ABSTRACT

Government Agency, Non-Governmental Organization and General User Twitter Accounts: A Rhetorical Analysis of the Dissemination of HPV Vaccine Information

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In this experiment, public health information dissemination about the HPV vaccination is explored between two groups of Twitter accounts, government agencies and non-governmental organizations versus other interacting Twitter users. The usage of the rhetorical strategies personal narrative, word choice, and sentiment and post frequency was evaluated between the two groups, with the hypothesis in support of other interacting Twitter users having increased usage of rhetorical strategies and more frequent posting. To conclude, the two-week long experiment, it was found that the other interacting Twitter users demonstrated better rhetorical strategy usage in their posts, especially when it came to informational terms, and posted more frequently. At the end, government agencies and NGOs struggled with infrequent posting and lack of rhetorical strategies which could prevent accurate vaccine information from being disseminated on social media sites like Twitter and the ability of misinformation to be more easily spread by other users as well.

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GOVERNMENT AGENCY, NON-GOVERNMENTAL ORGANIZATION AND GENERAL USER TWITTER ACCOUNTS: A RHETORICAL ANALYSIS OF THE DISSEMINATION OF HPV VACCINE INFORMATION

A Thesis Submitted to the Faculty of

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By

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF GRAPHS

CHAPTER ONE

Introduction to the Topic of the HPV Vaccine and Social Media: A Literature Review

Social media is a vital tool in our society, and health information makes up a significant portion of its content. Especially in 2020, health information about COVID-19 and prevention measures for this virus exploded on social media, and sites like Twitter were relied on as sources of up-to-date information about the virus. Another topic that gained traction in the health information world was the HPV vaccine. In 2011, the Gardasil vaccine was released for the first time by Merck and immediately met controversy online. Some posts were from parents worried about the negative side effects of the vaccine and the early childhood exposure to sexuality through the inoculation of a vaccine for a sexually transmitted disease (Wiyeh et al 6317). Many parents would explicitly post on social media sites like Facebook about how they would never let their children be injected with a vaccine like this with it being so new (Wiyeh et al 6319).

With posts such as these circulating on social media about the vaccine with the potential to help significantly reduce HPV infection rates, and prevent cervical and other cancers, government organizations and research groups released their own posts to help combat the fears and stigmas associated with the Gardasil HPV vaccine. Some health groups used short videos featuring physicians communicating about how the vaccine was safe for use and effective in its purpose (de Vere Hunt et al 1253). Other groups used informational fact posts and stories from people in health care to encourage people about the importance of the vaccine (Pedersen 4912). Lastly, different government agencies worldwide even contributed by posting on their social media about reminding the

physicians in their country to keep up with the inoculation series for the HPV vaccine and its potential positive impact for their communities (Pereira da Vega 1827). Eventually, as the vaccine persisted in many countries as a medically important and relevant vaccine for cancer prevention, governmental agencies and non-governmental organizations (NGOs) began to speak more about the benefits of the vaccine and its importance for our younger populations on different social media sites through their own accounts.

In terms of key players towards the push for positive and informational media surrounding the HPV vaccine, let's define a governmental agency, also known as a government agency, and an NGO. A government agency is defined as, "any agency or entity of the Federal Government or a State or local government," ("Governmental Agency" *Cornell Law*). This means that government agencies are groups or organizations formed within a government that often have assigned tasks in a certain field or issue to maintain order in society. In this case, people are concerned with organizations like the Center of Disease Control, which is a government agency tasked with assisting the American public in preventing the spread of disease that could cause great harm to people. On the other hand, an NGO is "typically a mission-driven advocacy or service organization in the non-profit sector," ("Nongovernmental Organizations (NGOs)" *Harvard Law School*). An NGO serves its community on a mission or passion of their choosing and they work to create initiatives promoting their mission and help their community in need without making any profit from doing so. Both government agencies and NGOs serve vital roles in the dissemination of knowledge to their communities as they are often trusted sources of information and assistance in obtaining resources for those in need of it. Thus, they are incredibly vital in influencing the public opinion on

different issues because of their sponsorship from their local, state or national government to maintain societal order, and their drive to fulfill their missions for their communities.

Furthermore these organizations are important in the discussion of HPV vaccination because they serve as important vessels of public health information dissemination among the general public using social media as a resource for up-to-date information (Chen et al 4442). Vaccination news in general is important to these health organizations in general because of the importance of vaccines in the prevention of illnesses and their spread (de Vere Hunt et al 1256), but any news helping to better understand how these vaccines work and clear misconceptions or misinformation is vital towards ensuring the general public remains safe from the harm illnesses like HPV can cause. Especially in times of public health concerns or emergencies, these organizations are relied upon by their community for disseminating new info quickly and effectively to keep the public aware and informed of any dangers (Zeng and Li 1). Along with these organizations themselves, many science research groups for public health and vaccination studies also help to assist these organizations in bettering the public knowledge of vaccines like the HPV one so that the public can better understand the science behind these technologies and interact between other users accurate information, instead of rumors (Su et al 1). These research groups can help government organizations in posting about the efficacy and facts on the HPV vaccine so that there can be virtual communities created on social media of users that can better communicate about the vaccine and exchange accurate information (Empinotti 55), thus reducing the spread of misinformation on the vaccine.

As stated previously, government agencies, NGOs and public health and vaccine research groups are all important users on social media sites that promote the benefits of the vaccine, especially with research groups making partnerships on these sites to help regain public trust of the vaccine (Pedersen 4911). Obviously, social media consists of other users besides these groups. Any user has the ability to post anything they wish to state about the vaccine on these sites (Veale et al 1). Thus, other groups exist that either come to support the HPV vaccine, show concerns about its safety or effectiveness, or project a negative viewpoint of the vaccine. Some users rally behind the government agencies and NGOs and show support for the vaccine because of the huge issue cervical cancer (an illness that could be caused by long-term persistent infections of HPV) is for women, and HPV remains one of the most common sexually transmitted diseases among the general public that often remains undetected (Madden et al 3741). However, there are many female users, such as mothers of young female children, that display concern for the vaccine and hesitancy towards inoculation for the Gardasil series for reasons such as negative rumors, fertility concerns, fear of negative adverse health consequences, and even fears of secret government population reduction plans spread through vaccine misinformation (Wiyeh et al 6317). These social media users contribute to the voices of those hesitant about the vaccine and whether it can be trusted as safe for their children and effective in preventing devastating illnesses like cervical cancer. Another group that exists purely to spread negative information about the vaccine are misinformation groups. These groups serve a purposeful mission to change people's view on social media to theirs, even if the information being used to do so is fake or altered in a way to be more believable to an unaware audience (Chen et al 102665). These groups purposefully

discuss the HPV vaccine in a negative light using misinformation to either widely project their own personal opinions on the matter or to influence a large number of people towards their perspective on the issue. Unfortunately, these groups do succeed in creating negative discussion of the HPV vaccine that can impact the amount of people willing to initiate and complete the inoculation series.

As a last point of discussion, it's important to look at how social media has become such an important source or point of dissemination of public health information. For starters, people spend significant amounts of time on social media during their day because of the wide variety of information available and media they can interact with for entertainment (Bhattacharya et al 1). Additionally, because of the speed and constant real-time updates across all these social media sites that can be easily accessed through internet sources like Google or Safari, people often use social media to keep up to date on news and other information they are curious about. Especially for public health information, around 80% of adults in the U.S. now look towards the internet and social media as a source of information on different health news and topics (Madden et al 3741). Because of the large amount of people that use the internet for health information, misinformation runs wildly through these sites (Massey et al 2) on different health issues such as vaccines, and the speed of the internet and simple user ability to interact with these sites allow for misinformation to quickly spread as well (Thompson et al 1400). Because of this, health organizations, such as government agencies and NGOs, try to help deflect misinformation on the internet and curb users towards factual and truthful information about health news like the HPV vaccine (Pedersen 4910). In order to do this, these agencies work to better communicate with these public social media users through

different campaigns like personal narratives and informational posts providing accurate vaccine information (Pedersen 4911). Additionally, other social media campaigns also exist internationally from government agencies and NGOs to help in combating HPV vaccine information through a variety of different medias (Chen et al 4442) in order to ensure reliable and accurate information is available to social media users to make informed decisions about their health that isn't skewed by misinformation. Social media has become one of the most important resources and tools in the spread of HPV vaccine information to the public, and it will continue to be as society becomes further entangled in the internet and its various sites. Because of this, government agencies and NGOs need to work even harder against misinformation to make sure accurate HPV vaccine news is seen more widely by the public instead of false information that could cause detrimental harm both now and to future generations.

Research Questions

In this experiment, I am evaluating the differences between how government agencies and non-governmental organizations tackle the dissemination of HPV vaccination information on social media in comparison to other users. Overall, I am examining what rhetorical techniques are implemented in these posts, such as personal narratives, word choice, and sentiment, to influence viewers of their post to be interested in their ideas. For this experiment, the questions I am using to help guide my evaluation of the content in the tweets are:"What rhetorical techniques are being used in social media posts in public health dissemination and how were they being used?", "With their social media posts and the rhetorical techniques employed in these posts, who is most

engaged with real time discussion of HPV vaccination?", and "What are the general attitudes or sentiments contained within these tweets when discussing information related to the HPV vaccine?" . These questions help me to assess how government agencies and NGOs utilized social media messages on HPV vaccination in comparison to other users, and if they were effective in disseminating their information.

My first question, "What rhetorical techniques are being used in social media posts in public health dissemination and how were they being used?", allows me to see how government agencies and NGOs fulfill their obligation or mission to better serve the public in the cause they support. I wondered if these groups would choose to have a more formal and informative way of communicating HPV vaccine information on social media in order to maintain a professional and reliable image to the public they serve. In comparison, I'm curious to see if other users on social media were attempting to use other strategies to communicate HPV vaccine information like graphics, threats, conspiracy theories, or humor to bring to light a particular opinion on the vaccine. Since other users on social media do not hold the same obligations as government agencies and NGOs do to serving the public or fulfilling a specific mission, other users have more freedom in the content they choose to post and how they utilize their posts to bring about certain reactions from other users. Ultimately, the freedom that other users have allows them to have the ability to make more radical statements either for or against the vaccine.

My second question in this analysis is "With their social media posts and the rhetorical techniques employed in these posts, who is most engaged with real time discussion of HPV vaccination?". While either of these two groups could've used different strategies to spread information on the vaccine, the most important thing is

whether or not users have continued to post during issues surrounding the vaccine, in order to provide accurate information about the vaccine amidst controversy or misinformation. This can be evaluated using the social media site of this experiment, Twitter, through checking the amount of posts that were posted during the time period of data collection. A successful account in terms of engagement with real time HPV vaccine discussion shows a consistent frequency in posting. So, I want to assess which of the two groups are better able to stay engaged with users on their posts using the rhetorical strategies they employed on their posts.

My final question for this analysis is, "What are the general attitudes or sentiments contained within these tweets when discussing information related to the HPV vaccine?". This is an important final question I want to evaluate for this experiment because I am curious to see if public attitude was leaning in favor or against the HPV vaccine. In general, I wonder if the social media posts on Twitter by these two groups are sending out particular messages on the vaccine that could have people turn away from accepting the inoculation series for themselves or for their children. Because of the controversy and sexualization of this vaccine, I hope to see if the vaccine posts with a positive sentiment are helping people turn towards the important benefits of the vaccine or if people are more secure in their beliefs of the negatives of the vaccine with their posts.

Functioning Hypothesis

For this experiment, I believe that other user posts on Twitter will both be more frequent in the posting of their tweets as a whole group and better disseminate

information about the HPV vaccine unlike government agencies and NGOs because they will use a variety of different rhetorical techniques to create more engaging posts and will be more frequent in interacting with discussions on any new information on the HPV vaccine. This hypothesis also comes from the idea that people often like to have people like themselves discuss important information, such as health, and discuss risks and rewards (de Vere Hunt 1253), and that other users may be more frequent in their posts about the HPV vaccine than government agencies and NGOs who do not always engage well with other users on their own posts (Zeng and Li 1).

CHAPTER TWO

Methods

Why Twitter?

For this experiment, any social media site could have been subject to analysis of rhetorical strategies using term and/or hashtag searches. Previous experiments on HPV vaccine social media rhetoric have been conducted on social media services such as Instagram, Facebook, and Weibo. However, Twitter at the time of data collection had allowed the most access to data mining of its posts without any payment to do this. Unfortunately, Twitter has made new API changes to their system so it is unclear whether Twitter will continue to be a social media site that can continue to have data mined from it without payment. The computer extension, NCapture, can be used while logged into Twitter to download tweets related to a particular term or hashtag, and have its data easily uploaded into software to analyze the data like Microsoft Excel. Additionally, Twitter allows for particular searches of posts by term or by hashtag, which will help in narrowing down the relevant posts needed for analyzing rhetorical techniques. Thus, Twitter was chosen as the medium that was most interactive and easiest to use for analyzing data related to the social media posts of government organizations and NGOs versus other users on the site.

Participants Chosen

In order to evaluate the differences between government agencies and NGOs and other users, two groups of Twitter users were selected to be participants for this

experiment. In general, much of social media research and data collection relies on the idea that much of social media content that could be searched up on the internet is public (Ravn et al 1). Meaning, one could search up '#viral' and any non-private data could appear in this search on Twitter. There can be concern that someone could access private accounts to take information from users who haven't consented to the use of their tweets in research studies (Ravn et al 1), however for this one with NCapture, only those made on public accounts were pulled. Additionally, no usernames or other identifying information is used in this experiment in order to maintain the most anonymity and privacy possible. This experiment is solely numerical in data.

In terms of the participants, the first group was that of the government agencies and NGOs. In this group, 14 organizations on Twitter were selected that post about vaccines, HPV, cervical cancer, and other topics that could relate back to the HPV vaccine. This group includes both American and international organizations because simply pulling from American organizations was not enough to comprise a solid list of Twitter accounts to pull enough tweets from. The government organizations and NGOs and their Twitter accounts included are as follows: hpvandme.org (@hpvandmeorg), HPV Action Network (@HPVAction), HPV Roundtable (@HPVRoundtable), CDC (@CDCgov), CDC Cancer (@CDC_Cancer), CPSTF (@CPSTF), ACS National Roundtable on Cervical Cancer (@cervicalRT), Oxford Vaccine Group (@OxfordVacGroup), Vaccinate Your Family (@Vaxyourfam), NCCC (@StopHPVCancer), HPV Cancers Alliance (@HPVAlliance), Project HPV Free (@projecthpvfree), HPV Cancer Free GA (@HPVCancerFreeGA), and NOMAN is an Island (@NOMANCampaign).

For the second group of participants, the participants were pulled from a search using particular terms and hashtags to pull tweets relating to the HPV vaccine and the dissemination of

its information. The tweets were pulled from the "Latest" page so the most recent and relevant posts about the vaccine were pulled in order to be aligned with the current perspectives on the vaccine (at the time of pulling the data). The terms and hashtags in which posts were pulled from were: #hpvvaccine, #gardasil9, #gardasil, #hpv, 'HPV', 'HPV vaccine', 'gardasil9', and 'gardasil'. These terms were chosen as they are popularly used terms and hashtags associated with the discussion of the HPV vaccine.

Procedure

For the procedure, the steps that will be described were repeated throughout the two week-long data collection process and were not altered at any point. On each day of data collection (the Monday, Wednesday and Friday of each of the two weeks), an account created solely for the purpose of collecting the Twitter data was logged into. Then in the search bar, either a term like "HPV" or a hashtag like "#gardasil" was entered and a page of results was generated with multiple tabs available along the top of the page. The tab needed for this research was the "Latest" tab, and not the "Top" tab that was automatically generated when a term or hashtag was entered into the search bar. Thus, once the search was generated, the "Latest" tab was clicked on and utilized. Once all the tweets under the "Latest" tab were populated, the NCapture tool from the Google Chrome Extensions was clicked on and activated. In the pop-up, the only option altered before the full download of tweets from the "Latest" tab began, a quick title for the download was entered, which was simply either the title or hashtag that was entered into the original Twitter search. Once this was entered, the download was initiated and completed after a few minutes.The download was then loaded onto a USB for data collection before data analysis began. For the term and hashtag search for the other users, this same process was

repeated Monday, Wednesday, and Friday for the two weeks for each of the terms and hashtags mentioned in the *Participants Chosen* section.

For the government agencies and NGOs pages, the NCapture download only occurred once at the end of the two week-long data collection phase. For each of the pages listed above in the *Participants Chosen* section, the account was searched in the Twitter search bar and the correct page was chosen from the search results. Once this was done and the accounts populated on the screen, the tab on the account for "Tweets Only" was chosen in order to ensure that only the responses affiliated with that account were downloaded by NCapture and used for data analysis. Once it was ensured that the "Tweets Only" tab was being viewed, the NCapture download was activated, and the download was titled whichever account was being downloaded. Once the title was set, the download was initiated, and after a few minutes, was completed. The completed download was then saved onto a USB for data collection and to be used later in data analysis. This process was repeated for each of the government agencies and NGOs Twitter accounts. Additionally, only posts that were created within the two week data collection were considered, and all others were left out in order to fairly compare the frequency of posts between these two organizations and other users.

Technology Used

In terms of the technology utilized for the data collection, everything was able to be conducted through an Apple Pro software. A new Twitter account was created so it could be completely clear of other searches or recommended topics that a personal account could influence during the search for the posts. The extension of the NVivo

software, NCapture, was downloaded onto the Google Chrome Extension service and was used to pull tweets from either each government agency or NGO page, or from each tweet and hashtag search page. Once the NCapture download was generated, the file was put through the Baylor created Google Lab code known as "NCapture Twitter Word Frequencies" in order to convert the NCapture data into an Microsoft Excel file for data analysis. The Baylor created Google Lab code, "Calculate VADER Sentiment from Excel" was also used in Excel for sentiment analysis.

Data Collection

In the data collection phase, Twitter was used in order to find the needed posts related to the HPV vaccine. For the second group of other users described previously in the *Participants Chosen* section, the data was collected over a period of two weeks from March 27, 2023 to April 7, 2023 and this time period was chosen because it correlated to a California State Congressional Session in which the CA AB659 was up for vote which would require parents to vaccinate their children for the HPV vaccine, along with their other needed immunizations that public schools required. This bill on Twitter was already causing a surge of discussion on the vaccine and its effectiveness and safety. Additionally, a period of two weeks was chosen in order to collect enough data that could be used for analysis and not give an inaccurate perception of the data. The data was collected during the two weeks on Monday, Wednesday and Friday, and the posts were pulled from the "Latest" page of each of the terms and hashtags within their specific searches.

For the first group of the government agencies and NGOs, a single NCapture data download was done on April 7, 2023 in order to collect all the tweets these pages released during the data collection time and even prior. A single download was done on each Twitter account for the government agency and NGOs because their pages did not drastically change by the thousands of tweets on the subjects like it did for the data collection on the other users with their term and hashtag searches.

Data Analysis

All Twitter data analyzed from the Ncapture downloads for the different terms and hashtags was uploaded onto Excel for analyses on frequency and rhetorical strategies. Numerical data on the number of posts, and word search for word choice and personal narrative terms was used in Excel. The VADER tool will be utilized for sentiment analysis with the NCapture data in differentiating between positive and negative feelings in the different posts through Excel.

For post frequency data, the Excel sheet generated from the "NCapture Twitter Word Frequencies" is used where the entire amount of tweets is counted for both the government agencies and NGOs and the other users' hashtags and terms search. For the other users' section, since these terms were specifically targeted towards information about the HPV vaccine, there wasn't a secondary manual sorting process that occurred where I had to double check whether the posts pulled actually discussed the vaccine or not. However, for the government agencies and NGO page, I personally went through all the tweets from these accounts to only include those mentioning the HPV vaccine, and not another cause the account may advocate for.

For personal narrative, the term search is used in Excel to count the number of occurrences in the tweets of the terms ‘experience’, ‘my’, ‘me’, ‘mine’, ‘journey’, and ‘story’ has occurred for each government/NGO account and for each hashtag and term for the general users. This amount will be counted and used to compare within both the individual categories of government agencies/NGOs and other users via hashtags and terms, and comparatively between the two groups.

For word choice, five categories of terms were searched within the government agency/NGOs Twitter accounts and hashtags and terms. The five categories are Fighting (‘battle’, ‘ignite’, ‘resist’, ‘fight’, ‘protect’, and ‘defend’), Political (‘CDC’, ‘FDA’, ‘government’, ‘politician’), Fear (‘tragedy’, ‘mistake’, ‘terrible’, ‘terrifying’, ‘horrible’), Informational (‘fact’, ‘research’, ‘guide’, ‘data’, ‘information’, ‘learn’, ‘know’), and Argumentative (‘argue’, ‘explain’, ‘prove’, ‘verify’, ‘exemplify’) Terms. A search will be done in each Excel sheet for the government agency/NGOs account data and each hashtag and term data sheet to count the amount of time each of the words within each of the categories appear within these tweets. The amount of times a term appears will be compared within the two individual groups and between the two groups as well.

For the final analysis, sentiment, the “Calculate VADER Sentiment from Excel” will be used for each government agency/NGOs and hashtag and terms spreadsheet to compare the average sentiment within each group and account and between the two groups as well. For sentiment, the values for the VADER range from -1 to 1 that would be considered positive are those closer to 1, neutral is close to 0, and negative is anything close to -1. Once these values are generated, they will be averaged among all the values

in the spreadsheet and these averages will be calculated and compared within the two groups and between the two groups as well.

CHAPTER THREE

Results

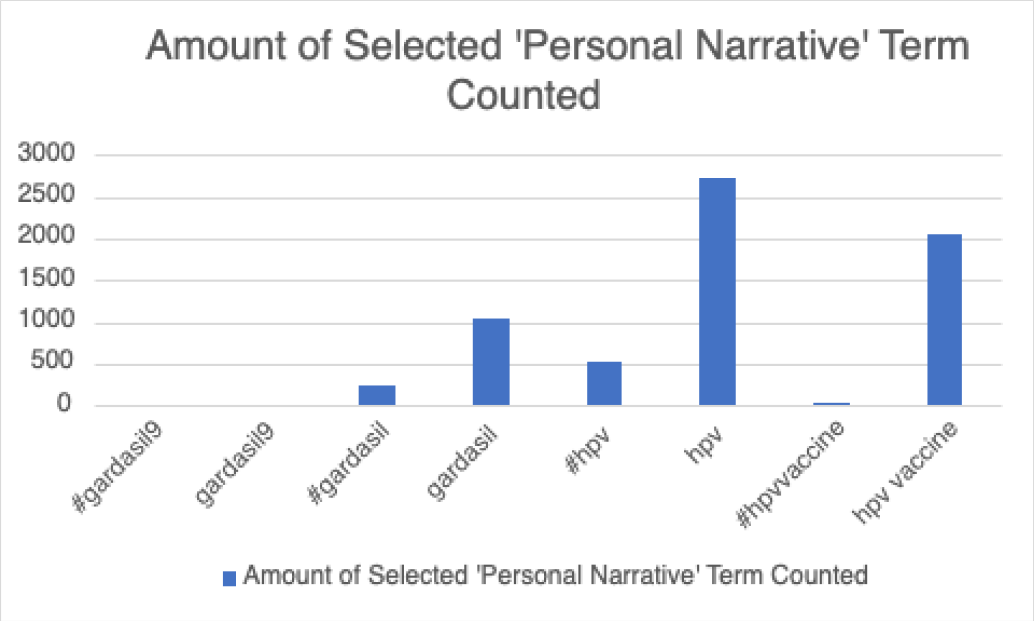
Rhetorical Strategies

At the conclusion of the data collection period, a trend occurred when analyzing the data between the government agency/NGO Twitter accounts in that there were almost none of the selected rhetorical strategies that appeared in the data set below studied in this two-week period of time. Only the word "learn" appeared five times and "know"appeared once amongst all the tweets from these accounts. There was no trace of any of the "Personal Narrative" terms or the other "Word Choice" terms either. Because of this, much of the data for the government agencies/NGOs are considered quantitatively insignificant because there is little contributing numerical value to the data for these sections. However, there are enough posts that were collected that had sentiment values within the government agencies/NGOs posts which are documented here to discuss the general attitudes presented within the posts that contained information and discussion related to the HPV vaccination.

In terms of the other users' tweets through hashtags and term searches, many of the terms also did not generate HPV vaccination related posts through the two week period. In the graphs that will follow for the results section in terms of the other users' tweets, they will only pertain to the eight hashtags and terms from this group.

Personal Narrative

Because of the lack of data for the government agencies/NGOs for personal narrative, the main focus of this part of the rhetorical analysis will solely focus on the other users' hashtags and terms.



GRAPH 1: Amount of Times the Selected Personal Narrative Terms Appeared in Other Users' Hashtags and Terms

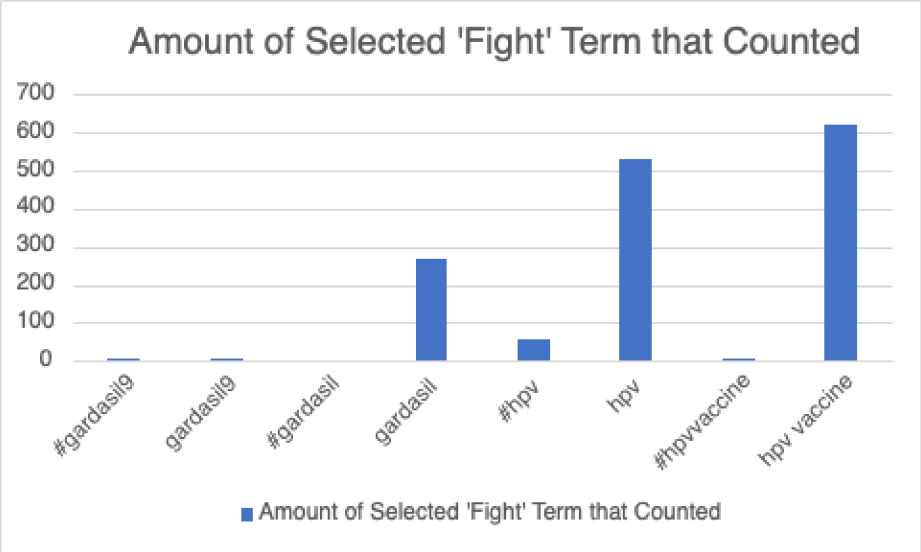
Overall, 'hpv' and 'hpv vaccine' were the two terms that had the most amount of personal narrative related terminology in them. Meaning, that 'me', 'mine', 'my', 'story', 'experience', and 'journey' were seen the most within tweets in these categories versus those in the other. In 'hpv', personal narrative terms numbered about 2731 in total with "me" being one of the most prevalent out of all of the terms present. On the other hand, none of the selected personal narrative terms selected for this experiment were located in the posts under the '#gardasil9' and 'gardasil9' categories and personal narrative was not

a factor at all of the rhetorical strategies and characteristics of the posts located within this category.

Word Choice

In general, word choice is also only considering the other users' hashtags and terms because of the lack of any of the selected terms from 'Fighting', 'Fear', 'Informational', 'Argumentative', and 'Political' in the posts associated with government agencies and NGOs. Thus, only the other users' posts will be used for this analysis since they contain the relevant material.

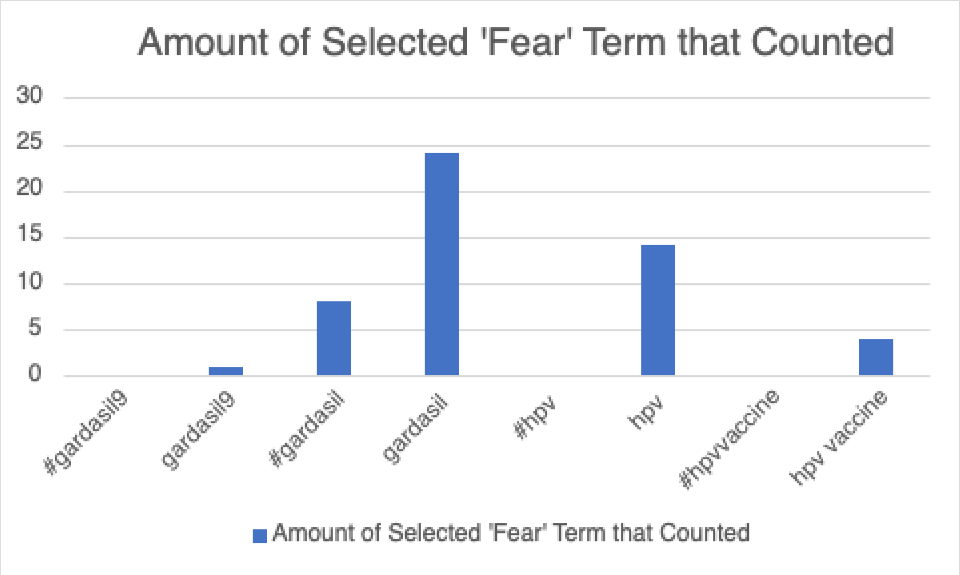
Fighting Words. For fighting words, the results are detailed below in the bar graph that demonstrates the total number of those words that appeared in the posts. All of the other word choice categories will also have their bar graphs arranged like this.



GRAPH 2: Amount of Times the Selected ‘Fighting Words’ Terms Appeared in Other Users’ Hashtags and Terms

For fighting words, ‘hpv’ and ‘hpv vaccine’ had the highest occurrences of these types of words of 531 and 622 occurrences respectively. In both terms and in the other hashtags and terms that contained these words, the word ‘protect’ was the most popular with it appearing 374 times on the ‘hpv’ posts and 652 times amongst all the categories here.

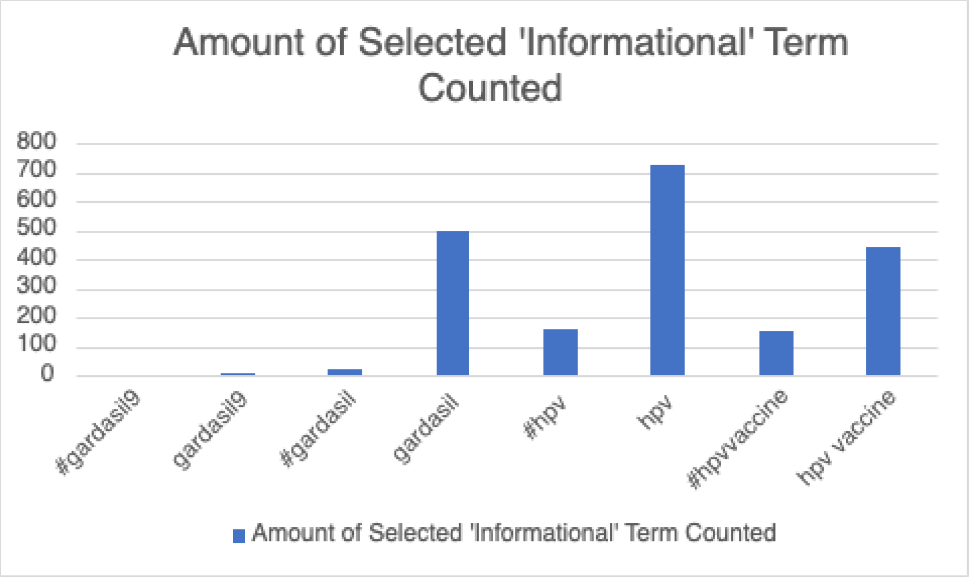
Fear Words.



GRAPH 3: Amount of Times the Selected ‘Fear Words’ Terms Appeared in Other Users’ Hashtags and Terms

For fear words, these occurred most in the ‘gardasil’ term category, with ‘hpv’ being the second most numerous. For the ‘gardasil’ category, ‘mistake’ was the most popular term used with 11 occurrences amongst all the posts and ‘terrible’ having 9 occurrences. For the three of the categories, ‘#gardasil9’, ‘#hpv’, and ‘#hpvvaccine’, there were no occurrences of these selected fear words occurring within the posts. Additionally, fear words were not nearly as numerous in total occurrences as the ‘fight’ words within the posts across all the hashtags and terms.

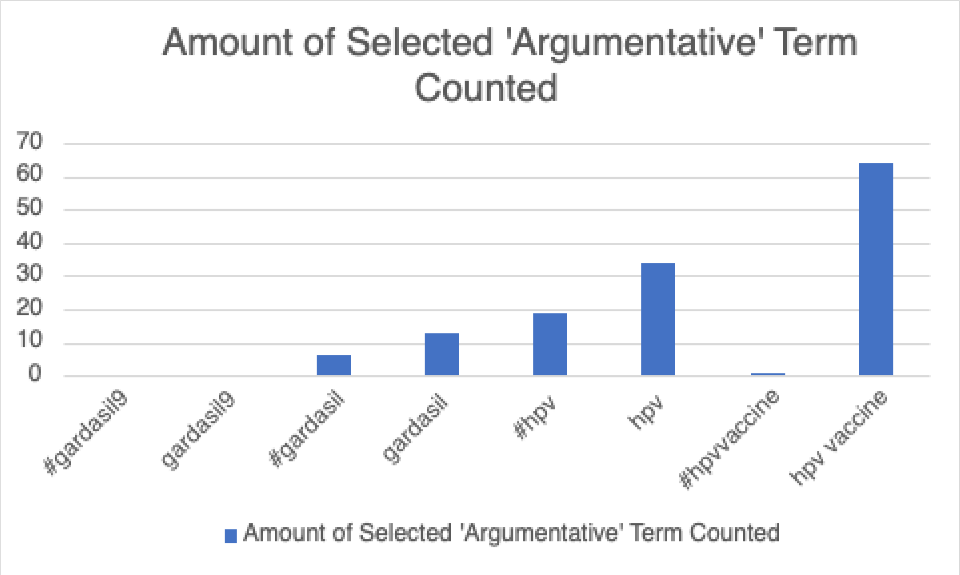
Informational Words.



GRAPH 4: Amount of Times the Selected 'Informational Words' Terms Appeared in Other Users' Hashtags and Terms

In this category, 'hpv' once again prevailed in having the most informational selected terms within its posts. The most popular terms include 'know' with 235 occurrences, 'research' with 187 occurrences, and 'learn' with 141 occurrences within the 'hpv' posts. 'Gardasil' also saw a lot of occurrences as well with informational terms with 'learn' being the most numerous term for them at 292 occurrences among all the posts. In terms of total occurrences overall, informational terms were popular amongst other user posts and were similar in prevalence to the 'fight' words category for word choice.

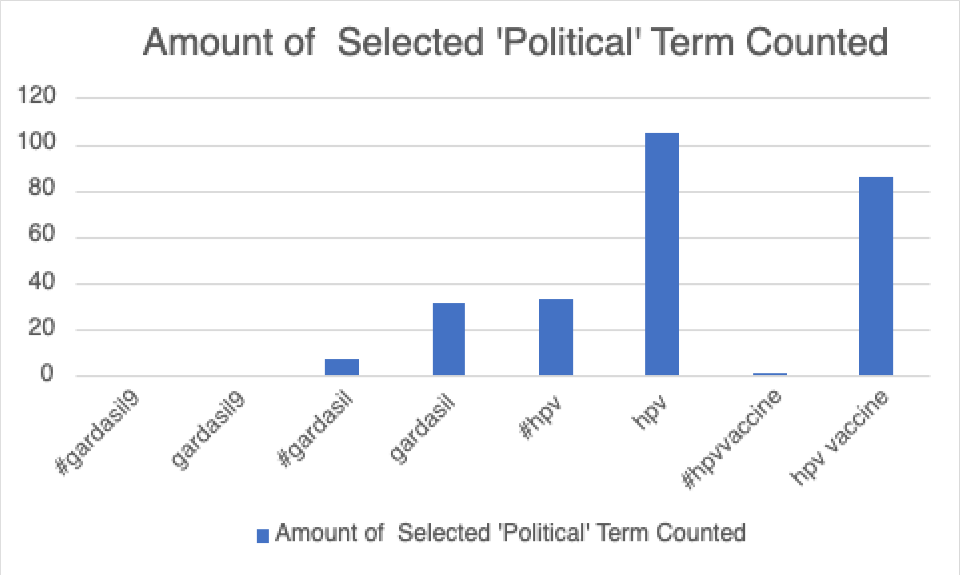
Argumentative Words.



GRAPH 5: Amount of Times the Selected 'Argumentative Words' Terms Appeared in Other Users' Hashtags and Terms

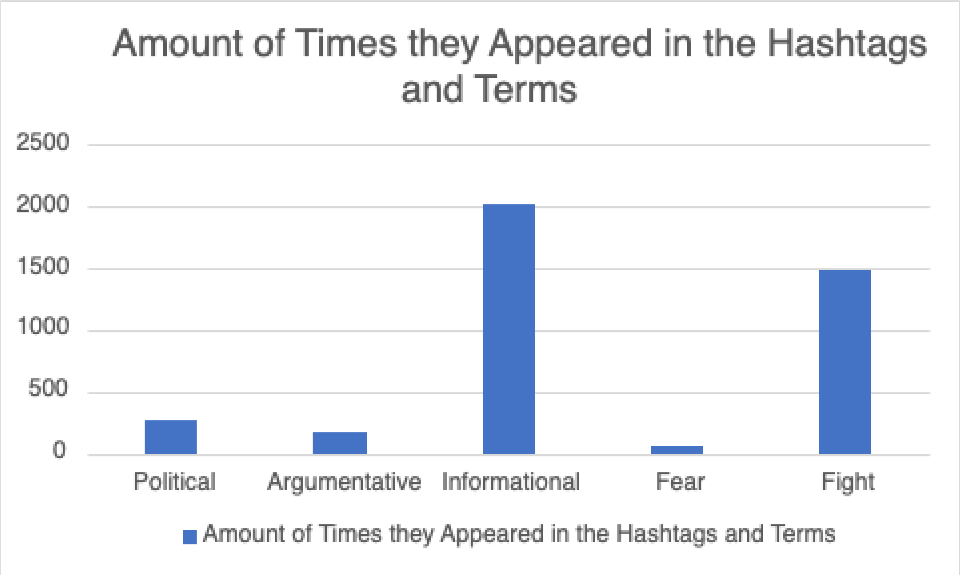
In terms of the argumentative words, these shared a similar prevalence overall among all the posts in the other user categories that 'fear' words had. This category overall wasn't nearly as large in number as the 'fight' or 'informational' words were. For this category, 'hpv vaccine' had the largest amount of 'argumentative' terms with a total of 64 occurrences, with 'prove' having 36 occurrences and 'explain' having 28 occurrences in the data set. Among the rest of the terms that had argumentative words included in them, 'prove' consistently was the most common occurrence out of all the selected terms in these posts.

Political Words.



GRAPH 6: Amount of Times the Selected 'Political Words' Terms Appeared in Other Users' Hashtags and Terms

For this final category, political words had the highest number of occurrences in the 'hpv' and 'hpv vaccine' category. In 'hpv', there were 105 total occurrences of political terms, with 'CDC' being the most numerous with 47 occurrences within the posts. 'CDC' also was the most numerous in occurrences in the 'hpv vaccine' category as well with a total of '50' occurrences among this term's posts. However, the political terms did not occur as much within the data set as 'fight' and 'informational' words did.



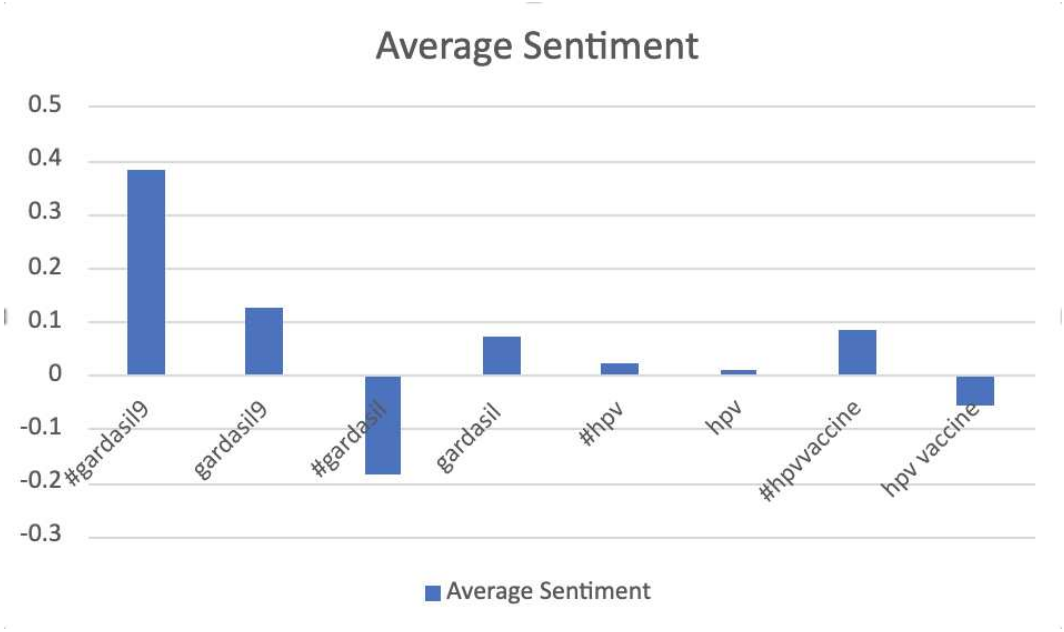
GRAPH 7: Total Number of Occurrences of Each Type of Term

To conclude, when totaled for the amount of times each category of the selected terms appeared among all the other users' hashtags and terms, 'informational' had the most total occurrences with 2,011 occurrences and 'fight' selected terms were the second highest with 1,479 total occurrences. On the lower end, the 'fear' selected terms had the lowest total appearance in the posts with only 51 total occurrences out of all the posts in the hashtags and terms category.

Sentiment Analysis

For the sentiment analysis, both the government agencies/NGOs and the other users' hashtags and terms were able to have posts be collected for sentiment analysis. Once again, for the other users' hashtags and term search, because only relevant tweets related to HPV information were already pulled for tweets related to HPV vaccination

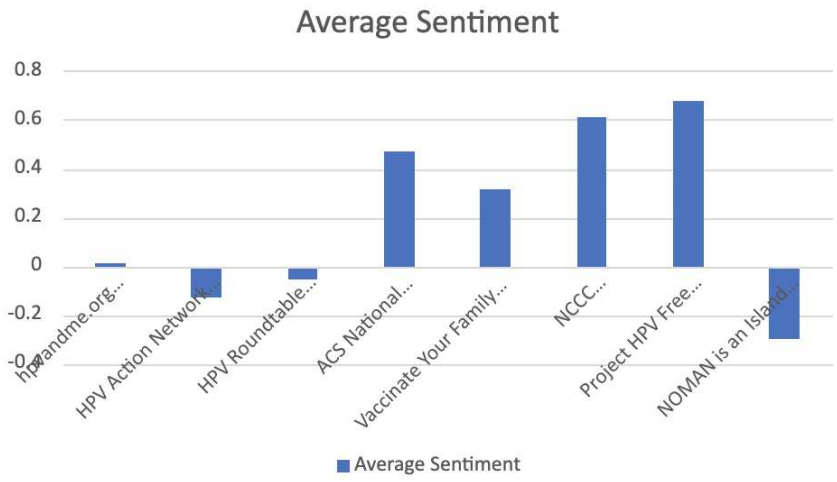
information, these posts were able to go through the “Calculate VADER Sentiment from Excel” without any prior edits. For the government agencies/NGOs, manually sorting of the tweets had to occur in order to only reference tweets on these pages that related to HPV vaccination information for sentiment analysis. The relevant tweets were placed on a separate Excel sheet for VADER analysis.



GRAPH 8: Average Sentiment of Posts Among Other Users’ Hashtags and Terms

In general, for the other users with each of the hashtags and terms, only 2 of the terms, ‘#gardasil’ and ‘hpv vaccine’, exhibited an average sentiment from their tweets that had a negative value attached to it. Especially, ‘#gardasil’ had the most negative value of -0.186, which indicates that there were more posts made by users in this category that had negative attitudes to them than the other categories. On the other end, ‘#gardasil9’ had the highest sentiment value of 0.3818, but this is only considering the

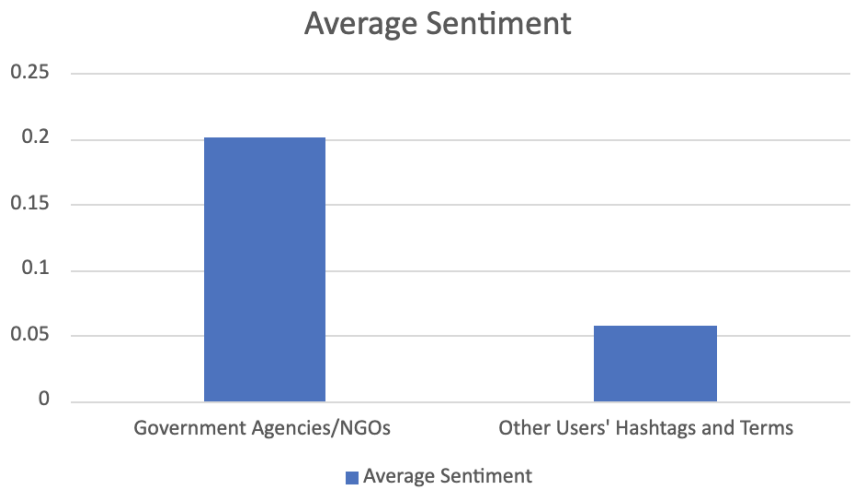
singular post that fulfilled discussion of the HPV vaccination for all the posts in this hashtag. Thus the more reliable section for a positive sentiment analysis value that contains a significant amount of posts is '#hpvvaccine', which had a sentiment value of 0.084 representing 124 posts under this hashtag from this data collection period. In general for many of the other hashtags and terms, their sentiment values were not too far from zero, which demonstrates that the average sentiment of the posts from each of these hashtags and terms are more neutral than more positive or negative for the HPV vaccination.



GRAPH 9: Average Sentiment of Posts Among Government Agencies and NGOs' Posts

For the government agencies/NGOs, there were more significant values for sentiment analysis for positivity and negativity. Interestingly, 'NOMAN is an Island' demonstrated an average sentiment analysis of -0.296 for their posts to have the most negative sentiment out of all the accounts with HPV vaccination posts with their content

on their accounts. On the other hand, 'Project HPV Free' and 'NCCC' had high positive sentiment analysis values of 0.6779 and 0.6124 associated with their HPV vaccination posts, indicating that there were strongly positive attitudes about HPV vaccination that were expressed in the posts from these organizations. Several other accounts also exhibited much higher positive sentiment values than those seen in the other users' hashtags and terms' results.



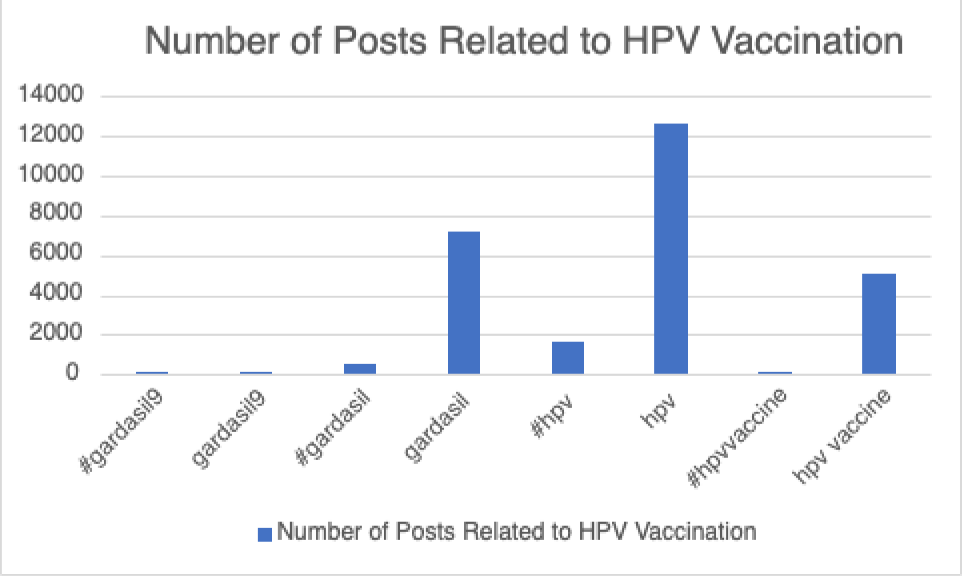
GRAPH 10: Comparison of the Average Sentiment between Other Users' and Government Agencies and NGOs

For the final part of the sentiment analysis, the average of all the government agencies/NGOs accounts' and other users' hashtags and terms' sentiments were averaged together to figure out the overall sentiment of these two distinct groups. The government agencies/NGOs had a much higher positive sentiment value of 0.202 with posts about HPV vaccination information than for the other users' hashtags and terms which had a more neutral value of 0.057. In general, government agencies/NGOs had more strong

positive attitudes in their posts about HPV vaccination than the posts contained within the other users' hashtags and terms which expressed more neutral attitudes towards vaccination.

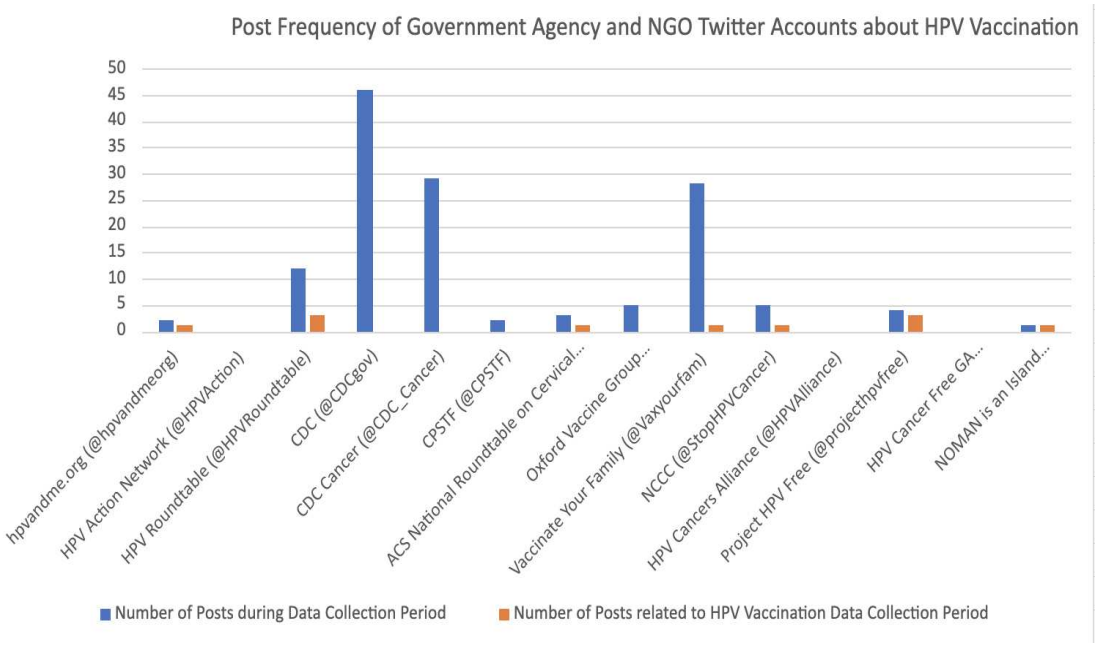
Post Frequency

For post frequency, both the amount of posts pertaining to the eight hashtags and terms and those related to the government agencies and NGOs. Overall, both groups demonstrated some form of posting, both consistent and inconsistent, during the two week period of data collection and didn't demonstrate any inactivity overall as a whole group.



GRAPH 11: Number of Posts Among Other Users' Hashtags and Terms during Data Collection

For the other users', all of them had shown frequent posting and because the relevant hashtags and terms discussing HPV vaccination were already selected during the rhetorical analysis, there was no need to separate which posts out of all of those pulled from NCapture contained HPV vaccination information or not. Overall, 'hpv' had the most number of posts related to HPV vaccination at 12683 posts. At the low end, '#gardasil9' had the least amount of posts related to HPV vaccination during the data collection with only one post being pulled with HPV vaccination information. Besides '#gardasil9' and 'gardasil9 with nine posts, all of the other categories had at least over 100 hundred posts related to HPV vaccination. Thus, the other user posts through hashtags and term searches demonstrated frequent posting about HPV vaccination during the data collection period.



GRAPH 12: Number of Posts Among Government Agencies and NGO during Data Collection

For government agency and NGO Twitter accounts, there was a staggering difference between the number of tweets the accounts posted during the data collection, and how many of them were directly related to HPV vaccination. With these accounts, they did have to be manually sorted to only include posts that were relevant to HPV information since the tweets were only pulled from the account's page itself and not by a hashtag or term search from relevant information. So the blue in the graph is reflective of the total number of posts that each account had posted on their account during the data collection period, and the orange is reflective only of the posts that contained HPV vaccination information. Many of the accounts had posted several times within the data collection period, with the CDC general account posting the most at 46 posts. However, despite the accounts having frequent posts, very few of them actually mentioned anything related to HPV vaccination at all, despite the discourse about the vaccine online from the California bill trying to be passed at the time. Only a few accounts engaged in the discussion of HPV vaccination and several accounts hadn't posted at all within the two week data collection period. Additionally, some of the accounts had large periods of inactivity during the data collections period, with the HPV Cancer Free GA account having not posted in about a year. So, while many of these accounts did show activity in posting, many of them didn't post anything related to HPV vaccination, despite many of their goals being related to HPV cancer-caused prevention and awareness.

CHAPTER FOUR

Discussion

Discussion of Results

Overall, the data supports the *Functioning Hypothesis* of this experiment. The other users on Twitter were the most frequent in their posts about HPV vaccination, unlike the government agencies and NGOs. Additionally, the other users on Twitter used a variety of rhetorical strategies in their posts among the different hashtags and terms such as personal choice, an abundance of the selected terms from the word choice category, and expressed a close to neutral sentiment about HPV vaccinations and other information surrounding them. Among all the data, three major trends can be noted that significantly contribute the differences and capability in information dissemination between the two groups: the high presence of informational word choice, the infrequency of posting by government agencies and NGOs, and the trend of positive sentiment for government agencies and NGOs and neutral sentiment for the other group of interacting users.

High Presence of Informational Word Choice

Overall, there was a high presence of informational word choice out of all the selected terms in the word choice category of the rhetorical analysis for the other interacting user group. On its own, there were 235 occurrences of the term “know” for the ‘hpv’ term category. The word ‘know’ appeared in only one term category, more than a whole group of selected terms appeared in the whole data set, such as with the “Fear

Words" selected terms. The high presence of informational words makes sense as a whole in tweets discussing public health information in order for people to explain to the public how a disease works, prevention strategies, and other related information during an outbreak event of a disease or pathogen that is a huge public health concern (Tao et al 8). Using informational terms can help users with no knowledge of the subject better understand what is going on in terms of the public health concern and what they need to do to be safe. Even with the lack of rhetorical strategies analyzed from the government agencies and NGOs in this data set, the only word choice rhetorical analysis terms that were identified were those from the 'Informational Words' category. It seems that especially for the HPV vaccination, the informational terms were highly present in tweets from the other interacting users category in order to educate others on the vaccine information they had knowledge of. With the use of informational terms, there are several functions this can serve towards the discussion of HPV vaccination information, such as helping to correcting discourse on misinformation with facts that counteract misleading information (Tao et al 8), or with public health bloggers with a background in public health or a desire to spread accurate health information, emerging to spread accurate information about health facts and data (Tao et al 9), like the HPV vaccine, so social media users exposed to this information can make educated decisions on their health based on accurate research and data, and not information. With all of this in mind, it does make sense as to why informational terms appeared the most in the data set out of all the other terms in the word choice set of the rhetorical analysis, because they are used the most to help educate public users about health information, like the HPV vaccine.

Infrequency of Posting by Government Agencies and NGOs

Another trend in the data that is significant is the infrequency of posting by government agencies and NGOs during the data collection time period. Even though the California bill was in discussion on Twitter and many of these organizations are American, many of them either had very few posts about the HPV vaccine during this data collection time period that were very minimal in information on the direct post, or they didn't post at all. In fact, some of the accounts hadn't posted all in several months, and HPV Cancer Free GA hadn't posted in a year. The lack of posting by these organizations is alarming because their role on social media sites like Twitter is the provide quick information dissemination about public health emergencies or concerns to the general public so that accurate facts are at the disposal of these users (Zeng and Li 1). However, most of these accounts failed to meaningfully take part in the discussion by posting information about the HPV vaccine in response to concerns from parents or misinformation about the vaccine. In fact, in other research this a common trend in that many government agencies have low response rates to user concerns on public health issues, like the HPV vaccine, because they maintain their focuses on public health information tweets only, rather than responding to concerns or misinformation (Bhattacharya et al 2). Additionally, if these organizations believe that the issue is not a current top public health concern or emergency, posting infrequency begins more and more across these accounts about particular public health topics (Pang et al 14). Meaning, if these organizations do not view HPV vaccination as a way to deter an immediate public health threat to a large part of the public population, their frequency in posting about the

vaccine will decrease. Thus, it is not surprising that the government agencies and NGOs showed infrequent posts about the HPV vaccine versus other interacting Twitter users because they seem to spend more time prioritizing public health information they view as emergent and a top concern in the moment for citizens, rather than posting about topics that they view as not an immediate concern. This may explain why there is a much higher post frequency amongst other interacting users because they feel the need more to respond to others and are not held to the same constraints of being a leader in public health information dissemination like government agencies and NGOs are.

Government Agency and NGOs versus Other Interacting Users' Sentiment

Lastly, there was the trend in the government agencies and NGOs in the tweet data set presented with an average positive sentiment of 0.202, while other interacting users' tweets overall had a more neutral sentiment of 0.057. This trend in sentiments for both groups aligned with expectation because government agencies and NGOs in support of the HPV vaccine would most likely post positive messages about the vaccine and its information, while the other group can have both a mix of positive and negative information about the vaccine since they have no obligation to the public to present only accurate information and data about the vaccine, and they are absolutely more free to post their own opinions. The objectives and roles that government agencies, and similar agencies like NGOs, play in disseminating public health information is to positively engage the public in providing accurate data, and help to correct misinformation present as well (Durowaye et al 2). Additionally, government agencies play an especially important role in public health information dissemination as they are often in charge of

"crisis management" in times of public health concerns and emergencies so that only the most accurate of information is available to the public, and not falsehoods or misinformation (Pang et al 2). Government agencies and NGOs are obligated to spread objective, truthful information about things like the HPV vaccine because of their role as a powerful influence as a government entity or relayer of health information to the public on social media. Thus, there is positive sentiment in these tweets because there isn't information that is contained in these tweets that would significantly decrease the overall sentiment of these tweets. However, the other interacting users' don't have this public obligation to serve as a truthful fact relayer to social media users on Twitter, so they are more free to express their feelings and personal opinions. And, with the amplification of all of these messages across sites like Twitter (Tao et al 9), a solid mix of both positive and negative sentiment tweets among other interacting users can be present which allows for the more neutral sentiment score to be seen in this group of users and accounts. In conclusion, with the public obligation to spread factual information on public health topics, government agencies and NGOs are more likely to have an average positive sentiment in their posts about topics like HPV vaccination than other interacting users that are not held to this same public obligation.

The Failures of Government Agencies and NGOs in this Experiment

Overall, it is intriguing by the end of this experiment to see how little of the government agencies and NGOs used any of the rhetorical strategies and how infrequently they posted in this data set. After the analysis of the results and looking back at the tweets themselves from the data set, there are two reasons for why other interacting

Twitter users had more significant results in the rhetorical analysis and posting frequency than government agencies and NGOs.

The first is that the government agencies and NGOs really do stick all too well to their role as solely information in content. In fact, most of the tweets in the data set from this category followed the same exact format as pictured in Figure 1 in having some statistic-based opening line, a phrase about finding out more information on another website, the link to the other website, and some media like a image that had something pertaining to HPV vaccination. And if not that, then they retweet a different government agency's or NGO's tweet containing that same format.

FIGURE 1: A screenshot from a tweet on the @CPSTF Twitter account during the data collection period.

Because of this repetitive format, there were no standout tweets that contained something unique about the HPV vaccine in the tweet itself. It required a user to leave Twitter to go to an external link about HPV vaccination. However, when a Twitter user from the general public is trying to quickly get an update on public health information, they are most likely not going to choose having to jump to a bunch of different separate websites for information versus reading a tweet that contains all the information already within it without an external website being needed. This format is severely limiting these accounts from disseminating information in their own tweets without reliance on an external website to explain everything for them.

This entire issue can be summarized by the Health Belief Model of public health, in which people are to be encouraged by certain cues presented by sources of health information to make decisions about their health and wellbeing. Meaning, if people perceive a benefit and see themselves as susceptible to the health issue at hand, they will be more likely to act on a situation to fix that, like with getting a vaccine. However, government agencies fail in that they assume that people will always choose a situation in which they will act upon a health decision just because a threat is perceived or they are susceptible. People need to decide for themselves to act upon an issue and it may take time for that to happen, such as with the Transtheoretical Model that allows for different stages of thought like precontemplation and contemplation to encourage people to take the independence to digest the information they are presented with and make the decision for themselves. Unfortunately, instead of giving people the opportunity to think about action and providing all the information for people like users on Twitter to think about a decision and then act on a decision, government agencies and NGOs fail in that they

assume that if people see a threat to their health wellbeing then, they would act upon it to fix the situation. However, people will not immediately pursue a solution if they really don't perceive the threat to be of immediate harm to them, and thus may require resources to help encourage the precontemplation and contemplation stages to help them think through a decision. These accounts fail to encourage people to think about taking their health decisions into their own control and instead only provide possible threats to their safety through the hyperlinks and one-liner facts that begin their repetitive messaging.

The second issue is once again posting infrequency. As mentioned earlier, previous research studies have shown that government agencies seem to post more during emergent situations (Pang et al 14) and will decrease their posting in non-emergent ones. Based on this idea, it seems that the infrequent posting may be a way of these accounts expressing that HPV vaccination is not a top health concern for these groups and that there are other issues that take precedence. While this makes sense at times for accounts like the CDC that are the central organizations for all diseases, it's concerning how accounts only focusing on the HPV vaccine are also following this trend, despite not having a focus on other health issues in their goals and missions. If these accounts also post infrequently, this may send signs to the public that HPV vaccination really isn't as important for them, and this can negatively influence people away from inoculation. If these HPV vaccine focused accounts are posted on more frequently, a general, public user may be better able to see the importance of HPV vaccination as a way to prevent future health concerns in their futures. However, until this frequency of posting improves, the

role and importance of the HPV vaccine seems much more diminished than it should be on social media.

Implications of this Research on HPV Vaccination Communication on Social Media

In general, the goal in this research is to demonstrate the potential gaps between other users on Twitter and government agencies and NGOs in how they communicate with users on a public social media platform. There seemed to be an unfortunate trend in that government agency and NGO accounts would infrequently post about HPV vaccinations, despite a purpose of their account to be in informing the public in a timely and effective manner (Zeng and Li 1), or would just seem to completely stop posting entirely. Additionally, the repetitive lack of rhetorical strategies that could be used to convince the general public of the importance of the HPV vaccine is concerning, as people may not want to engage with an account that doesn't make an effort to engage with users in different ways. Additionally, the repetitive use of the same format to post information may not be effective in reaching all of the account's target audience as some users may better absorb information about HPV vaccination from the singular post itself or a series of posts on the account, instead of constantly being referred to an external link to explain everything about the vaccine. If government agencies and NGOs in support of the vaccine wish to relay the importance of the vaccine to the general public on social media sites, they may need to increase their frequency in posting about the vaccine and try utilizing some different rhetorical strategies in order to keep up the evolution and frequency of the HPV vaccination discussion among other users on Twitter.

Error Analysis and Limitations

In this experiment, there were several limitations that prevented a further in-depth analysis on the rhetorical strategies and posting frequency of government agencies and NGOs and other Twitter users. One would be that a longer period of data collection couldn't be conducted for a more long-term analysis of trends. Because of the limited two week data collection period, there could have been opportunities missed to see other new HPV vaccine discussions appear with the controversy of the potential implementation of the HPV vaccine to the required school vaccine requirements in the U.S. states like California. Additionally, government agency and NGO accounts that didn't post within the two weeks of data collection may have had more engaging posts that could've possibly contributed to a positive addition of rhetorical strategies being utilized by these accounts, or better frequency in posting different materials.Additionally, I do wish that this study could've been expanded to social media sites like Facebook and Instagram to see if the discourse on the HPV vaccine is different there and if these types of accounts behave differently in the content they post and how often they post on these other sites. However, due to the lack of easily accessible data mining tools for these sites, there was an inability to expand the collection of data from these other social media sites.

In terms of errors, there were several instances in this experiment where data was lost and had to be recovered due to inexperience with the data mining technology utilized. There were several times where I had struggled with using these tools and may

have lost valuable data in the process of this experiment with not saving the files properly. Additionally, there could've been the presence of duplicates of tweets in the data as the NCapture tool doesn't do a stellar job in removing duplicate posts under these hashtags and tweets. These duplicates could've skewed the data away from a more accurate representation of the data from the other users; hashtag and term search. These two errors may have been the most prevalent issues I had in the process of this experiment.

For Future Experiments

If I were to have the ability to conduct future experiments on this topic, there would be two things I would do. First, I would try to see how these different accounts go about disseminating HPV information on other social media sites. As mentioned earlier, Facebook and Instagram are two other incredibly popular sites that may also contribute significant information on the impact of how posting frequency and rhetorical strategies can impact the dissemination of HPV vaccine information on social media. The second thing I would expand the terms I used in the *Word Choice* section of the rhetorical analysis to see if more data could be contributed to how well these accounts do in communicating different sentiments in regards to HPV vaccine information with additional terms being considered in the search and analysis.

WORKS CITED

Bhattacharya, Sanmitra, et al. “Social Media Engagement Analysis of U.S. Federal Health Agencies on Facebook.” *BCM Medical Informatics and Decision Making,* vol. 17, no. 49, 2017, pp. 1-12.

Chen, Liang, et al. “Promoting HPV Vaccination on Social Media: Interactive Effects of Threat, Efficacy and Social Cues.” *Human Vaccines & Immunotherapeutics,* vol. 17, no. 11, 2021, pp. 4442-4456.

Chen, Sijing, et al. “Persuasion Strategies of Misinformation-Containing Posts in the Social Media.” *Information Processing & Management,* vol. 58, no. 5, 2021, pp. 1-23.

De Vere Hunt, Isabella, et al. “A Social Media-Based Public Health Campaign Encouraging COVID-19 Vaccination Across the United States.” *American Journal of Public Health,* vol. 112, no. 9, 2022, pp. 1253-1256.

Durowaye, Toluwanimi D., et al. “Public Health Perinatal Promotion during COVID-19 Pandemic: A Social Media Analysis.” *BMC Public Health*, vol. 22, no. 895, 2022, pp. 1-12.

Empinotti, Marina Lisboa, and Rita de Cássia Romeiro Paulino, “Altmetrics and Journalism: Using Twitter Comments to Analyze Public Engagement.” *Journal of Digital Media and Interaction,* vol. 1, no. 1, 2018, pp. 55-67.

“Governmental Agency.” *Cornell Law,* https://www.law.cornell.edu/definitions/uscode.php?width=840&height=800&iframe=true&def_id=12-USC-1003829559-381552562&term_occur=2&term_src=title:12:chapter:11:section:1441a%E2%80%933. Accessed 24 October 2023.

Madden, Kelly, et al. “Sorting Through Search Results: A Content Analysis of HPV Vaccine Information Online.” *Vaccine,* vol. 30, no. 25, 2012, pp. 3741-3746.

Massey, Philip M., et al. “Dimensions of Misinformation About the HPV Vaccine on Instagram: Content and Network Analysis of Social Media Characteristics.” *Journal of Medical Internet Research,* vol. 22, no. 12, 2020, pp. 1-17.

“Nongovernmental Organizations (NGOs).” *Harvard Law School*. https://hls.harvard.edu/bernard-koteen-office-of-public-interest-advising/about-opia/what-is-public-interest-law/public-service-practice-settings/international-public-interest-law-practice-setting/nongovernmental-organizations-ngos/. Accessed 24 October 2023.

Pang, Patrick Cheong-Iao, et al. "Engagement of Government Social Media on Facebook during the COVID-19 Pandemic in Macao." *International Journal of Environmental Research and Public Health,* vol. 18, no. 7, 2021, pp. 1-19.

Pedersen, Eva A., et al. "Strategic Health Communication on Social Media: Insights from a Danish Social Media Campaign to Address HPV Vaccination Hesitancy." *Vaccine,* vol. 38, no. 31, 2020, pp. 4909-4915.

Pereira da Veiga, Cássia Rita, et al. "Facebook HPV Vaccine Campaign: Insights from Brazil." *Human Vaccines and Immunotherapeutics,* vol. 16, no. 8, 2020, pp. 1824-1834.

Ravn, Signe, et al. "What Is 'Publicly Available Data'? Exploring Blurred Public-Private Boundaries and Ethical Practices Through a Case Study on Instagram." *Journal of Empirical Research on Human Research Ethics,* vol. 15, no. 1, 2020, pp. 40-45.

Su, Leona Yi-Fan, et al. "Generating Science Buzz: An Examination of Multidimensional Engagement With Humorous Scientific Messages on Twitter and Instagram." *Science Communication,* vol. 44, no. 1, 2022, pp. 30-59.

Tao, Zhuo-Ying, et al. "Nature and Diffusion of COVID-19-related Oral Health Information on Chinese Social Media: Analysis of Tweets on Weibo." *Journal of Medical Internet Research,* vol. 22, no. 6, 2020, pp. 1-20.

Thompson, Erika L., et al. "Exploring Novel Strategies for Social Media HPV Vaccine Information." *Human Vaccines & Immunotherapeutics,* vol. 17, no. 12, 2021, pp. 5397-5401.

Veale, Hilary J., et al. "The Use of Social Networking Platforms for Sexual Health Promotion: Identifying Key Strategies for Successful User Engagement." *BMC Public Health,* vol. 15, no. 85, 2015, pp. 1-11.

Wiyeh, Alison B., et al. "Social Media and HPV Vaccination: Unsolicited Public Comments on a Facebook Post by the Western Cape Department of Health Provide Insights into Determinants of Vaccine Hesitancy in South Africa." *Vaccine,* vol. 37, no. 43, 2019, pp. 6317-6323.

Zeng, Runxi, and Menghan Li. "Social Media Use for Health Communication by the CDC in Mainland China: National Survey Study 2009-2020." *Journal of Medical Internet Research,* vol. 22, no. 12, 2020, pp. 1-21.