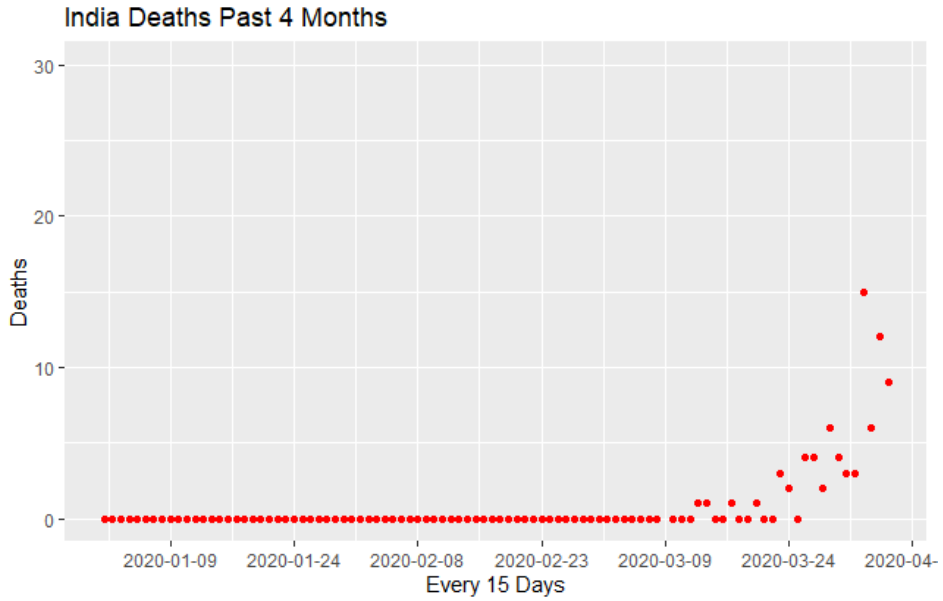


Figure 7: A scatter plot of the deaths that have occurred in Spain against the amount of covid-19 cases.

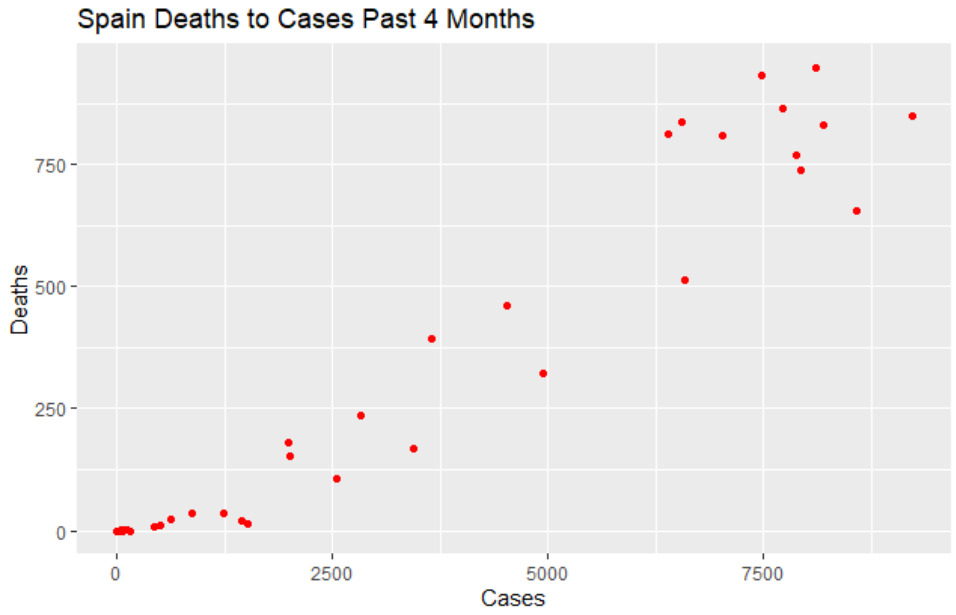


Figure 8: A scatter plot of the amount of deaths that have occurred daily in Spain over the course of four months due to covid-19.

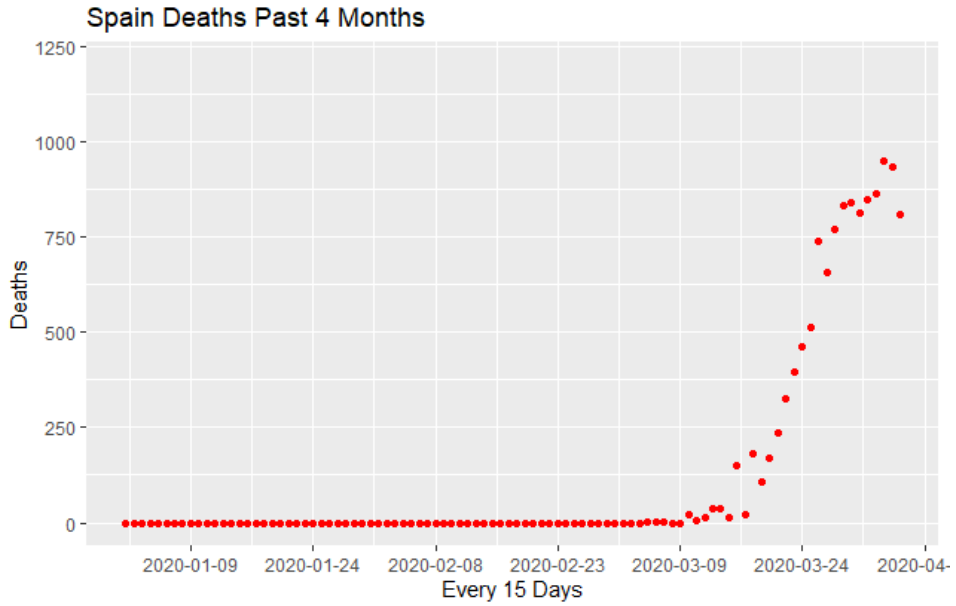
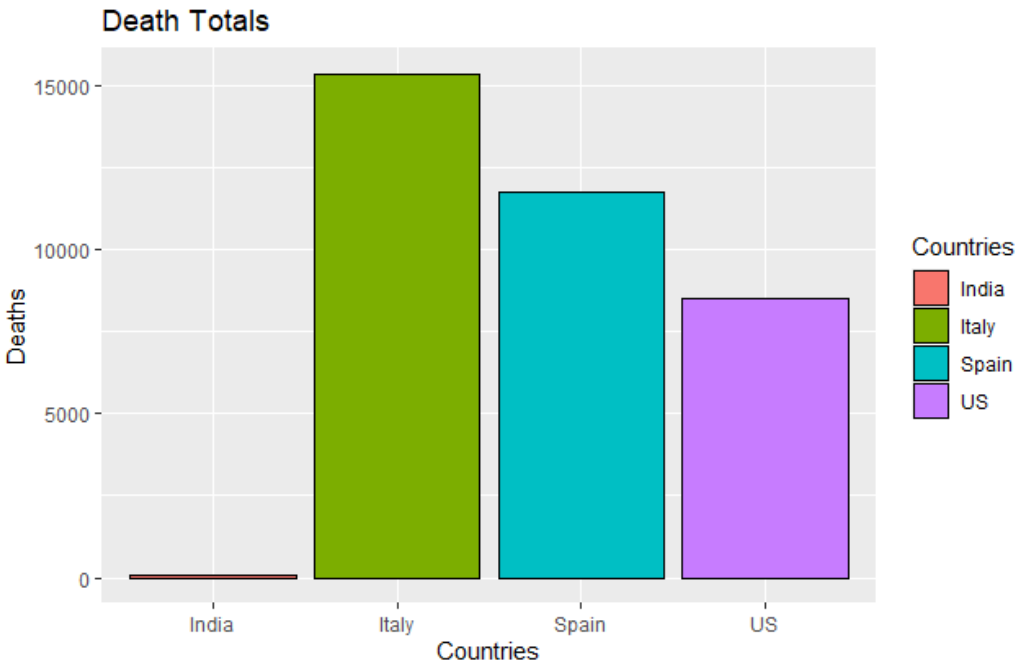


Figure 9: A bar graph comparing the amount of deaths that have occurred in the United States, India, Italy, and Spain over the course of four months.



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