

Introduction

As of March 2022, the COVID-19 pandemic has reached its second anniversary. The unprecedented times left the world vulnerable, where public advice on masks against the virus was constantly changing. The growing public concern and skepticism against masks and their effectiveness resulted in a multitude of conversations on social media like Twitter and the need to control the pandemic in the US and around the world.

The goal of this study is to explore the conversations being made and examine the relationship of the general public's overall sentiment with COVID-19, masks, and related events during the first year of the pandemic.

Methods

Data Collection

Collected more than two million tweets related to COVID and masks from the beginning of March 2020 to the end of March 2021 using the Python module *snsraper*¹. The module pulled dates, tweet texts, usernames, display names, like counts, hashtags, and languages of the tweets. The Python library *pandas* was also used to format the tweets into a data frame and exported the data into an excel file.

Data Cleaning

Cleaned the tweets for easier analysis by deleting punctuation, removing stop words, and lemmatizing. The Python library *nlTK*² was imported to use the *corpus* module, which referred to a list of stop words that can be removed from the tweets. The *WordLemmatizer* module helped group different forms of words.

Topic Analysis

To analyze the popular conversations surrounding COVID and masks every month, I used Python's Latent Dirichlet Allocation (LDA) from the machine learning library *sklearn*³. I set the document frequency to appear at a maximum of 75% of the data, and at least two times in the overall tweets. This allowed the data to focus on bigger conversations and remove common words. The number of topics to be analyzed was set to 5 to have unique conversations.

Sentiment Analysis

Processed the sentiment of each tweet every month by using the Python module *vaderSentiment*⁴, which is a Valance Aware Dictionary Sentiment Reasoner (VADER) that is specifically used to analyze sentiment on social media. After categorizing each tweet as overly negative, negative, neutral, positive, or overly positive, I mapped the data into a timeline to show the peaks of tweets and the overall sentiment of the general public using the Python data visualizer library *seaborn*⁵.

Results & Conclusion

The total tweets about COVID-19 and masks per month had a similar pattern to the COVID-19 daily cases and death rates in the first year of the pandemic. Where there were waves of the virus, there were also peaks of tweets about these trends, specifically March 2020, July 2020, October 2020, and March 2021.

In March 2020, much of the conversation surrounded the shortage and types of masks, hospitals, and information about and protocols against the virus. While the US started to shut down and more information about the virus was released, the general public tweeted more.

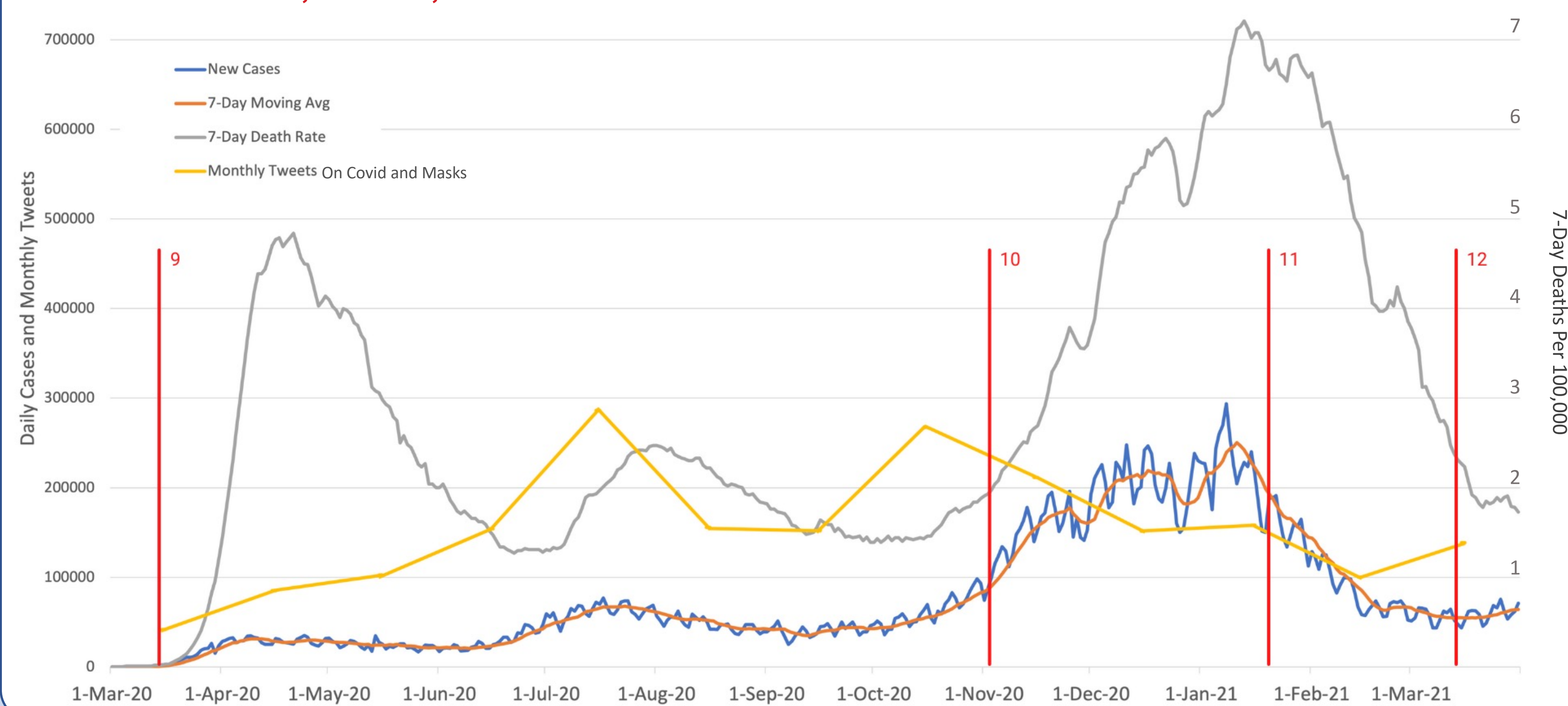
In July 2020, there were reminders of safety precautions against the virus, but there were also US politics and the differences of opinion between the Republican party and experts' beliefs in these precautions. On July 30, 2020, Republican presidential candidate Herman Cain passed away from COVID, where he potentially caught the virus at a Trump rally in the previous month without wearing a mask. The number of tweets on this day was greater than other days in July and had an overall negative sentiment.

October 2020 led up to the presidential election and had many tweets on the day President Trump tested positive for COVID-19. The overall sentiment was mixed throughout the month.

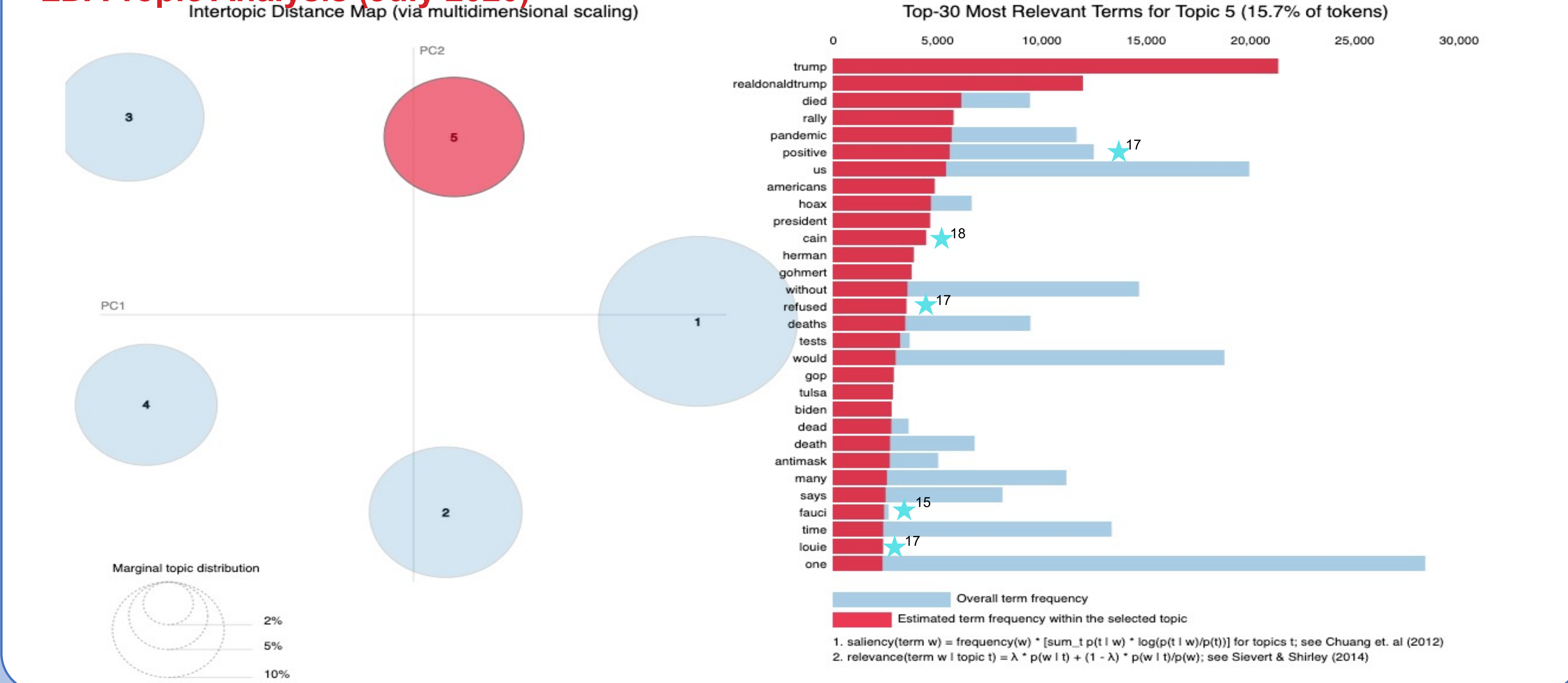
March 2021 marked the first anniversary of lockdown and the start of mandates being lifted, which was most of the discussion and had mixed sentiment.

Generally, the response sentiments, both positive and negative, are inflated at the same time, with an average of more positive than negative. This reflects the abundance of tweets that day, and overall reflects the daily cases in the year. The COVID-19 daily cases and the US events influenced the number of tweets, sentiment, and topics of discussion on Twitter.

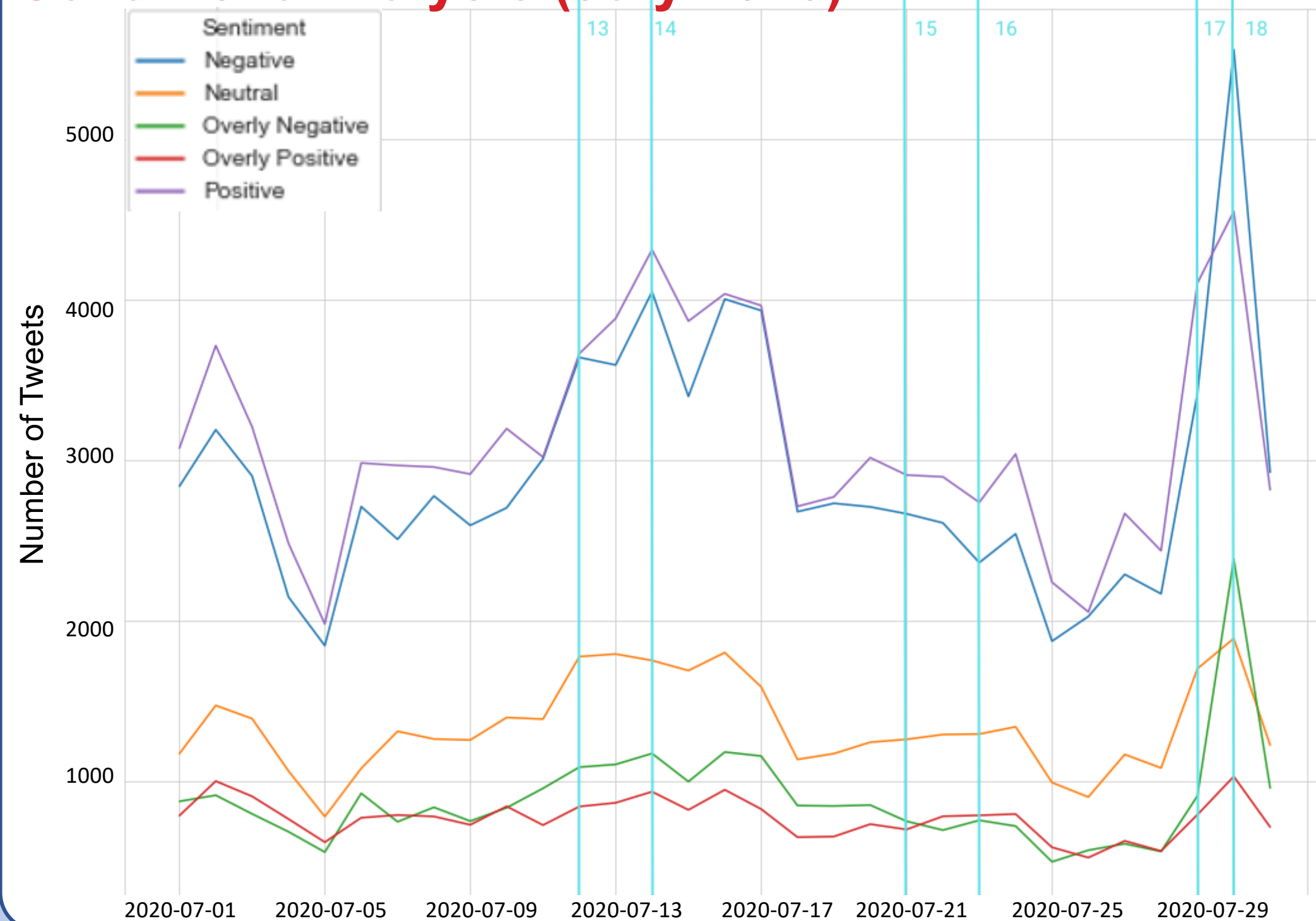
COVID-19 Cases, Deaths, and Tweets⁶



LDA Topic Analysis (July 2020)



Sentiment Analysis (July 2020)



References

- [1] snsrape. Github <https://github.com/JustAnotherArchivist/snsrape>
- [2] Natural Language Toolkit Python Library <https://www.nltk.org/>
- [3] Scikit Machine Learning Python Library <https://scikit-learn.org/stable/modules/generated/sklearn.decomposition.LatentDirichletAllocation.html>
- [4] Valance Aware Dictionary Sentiment Reasoner. <https://github.com/cjhutto/vaderSentiment>
- [5] Seaborn. <https://seaborn.pydata.org/>
- [6] Centers for Disease Control and Prevention. (n.d.). CDC Covid Data tracker. Centers for Disease Control and Prevention. Retrieved from https://covid.cdc.gov/covid-data-tracker/#trends_dailycases
- [7] Netburn, D. (2021, July 27). A timeline of the CDC's advice on Face Masks. Los Angeles Times. Retrieved from <https://www.latimes.com/science/story/2021-07-27/timeline-cdc-mask-guidance-during-covid-19-pandemic>
- [8] Centers for Disease Control and Prevention. (2022, January 5). CDC Museum Covid-19 Timeline. Centers for Disease Control and Prevention. Retrieved from <https://www.cdc.gov/museum/timeline/covid19.html>

Acknowledgements

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Timeline^{7,8}

- February 29, 2020**
US Surgeon General Dr. Jerome Adams tweets that face masks. "Seriously people -- STOP BUYING MASKS!"
- March 11, 2020**
The World Health Organization (WHO) declares COVID-19 a pandemic
- March 15, 2020⁹**
US begins to shut down to prevent the spread of COVID-19
- April 3, 2020**
CDC announces new mask wearing guidelines and recommends that all people wear a mask when outside of the home
- May 2, 2020**
WHO renews emergency declaration from 3 months prior calling the pandemic a global health crisis
- July 12, 2020¹³ ***
Florida has the highest daily amount during the pandemic than any other state
- July 21, 2020¹⁵ ***
Dr. Anthony Fauci, US's top infectious disease expert, says masks are important to fight the COVID-19 pandemic
- July 29, 2020¹⁷ ***
Texas Republican Louie Gohmert, who refused to wear a mask, tests positive for COVID-19
- September 22, 2020**
US COVID-19 death toll surpasses 200,000
- November 3, 2020¹⁰**
US Presidential Election occurs. Response to the pandemic is one of the most debated issues
- December 14, 2020**
US COVID-19 death toll surpasses 300,000
- January 21, 2021¹¹**
President Joe Biden signs 10 executive orders for his national COVID-19 strategy -- require to mask for travel, expansion of COVID-19 testing, reopen nation's schools, and restart the US economy
- February 21, 2021**
US COVID-19 death toll surpasses 500,000
- March 8, 2021**
CDC releases new guidelines allowing Americans to gather indoors without masks if they're fully vaccinated against COVID-19. It is still recommended that everyone remains masked in public
- March 4, 2020 ***
Floridan Republican Representative Matt Gaetz mocked the pandemic by wearing a gas mask
- March 13, 2020**
President Donald Trump declares a nationwide emergency
- March 24, 2020**
CDC says, "Facemasks may be in short supply and they should be saves for caregivers."
- April 13, 2020**
Most US states report widespread cases of COVID-19
- May 28, 2020**
US COVID-19 death toll surpasses 100,000
- July 14, 2020¹⁴ ***
CDC publishes a study that finds masking to be a likely contributing factor for preventing the spread of COVID-19
- July 23, 2020¹⁶ ***
CDC releases new science-based resources and tolls for schools and parents for safe school reopening
- July 30, 2020¹⁸ ***
Republican presidential candidate Herman Cain died from COVID-19. (He attended a Trump rally in June without a mask)
- October 2, 2020 ***
President Donald Trump tests positive for COVID-19
- December 3, 2020**
The Advisory Committee on Immunization Practices (ACIP) recommends health care professionals and residents of long-term care facilities be offered COVID-19 vaccines first
- January 18, 2021**
US COVID-19 death toll surpasses 400,000
- January 30, 2021**
CDC issues an order requiring travelers to wear a face mask. Refusal to wear a mask is a violation of federal law
- March 2, 2021 ***
Texas Governor Greg Abbott lifts the mask mandate and opens Texas 100 percent
- Mississippi Governor Tate Reeves lifts the mask mandate and removes COVID-19 related restrictions on businesses
- March 13, 2021¹²**
US administers 100 million vaccinations

* - events that were found in the LDA Topic Analysis
Italicized events are to give context in the timeline and are unrelated to masking