Impact of the Overturning of Roe v. Wade on Online Patterns of Twitter Users

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Abstract

Between April 1st and August 1st of 2022, there were at least 11,000,000 abortion-related tweets. Brought about by two major events, the Supreme Court's decision to overturn Roe v. Wade and the earlier Politico leak of the decision, many people reacted through social media, specifically Twitter. Using this dataset, we randomly sampled 1,200 tweets from the larger pool for categorization and basic sentiment analysis. Two factors were considered for categorizing: stance on abortion (pro-choice, pro-life, neutral) and the context of the tweet (informative, emotional, directive, ideological, political, anecdotal). Polarity levels were calculated for pre- and post-Roe's overturning to compare, and chi-squared analyses were run to show that significant associations exist between certain stances.

Motivation

The Supreme Court Dobbs decision that overturned the landmark case Roe v. Wade this past summer left the entire nation in a state of shock and ensuing disarray and turmoil. More notably was the resounding impact it had on the emotional and personal well-being of individuals able to give birth. The overturning of Roe v. Wade meant a significant blow to the fight for more accessible reproductive healthcare, knowledge, and rights. And while different in its social and political implications, like all controversial news, Twitter exploded upon the ruling's official (and unofficial) announcement. The incredible uptick in the quantity of tweets is no surprise, behaviorally, social media users are expected to engage and create much more when there is something to express their opinion about.

Rather than just identifying such a trend, the motivation behind this project was to characterize the uptick in tweets. Even with just some understanding of the culture of Twitter, it is obvious that there will be tweets that display incredible devastation, for others elation. There will be tweets that call upon their followers to protest, to rally, to inform and educate. There will be tweets that attack politicians, morals, tweets that tell stories. In an attempt to explore the ways in which pivotal events like Dobbs impact how social media is used, our group set out to categorize abortion-related tweets into various categories and stances, wanting to see how they changed over time, pre- and post- overturning. Social media platforms, especially ones like Twitter where user-to-user engagement is so quick and can easily happen on a large scale (small accounts going viral), hold a powerful position in today's generation as a provider of information.

Research Questions

How did the overturning of Roe v. Wade impact the frequency of tweets pertaining to categories like directive, informative, emotional, political, ideological, and anecdotal? Is there any relationship between a given category and whether or not a tweet is characterized as pro-life or pro-choice. What is the distribution of tweets' polarity across two time periods: April-May 2022 during the Politico leak of the decision and June-July 2022 during the official announcement?

Data

Twitter data was collected by Professor Mustafaraj through the Twitter API in which ultimately, over 11,000,000 tweets containing at least one of the following keywords were gathered: *Roe, Roe v(.) Wade, Roe v(s) Wade, abortion, pro-life, pro-choice, pro life, pro choice, Dobbs, Dobbs Act, heartbeat bill, planned parenthood, pregnancy termination, terminate pregnancy, trigger law(s)*. We chose these words in order to get as many tweets as we possibly could, including keywords that leaned towards the more conservative-right side, for the purpose of being comprehensive.

The time scope of our data was from April 1, 2022 to August 1, 2022 so that it could encompass two major events: the media leak of the decision that happened May 3, 2022 and the actual day Dobbs was announced on June 24, 2022. The data was formatted into .json files where each file had ten pages and within each page was around 99-100 tweets. In total there were ~11,000 .json files and ~11,000,000 tweets collected in total across four months. Figure 1[1] depicts how these millions of tweets were distributed across time, with significantly noticeable peaks on May 3 and June 24 and comparable trends following those most popular days.

[1] This graph was made by Kai!

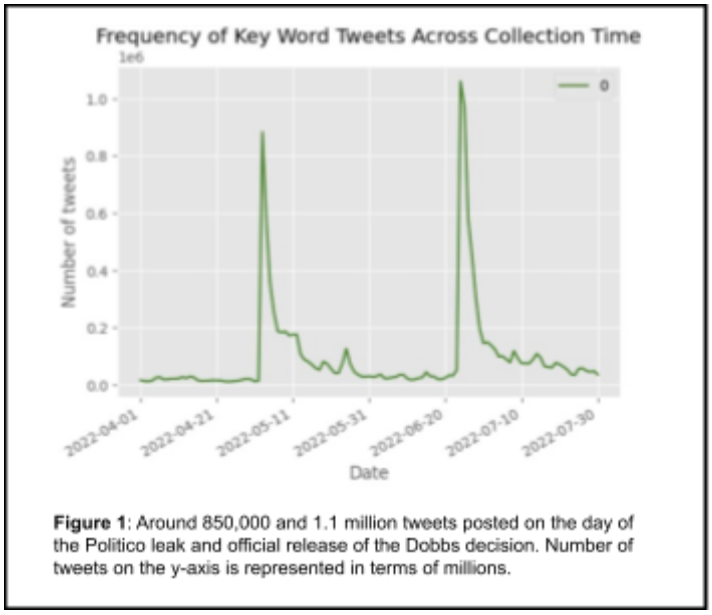

Figure 1: Around 850,000 and 1.1 million tweets posted on the day of the Politico leak and official release of the Dobbs decision. Number of tweets on the y-axis is represented in terms of millions.

For the sake of feasibility, as a group we only analyzed a random sample of 1,200 tweets from the grand total. Two hundred random files were selected from the 11,000 at a time and the first tweet from each file was taken. This process was done for a total of six times, once for each group member so that they would have two hundred tweets to annotate. Annotating was a two-step process where we categorized the stance of the tweet, pro-choice, pro-life, or neutral, and then determined binary markers for whether a tweet fit into the following categories: directive, informative, emotional, political, ideological, anecdotal, ambiguous, and irrelevant. If a tweet fit that category, it received a 1 but a 0 if it did not. Tweets could fall under multiple of the previously mentioned categories. An annotation guide and rubric was created to best account for consistency[2]. Based on this more rudimentary method of categorizing and sentiment analysis, our counts revealed there to be more pro-choice tweets than pro-life and more emotional and political tweets than other categories (Fig. 2)[3]. Once annotated separately, the data frames were combined to create an overall dataset that would be used for analysis, containing 1,200 rows where each row was a tweet, and fourteen columns for the categories, as well as basic information about the tweet.

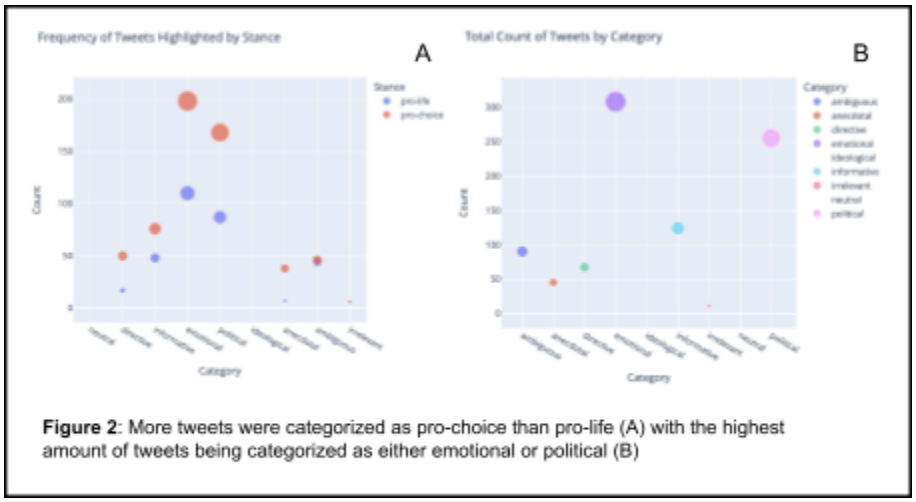

Figure 2: More tweets were categorized as pro-choice than pro-life (A) with the highest amount of tweets being categorized as either emotional or political (B)

[2] The annotation guide is attached at the end for convenience.
[3] These graphs were made by Tiasa!

Methods and Results

i. How did the overturning of Roe v. Wade impact the frequency of tweets pertaining to categories like directive, informative, emotional, political, ideological, and anecdotal?

To answer this question, the larger dataset containing the 1,200 annotated tweets was split into two: one denoted as pre-overturning (April 1-June 24) and post-overturning (June 25-August 1). The frequency of tweets pertaining to a given category were calculated by totaling down the column, and visualized in a stacked bar graph[4]. For most categories, in terms of quantity, there are more tweets post-Dobbs. This makes sense, because even though the time period before included the Politico leak, we expect a higher number of tweets for nearly every category since an official confirmation of the decision would lead to more people feeling emboldened to engage in conversation (rather than how the leak may have caused people to doubt or second-guess). Assuming that the split done for the stacked bar graph was right down the middle and each separate data frame had n=600 rows, it appears that there were observable increases in emotional, political, directive, and informative tweets.

ii. Is there any relationship between a given category and whether or not a tweet is characterized as pro-life or pro-choice?

To answer this question, I ran a series of chi-squared tests to see if tweets categorized as pro-life or pro-choice are independent from tweets that were categorized as emotional. I defined the null hypothesis as there being **no relationship** between these categorical variables. I looked at these associations across two time periods: April 1-May 31, 2022 which encompasses the time before and after the Politico leak and June 1 onwards which encompasses the time before and after the official Dobbs decision. I ran contingency tables and chi-squared tests for the following associations: pro-life/emotional during Politico leak (1), pro-choice/emotional during Politico leak (2), pro-life/emotional during official decision (3), and pro-choice/emotional during official decision (4). The table below depicts the corresponding p-value for all tests run.

Pairing	p-value
Pro-life/emotional (Politico)	0.029054233036183
Pro-choice/emotional (Politico)	1.8892566601710388e-09
Pro-life/emotional (Dobbs)	0.001232875725321124
Pro-choice/emotional (Dobbs)	3.0022898798889277e-07

The p-values for the Chi-squared tests comparing pro-choice and emotion are much, much lower than the p-values for comparing pro-life with emotions. We reject the null that there is no relationship between these categorical variables. These data suggest there is a statistically significant association between abortion stance and whether or not their tweet expresses emotion.

[4] Remi had made this graph! I am unsure as to if she used the actual frequencies or the proportions, which would have accounted for the fact that I think the sample sizes of the two data sets are not equal.

iii. Given our interest in sentiment, what is the distribution of tweets' polarity across April-May 2022 versus June-July 2022?

This question was asked in an attempt to exercise natural language processing basics and better understand the sentiments that may have been felt in tweets that were especially emotional. Inspired by an interest in the polarity of tweets pre- and post-overturning, the TextBlob package was used to apply sentiment analysis. Data and tweet preprocessing made up a measurable portion of time and effort but was necessary to help answer this question. After removing URLs, usernames, hashtags, punctuation, special characters, and numbers from tweets, this cleaned version was then normalized, put into all lowercase, tokenized, and lemmatized. Finally, a list of stop words was created, and a frequency dictionary of the most prevalent words from the tweets was created. This was done for both tweets collected from April-May 2022 and June-July 2022.

TextBlob's built in polarity and subjectivity functions were of great help, and they were just applied through a lambda function on every annotated, and cleaned tweet. A histogram of the frequencies of the continuous levels of polarity are shown in Figure 5 and 6[5]. Because the April-May period held 753 tweets and June-July, 447, it was decided that scaling the frequencies on a percentage level to be proportional would be a way to account for the discrepancy in size. Being mindful that the y-axes are not demarcated the same way, the results show that there is a higher frequency of more positive tweets in the summer period. However, during the time of the leak, there is a greater spread in polarity, with some percentage of tweets being completely negative (Fig. 5, 6).

Visualizations for Communication

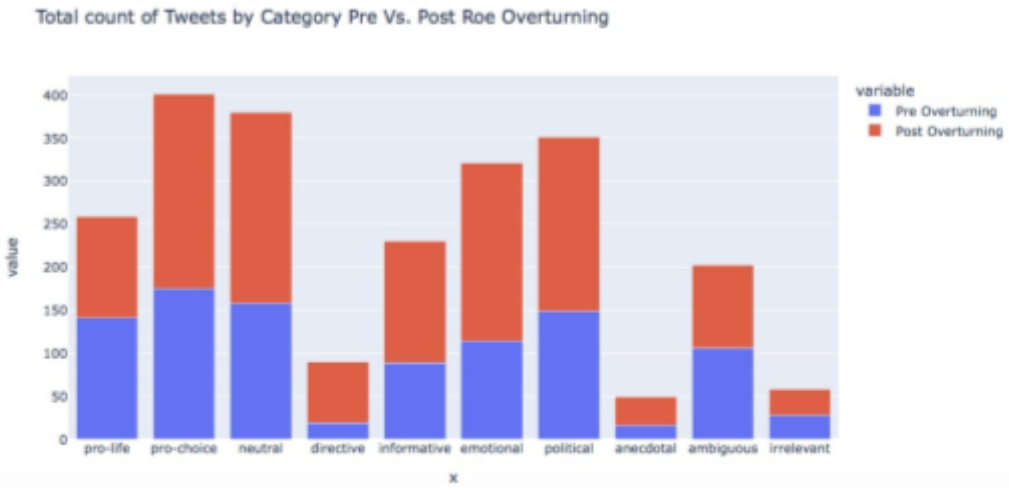

Figure 4: Frequency of abortion-related tweets by category vary pre- and post-Roe's overturning.

[5] I made the polarity histograms along with the word clouds!

Figure 5: Abortion-related tweets from during April-May 2022 encompass a wide range of polarity, with a slight concentration between just past 0 and before 0.25.

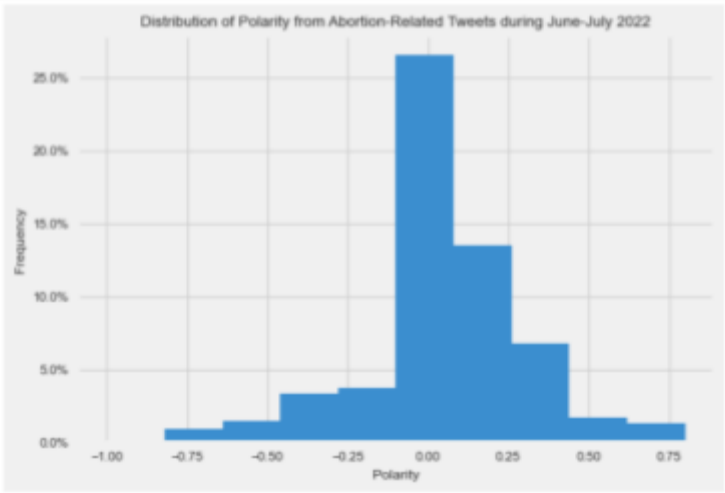

Figure 6: Abortion-related tweets from June-July 2022 vary less than the months before them but have a higher frequency of tweets that are more positive (where polarity = 0.75)

Figure 7: Word cloud of most prevalent words taken from tweets posted during April-May 2022 (Politico Leak Period)

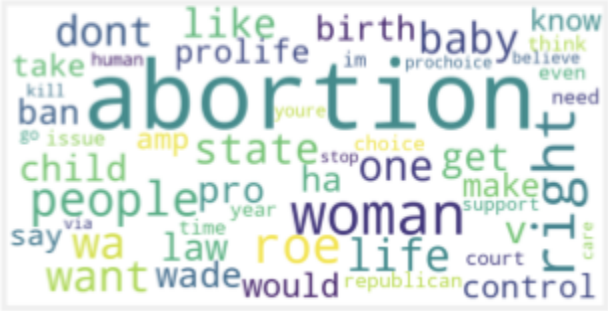

Figure 8: Word cloud of most prevalent words taken from tweets posted during June-July 2022 (Official Overturning Period)

Conclusions and Future Work

Looking at the frequency of tweets pertaining to our defined categories, there appears to be some discrepancy between the numbers pre- and post- overturning of Roe v. Wade. The stacked bar chart depicts the following: there were more pro-life tweets pre-Dobbs, but for every other category, there were more tweets post-overturning. These differences are based purely on visualizations though and a statistical t-test is needed to see if the difference is significant or just from a matter of chance. Assuming that the split between pre-overturning and post are even is important because Figure 1 shows how the time period between June and July inherently has more tweets. Therefore, we do not want the frequency discrepancy to be a result of sample size differences or chance, but ideally, because the Supreme Court decision actually changed something. However, this is a matter of causation which is unable to be determined given the scope of the project.

Focusing on the overarching binary of pro-choice and pro-life, upon conducting a chi-squared analysis of the data, we observe significant relationships between tweets that are pro-choice and emotional, as well as tweets that are pro-life and emotional. In fact, these significant relationships hold across both time periods of interest. Interestingly though, the p-values obtained for pro-choice/emotional tweets are much lower than those calculated for pro-life/emotional tweets. The fact that abortion stance is not independent from emotion is expected; the contentiousness of the topic is derived from conversations on human life and death, morality, sexual autonomy, and much more. It would be very interesting to see if abortion stance is significantly associated with some of the other categories we defined.

Given more time, the project would be much more stable if we were able to analyze a much more significant portion of the 11,000,000 tweets. With such a large amount of data, there is likely a plethora of perspectives that would contribute greatly to our interpretation and understanding of how *everyone* reacted to the Dobbs decision. As a platform for and opportunity to spread information, analysis and exploration of social media usage patterns is extremely relevant, especially in the face of topics regarding SRH where the most efficient way to hear people's voices is through the Internet and social media.

Sentiments: *One tweet can fit several sentiment categories.*

- **Political:** Mentions a politician or political party.
- **Directive:** Call to action; encourage readers/followers to do something; call, vote, protest.
- **Informative:** Refers to a news article or gives information on/directs people towards resources; funds, reproduction products/contraceptives, housing, abortion clinics, pregnancy support, adoption resources.
- **Emotional:** Mentions author's emotions state/how they feel about the decision; scared, depressed, angry, hopeful, pessimistic. A broader definition includes less explicit mention of feelings and lends itself to the use of all caps, exclamation points, and emojis.
- **Anecdotal:** Someone talking about their own experience or referring directly to the story of someone else's.
- **Ideological**: Regarding topics of religion, morality, feminism, philosophy, and concepts of thinking.
- **Ambiguous**: Does not fit within any of the other categories.
- **Irrelevant**: Misclassified tweet with no relevance to Roe v. Wade or intention behind keywords. Requires that all other fields be marked as 0.