

# Behaviour of Disinformation Relating to the Covid-19 Vaccine

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I400, Spring 2021

## ABSTRACT

## INTRODUCTION

With the social media we use today, information has never spread faster. Users can connect, share, and like content within an instant of it's posting. However, when this information is incorrect and intentionally spread, this is called disinformation. Countries, media sources, conspiracy theorists and many more have used disinformation tactics throughout history to change the public's opinion. Distrust in medical suppliers, governments, education, and much more surfaces. With the Covid-19 pandemic spreading in early 2020, information spread like wildfire. Vaccine information and disinformation combatted for the top spots on social media. To help people analyze the behavior of disinformation relating to the Covid-19 vaccine, this paper will analyze the historical context of vaccine disinformation, analyze behavioral data on the subject, and conclude with a well organized way of recognizing disinformation and its influence.

## LITERATURE REVIEW

The rise in fear of vaccines took off in 1998 when Andrew Wakefield and a group of his colleagues suggested that the measles, mumps, and rubella vaccines cause more harm than good. By suggesting that this vaccine causes autism, purely based on a sample size of only 12, an uncontrolled design, and a speculative nature of conclusions, this published paper caused a significant drop in parents wanting to vaccinate their children [9]. This was the contemporary beginning of vaccine distrust. These beginnings are the root of why people distrust the new COVID-19 vaccine. With media, opinions, and no way of containing peoples thoughts online, the mistrust has just grown over the past year. To analyze disinformation on social media we decided to take a look at what media is, and why it behaves the way it does. The thought process is, that understanding the platform of disinformation will help us analyze why it becomes so impactful.

Propaganda is intentionally using information to make feelings of an audience for/against a certain subject. To continue this vaccine distrust, propaganda was used by many. On news channels, like Fox and CNN, anti-vaccination propaganda spreads with hosts like Tucker Carlson or Chris Cuomo claiming authorities are lying to the mass public about the vaccine and COVID-19 as a whole.

Carlson has stated that no science is involved in anything related to the vaccine [7]. People who are watching these news channels, trust these prime time news anchors and big media, so they are not going to question the destructive claims that he is making, since he says them so confidently, while holding a position of authority for certain groups of people. Others also claim that the government has used COVID-19 and the vaccine as a means to control the mass public. The movement QAnon claims that whoever owns the vaccine, has the power over all the people, scaring others into believing that this is all a game of control over the public [4]. The more people view videos, news articles, and tweets, the more they are going to believe that these things are true and that this vaccine is only here to get the people under the government's control.

There is an interesting thing that happens when reading news. If people already view the vaccine as a hoax and fake, they will believe the news that goes along with their views. This is called the illusory truth effect. Users go to news outlets and follow others who hold the same beliefs. This is outlined by motivated skepticism [8] where a confirmation and disconfirmation bias occur. If a belief is shared with a media outlet, they will return to the same site because it affirms their knowledge. The same thing happens as well when an opposing view is shared. The person will be pushed farther to their belief. Disinformation on social media takes advantage of these sociological effects on humans. Media outlets also keep in mind a couple goals one end goal being money. These big stories that are controversial bring in a wider audience. After the rise in views and revenue, the media outlet will continue to publish and report on the misinformation because it has proven to be more profitable. If a story is inconvenient to the media elite, they will begin to trash the stories and find ways to discredit their sources. Media outlets will push their and their viewers view points because it makes a profit for them. Although the media outlets say they are mostly for the people, they are still looking to make a profit at the end of the day. [1].

While searching for interviewees to interview during their show, media elites commonly search for experts that have similar viewpoints to their own, furthering their own agenda. However, these experts are going to be people in power positions, with money. News outlets will use members of the government, institutions and corporations to go along with what they are saying to keep the viewers on their side, and

these “experts”. This will constantly keep the people in power in control of what is happening around them, and what will continue to happen. Since this select group of people are in charge, if they decide a news story doesn’t fit their standards, they can completely nullify the article, and discredit the sources. News organisations have an agenda that they tend to follow, and as a core news value, they will stick to their ideological campaigns [6]. They will follow this agenda and they will continue to get the same crowd coming back for more, keeping them interested, and on their side.

What makes up an influential post is an important idea to understand if misinformation will be understood itself. To help keep viewers interested, a common enemy is placed to shift the blame around and have it all land on a specific person, or group of people. Some media outlets have blamed communism, terrorists, and immigrants [4]. By pushing problems and blame on certain groups, the media can form an alliance with its viewers, and get them to keep coming back to their source. The media will provide motivated skepticism and encourage their viewers to hold up the same belief. This means that no matter what, nothing will alter the beliefs of the consumers. Media will use confirmation bias, pushing only stories that will aid in their favor, and affirming the viewers already preconceived notions. Cognitive dissonance is another way to keep their viewers' interest peaked. If the media presses a story so much, hearing the opposing view that challenges beliefs, will actually end up pushing the viewer closer to their own ideas, criticizing the knowledge that was provided. [8]. When presented with other media sources, users can look back at what they know and either confirm their previous beliefs, or push them closer to their own views and feelings, feeling lied to from this new media source. With the COVID-19 vaccine, if viewers have already decided that the vaccine is unsafe and untrustworthy, they won’t believe what scientists, doctors or government officials say. If they still have one media outlet that is aligned with their views, and confirms their fears with the vaccine, they will continue to hold their misguided beliefs.

News stations also have a select core group of values that are commonly used to create interesting stories.. A news station will want the newest, most interesting story and a story that is exciting for people to watch. A story that people will remember and talk about will be the story that is sad, surprising, or has a massive conflict. Since news stations follow confirmation bias, they will create exclusive stories. Interviewing people of their own decision, creating polls, investigations, or surveys will create extra exclusive data that no other news station will be able to provide [6]. Creating stories that create drama and effects everyday life is very important in keeping viewers interested, and keeping the viewers interested brings in more money.

Even without creating a new story, talking about topics and following up on current subjects can also keep viewers entertained. This is a recurring idea in disinformation, where multiple fake posts will be posted to show more legitimacy.

Hearing the same story about how the vaccine is beneficial isn't going to keep people interested, but a story that tells how the COVID-19 vaccine can be harmful and dangerous, will keep people’s eyes to the screen. A story like this would also be surprising to the audience, keeping them entertained. Outside of news broadcasts, social media platforms like Twitter or Facebook are popular for sharing stories because it can be shared to a wide audience with only a single click [6]. False vaccination stories will spread very quickly on social media platforms because of this share feature. Dramatized things like escapes, accidents, searches and rescues, siegeds, battles and court cases all get much more attention, so again, the media will focus on things related to drama. Big, relevant stories sweep across the media because when they are relevant, have a large magnitude, or contain drama, people will want to share more information they have learned. While more and more people are able to get vaccinated, it becomes more relevant for everyone, and more interesting to learn about the vaccination and the process, and potential side effects. Using social media, more people can spread information more quickly and easily, without having to double check or even fully read an article. With this fast paced sharing, disinformation uses the foundations of media described above to move and find its way into the spotlight of social media.

## **MISINFORMATION & VACCINES**

With trusted articles and trusted websites pointing out the false research, there will still be antitrust and anti-vaccine movements. People will look to those in charge especially ones they believe have their best interests at heart. Former President Donald Trump was a large participant in the spread of this antitrust and anti-vaccine campaign [2]. Letting his devoted followers know that they shouldn’t fear this virus, and that they shouldn’t let it control their lives, he actively put others in danger, while spreading the idea that this virus is nothing more than the common cold. Researchers at Cornell university found that Trump was the single largest driver regarding the spread of the misinformation about the virus [3]. By actively encouraging people to be unafraid of the virus, but simultaneously created fear around the vaccine, more and more people began to distrust the vaccine, and the entire pandemic as a whole.

Although it is easy to spread misinformation about the COVID-19 vaccine, there are websites that will help in disproving the false information. Websites like Retraction Watch, and Iffy.news are just two examples of websites that show misinformation and point to the true facts. A lot of research that has been done on the vaccine has been disproven on these websites, but people would rather believe what they want instead of having to double down on what they previously believed.

While there are people who distrust the vaccine and people who trust it, there are still the select group who are still

undecided. This group is the most important when establishing the trust [2]. According to Professor Neil Johnson, he claimed that the undecided group of people were much more interested in the misinformation, because it was the most interesting. The true and trustworthy information was not as desirable because it was much less interesting. Due to this, the ones who don't trust the vaccine are more likely to be entangled with the undecided [9]. This only makes misinformation and the spread much more dangerous since the undecided only want to look at these topics, and can talk to others who feel the same way, without looking at the true facts. Johnson believes that within the next few years, the mistrusters will be in the majority of the population [9]. The easier it is to spread the misinformation to friends and family who have yet to decide if they trust the vaccine, the easier it will be to get the majority to distrust the vaccine.

Russia has also always been a big part in scare tactics. Sputnik V, the vaccine created by the Russians, was created as a way to make themselves look technologically advanced, and boost domestic morale, but because this was created so quickly, it was criticized for how quickly it was approved [5]. Claiming it was "first made", this vaccine encouraged nationalism in Russia, and claimed to be better than the United States and other Western vaccines like Pfizer. It was also discovered that Russian intelligence services were linked to websites that published false information that questioned the legitimacy of Western vaccines and the safety of these in order to make their vaccine look like the best. Russia wants to look good internationally and domestically, so by publishing misinformation surrounding the western vaccine theirs and theirs alone will look like the proper vaccine and the only one that is safe for others to use [5]. Westerners find these websites and false claims about the vaccines and use it as a way to form distrust around each other and distrust the vaccine based on Russian propaganda.

To learn more about the behavior surrounding the misinformation about the vaccine, OSoMe's core activities show 100+ billion tweets that can be used to look at how fast information is spreading on Twitter. As well as the tweet collection database it also allows the user to conduct research to "understand the cognitive, social, network, and algorithmic factors" that allow misinformation to spread so rapidly. The research that is done by OSoMe can help determine how trustworthy all the information and sources are that are online [10]. We can use these tools to establish a connection between the misinformation and the spread of it through social media. It will provide inside information on ways to understand cognitive, social, network and algorithmic factors that lets the media be manipulated. Collaborators of the data are grabbed from computer scientists, journalists, physicists, cognitive scientists, political scientists, and sociologists to really grasp the impact of the spread of the COVID-19 vaccination misinformation.

In response to all of the misinformation, research like CoVaxxy has been created. To look at the relationship

between the COVID-19 vaccine and the adoption of misinformation, CoVaxxy is a core tool that will help with this. It has many different relationships to visualize, such as hashtags, geographic data, correlating data, and still much more that is available for the public to view. CoVaxxy can help find the ways misinformation is spread online. Instead of ignoring the rapid spread of misinformation, Twitter and YouTube have created algorithms to make more relevant information more present, while simultaneously not censoring the disinformation. These algorithms are made to not censor this information because of the power they have to save lives. The rapid ability to share information can be helpful as long as the information being spread is true and lets its users know when the information they are reading is false. To counteract this, Facebook banned anti-vaccine ads and Twitter created warning labels on misinformation letting the user know that this has been fact checked, and is wrong. Twitter also banned Donald Trump because he was such a huge component in the rapid spread of misinformation. These are just two ways social media is discouraging people to spread misinformation around and give them the opportunity to look at true, science backed evidence. By creating these algorithms, it allows for more people to be able to view the proper facts and information instead of solely relying on misinformation spread around too quickly.

## DATA ANALYSIS

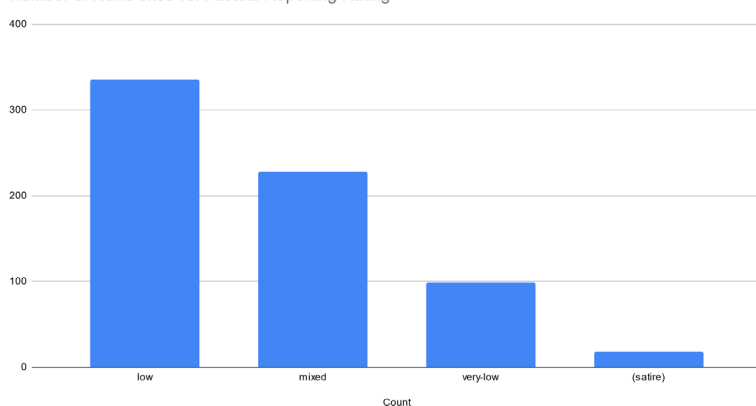
Osome standing for the Observatory of Social media is a joint project with the Network Science Institute, Center of Complex Networks and Systems research(CNetS), the Luddy School of Informatics, computing and Engineering at Indiana University and The Media School at Indiana University. The main Goal of Osome is "to understand the cognitive, social, network, and algorithmic factors that make the media landscape vulnerable to manipulation, and design interventions and incentives to mitigate these vulnerabilities. Osome consists of many different projects to help achieve these goals including: Hoaxy, Botometer, Fakey, BotSlayer, EchoDemo, Bot Electioneering Volume, and Covaxxy. Each of these tools is a cleverly named research visualization and amalgamation tool that aims to pinpoint a particular issue. The data that is most relevant to the topic is the data from Covaxxy.

CoVaxxy's specific goal is "visualizing the relationship between COVID-19 vaccine adoption and online (mis)information" Due to the sheer size and complexity of Covaxxy, all of Covaxxy's data wasn't necessarily relevant. Most data from CoVaxxy was publicly available and accessible from the Covaxxy page. Taking this into account, cherry picking the correct data sources was paramount. Covaxxy focused mostly on twitter data boasting a discussion map, vaccine adoption map, correlations between the two datasets, hashtag usage, most shared sources of low credibility and mainstream sources by week, and United States Vaccine Uptake.

Due to the topic, understanding what sources are reliable and which sources are not will determine the validity and value. Mediabiasfactcheck.com was integral in qualifying how much misinformation or disinformation is floating around in the media. Mediabiasfactcheck.com is reputable due to their transparency of both their monetary income broken down by percentages and their transparency of how exactly each news site is graded. The percentage of Mediabiasfactcheck.com consists of the following: 89% of revenue from advertising, 10% of revenue from Membership Fees, 1% of revenue from donations. If 99% of revenue is self funded, Mediabiasfactcheck.com has vested interest in keeping their data as accurate and uncorrupted as possible. The way that Mediabiasfactcheck.com grades each news source is also transparent. A scale ranges from 0 to 10 with each set of numbers indicating different meanings; 0-2 least biased, 2-5 Left/Right Center Bias, 5-8 Left/Right Bias, 8-10 Extreme Bias. Each news site is judged upon the following categories: Biased Wording/Headlines, Factual/Sourcing, Story Choices, and Political Affiliation. A score is then given for each category and then averaged to give a reasonable estimate of how biased a source is.

Utilizing specific aspects of the rating system allows for more drilled down analyses. Using the Factual Reporting Rating allows for the quantification of dis/misinformation sources(example given below)

Number of News sites vs. Factual Reporting Rating

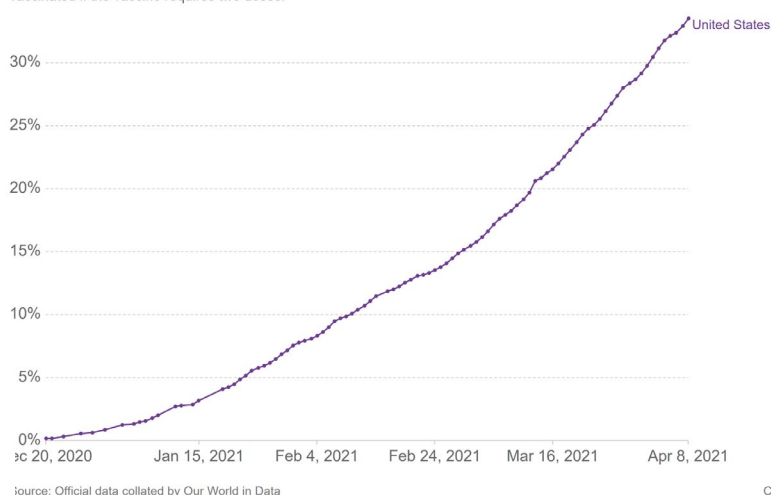


Our World in Data is a publication that focuses specifically on “the large problems that continue to confront us for centuries or much longer and the long-lasting, forceful changes that gradually reshape our world.” As a result Our World in Data has one of the largest publicly available real time data sets on various aspects of the COVID-19 Pandemic. Our World in Data is all data collected from different sources and people.

Due to the topic being related to vaccinations for COVID-19 having data about COVID-19 Vaccinations is very important. This data set was found as a cited source for Covaxxy and contains mostly information related to medical affairs (e.g. hospital room capacity, death toll, test numbers, etc.)

Our World in Data has a very robust innate data-visualization module. Because of this some of the visualized data was used through this module and saved as a PNG(example Given below). However, to layer various other types of data either from other sources or from some sources within the raw data, the dataset had to be downloaded and analyzed.

Share of people who received at least one dose of COVID-19 vaccine  
Share of the total population that received at least one vaccine dose. This may not equal the share that are fully vaccinated if the vaccine requires two doses.



The Our World in Data dataset has data that is mostly health focused. Much of the data is centered around the number of Covid Cases, Vaccine Adoption rates per country, number of deaths, excess mortality, hospitalizations, etc. Our World in data was very Health focused. This helped with pairing data that showed a more cultural of social significance, such as adoption of masks and mortality rates.

The third Dataset that was used was the Delphi Epidata Center. The Delphi Epidata Center was also discovered through the Osome Covaxxy references. The Delphi Epidata Center is a research group based out of Carnegie Mellon University. Their mission statement is that they are “dedicated to developing the theory and practice of epidemic tracking and forecasting.” They have been “supporting and advising the U.S CDC in their community-driven COVID-19 forecasting effort.” As a group backed by a university and an advisor to the CDC, the data that they provide is reputable.

The data utilized by the Delphi Epidata Center is accessed through both an API and a CSV dataset export module featured on the Delphi Epidata Center Website. To access some of the data, the API was accessed and installed through a pip install of Python. Then the requisite fields were extracted and converted into a csv file format. Other data has been extracted from the csv export module that is embedded into the website.

Covid DATA Api covid tracking project is a website that deals with tracking data about coronavirus and changes throughout viewing the API. As of now the project stopped due to being a year of covid. So the API will give me information from March 7th 2020 to March 7th 2021. New fields can be added without warning for example, say a new mutation of the virus comes into play then a new field will be created for such mutation of corona. It consists of multiple types of files for example a JSON format with a README file or CSV file which is a delimited file for Excel. Fields that include for this API will consist of date, dateChecked, death, deathIncrease, hash, hospitalized, hospitalizedCumulative, hospitalizedCurrently, hospitalizedIncrease, inIncuCumulative, inICUCurrently, lastModified, negative, negativeIncrease, onVentilatorCumulative, onVentilatorCurrently, pending, posNeg, positive, positiveIncrease, recovered, states, total, totalTestResults, totalTestResultsIncrease. If you cypher through the website, you can also notice how there are multiple values for different countries, US, or even states within the US. If I want to single out a certain state then I am able to do so given the API and data I am given. I am able to check if anything is missing anything data integrity wise.

This fact sheet for the vaccine is by one of the big Pharma companies like Pfizer, Moderna, and Johnson & Johnson. This PDF includes a sheet about how vaccines are administered and that it is administered correctly. It

discusses how the vaccines are stored and being taken care of properly when administering.

The CDC website is a factual and trusted website, that allows us to double check and make sure the data is factual.

Anaphylaxis, an acute and potentially life-threatening allergic reaction, has been reported rarely following COVID-

Vial	Thaw in Refrigerator	Thaw at Room Temperature
Maximum 11-Dose Vial (range: 10-11 doses)	Thaw in refrigerated conditions between 2° to 8°C for 2 hours and 30 minutes. Let each vial stand at room temperature for 15 minutes before administering.	Alternatively, thaw at room temperature between 15° to 25°C for 1 hour.
Maximum 15-Dose Vial (range: 13-15 doses)	Thaw in refrigerated conditions between 2° to 8°C for 3 hours. Let each vial stand at room temperature for 15 minutes before administering.	Alternatively, thaw at room temperature between 15° to 25°C for 1 hour and 30 minutes.

19 vaccination. These interim considerations provide recommendations on assessment and management of anaphylaxis following COVID-19 vaccination. Detailed information on CDC recommendations for vaccination, including [contraindications and precautions](#) to vaccination, can be found in the [Clinical Considerations for Use of COVID-19 Vaccines Currently Authorized in the United States](#). Patients should be screened prior to receipt of each vaccine dose, and those with a contraindication should not be vaccinated.

## CONCLUSION

After reading upon what the sociology of social media is we can gain a deeper understanding of what makes up an influential post. These news values and characteristics of an influential post use motivated skepticism and other human psychological effects to keep the viewers attention. With a viewer's grasp on the post, all that is left is to show them information and they have a larger chance of believing it. The Covid vaccine has been a hot topic in the last year and has seen massive amounts of disinformation. With influential characters from news anchors to presidents everyone has had their opinion widely shared with the massive online platforms we use. Our deeper understanding of media and trends among the US regarding vaccine acceptance, disinformation spreading, and much more using online tools, we can see how easy it is to discern disinformation. Having this understanding is key to allowing more people to have the tools to discern disinformation. There is no way to simply stop disinformation. The only way to slow it's spread is informing people on the things we have discussed in this paper. With that, we can finally visualize vaccine disinformation.

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