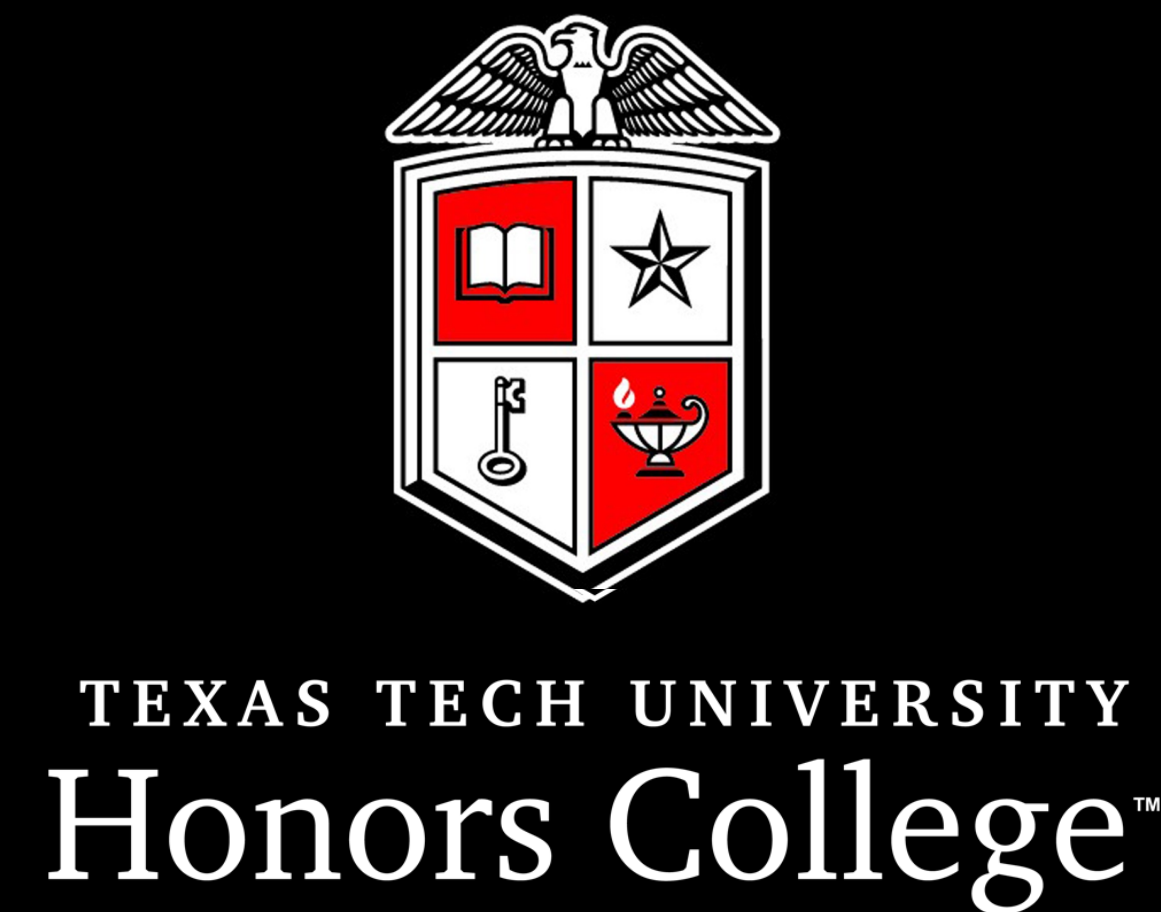


The Impact of Social Media on Vaccine-Related Legislation Following Measles Outbreaks

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ABSTRACT

- According to the World Health Organization, vaccine hesitancy is one of the top ten global health threats.
- Many people in the U.S. are choosing to exempt from getting state mandated vaccines.
- The rise in vaccine exemptions have allowed viruses like measles to spread more easily and cause outbreaks.
- In response to measles outbreaks, New York and California passed ‘pro-vaccine’ bills which sought to remove religious and/or philosophical exemptions.
- Conversely, Arizona and Texas proposed ‘anti-vaccine’ legislation that sought to make vaccine exemptions easier to obtain, but neither the Arizona bills nor the Texas one passed.
- In this study, we seek to determine if social media is informing individual states’ decisions on vaccine-related legislation. We hypothesize that social media platforms, such as Twitter, influence public opinion on vaccination, which consequently affect legislation.
- To test this, we retrospectively collected social media data from the bills passed in California, New York, Arizona and Texas and compared the sentiment with the success or failure of each bill.
- If social media indicates public attitudes about vaccines, and laws are made based on constituent sentiment, we predict that sentiment on social media will be predictive of the outcomes of recent vaccine-related legislation.

INTRODUCTION

- For 2019, there were a total of 1,282 confirmed measles cases in the country, the most observed in the U.S. in the 21st century.
- It is plausible that high numbers of exemptions and low numbers of individuals vaccinated have led to this observed increase of measles cases.
- The two pro-vaccine bills that will be discussed in this study are SB 277 in California and S2994A in New York. The two anti-vaccine bills that will be discussed in this study are HB 1490 in Texas and a package of three bills in Arizona: HB 2470, HB 2471, and HB 2472.

PURPOSE

- To determine if sentiment on social media is predictive of the outcome of vaccine-related legislation

METHODS

- The Twitter “advanced search” tool was used to identify social media content related to the bill of interest.
 - The search was geared towards tweets that contained the name of the bill of interest.
 - Tweets were collected within specified time frames. The specified time frame for each bill started on the date when the bill was first introduced and ended when a decision was made on the bill.
- The search results yielded a total of 387 tweets for the sample analysis.
- Descriptive data was collected for the bills based off outcome, sentiment, frequency, and source.
 - Note that sentiment was coded for sentiment toward each *bill*, regardless of the ‘pro’ or ‘anti’ vaccine nature of the bill.
 - Sample tweets are shown in Table 1.
- A chi square test was performed to determine the statistical relationship between sentiment and bill outcome.

RESULTS

Table 1. Sample tweets and sentiment

Sentiment	Tweet
Positive	“Measles is so contagious that 90 percent of unprotected people exposed to the potentially deadly virus will get sick. Today, we’re calling for the passage of legislation (A.2371/S2994A) to increase immunization coverage and prevent more from getting sick. #VaccinesSaveLives”
Negative	“I oppose the forced vaccinations bill, SB 277, because it removes our state’s personal belief exemption...”
Neutral	“Arizona lawmakers approved three measures that foes said could result in fewer children being vaccinated even amid outbreaks of measles in pockets across the nation.”

Research question 1: What was the overall sentiment toward each bill on Twitter during its specified time frame?

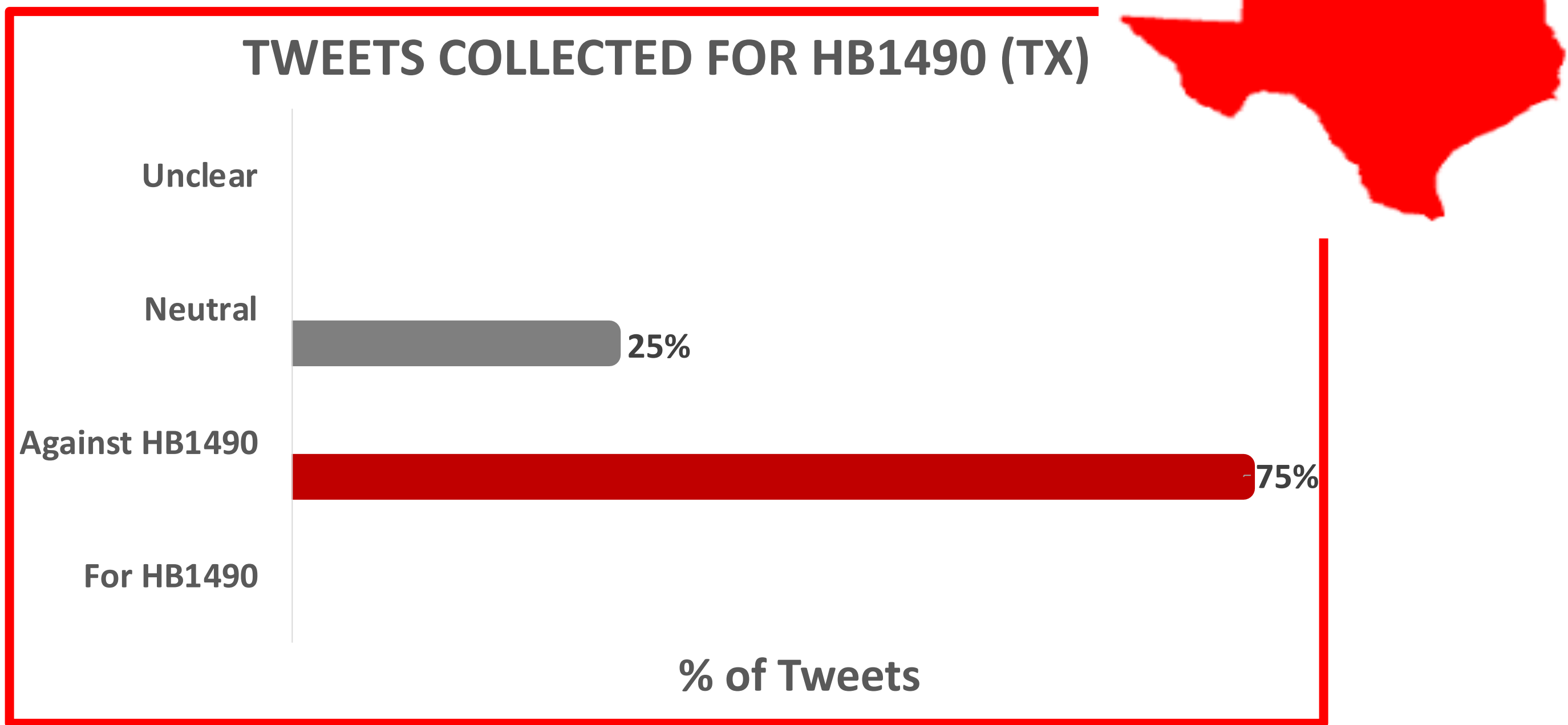


Figure 1. Sentiment analysis broken down for Texas bill H1490 (n = 8)

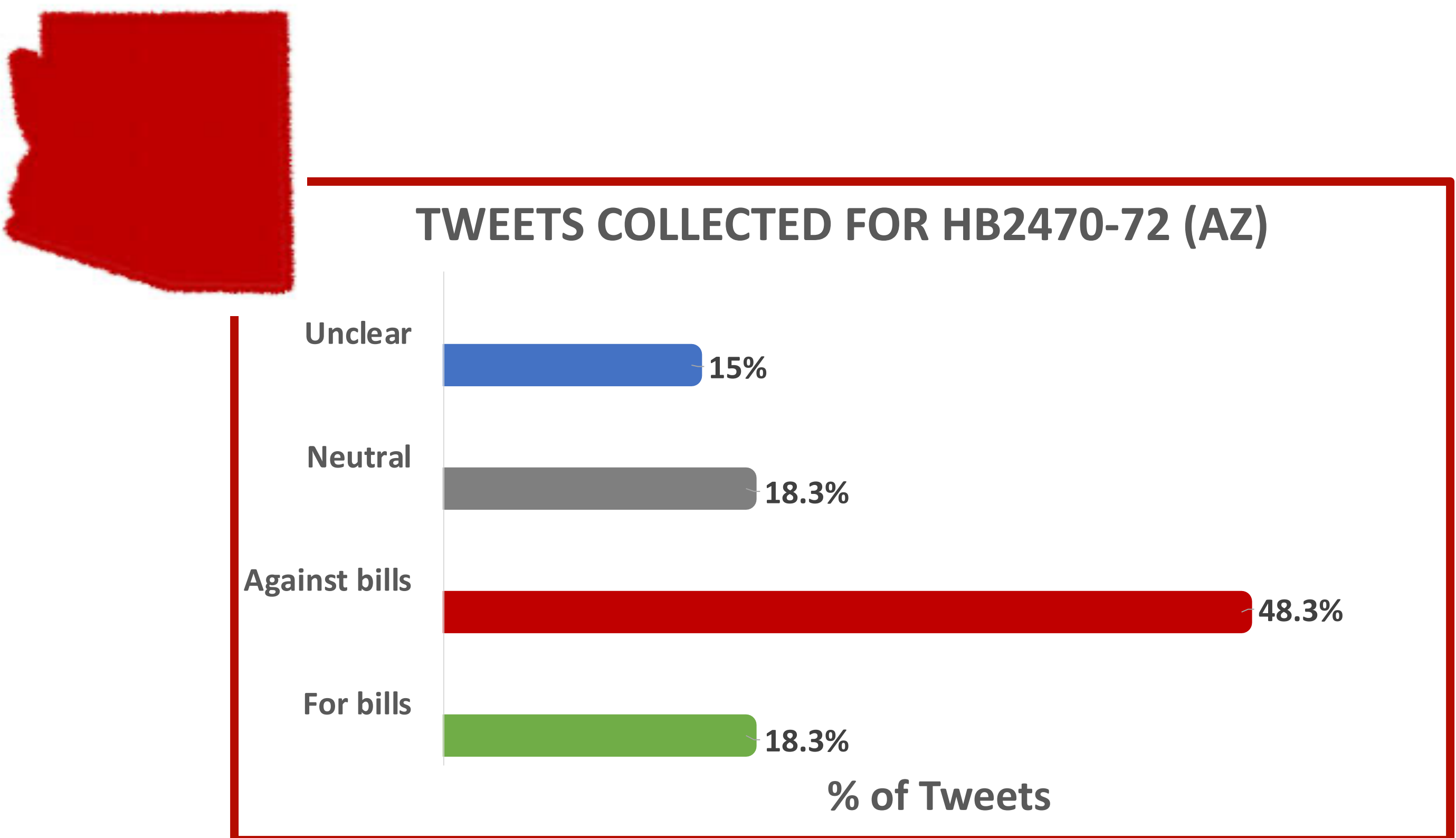


Figure 2. Sentiment analysis broken down for Arizona bills HB2470, HB2471, and HB2472 (n = 60)

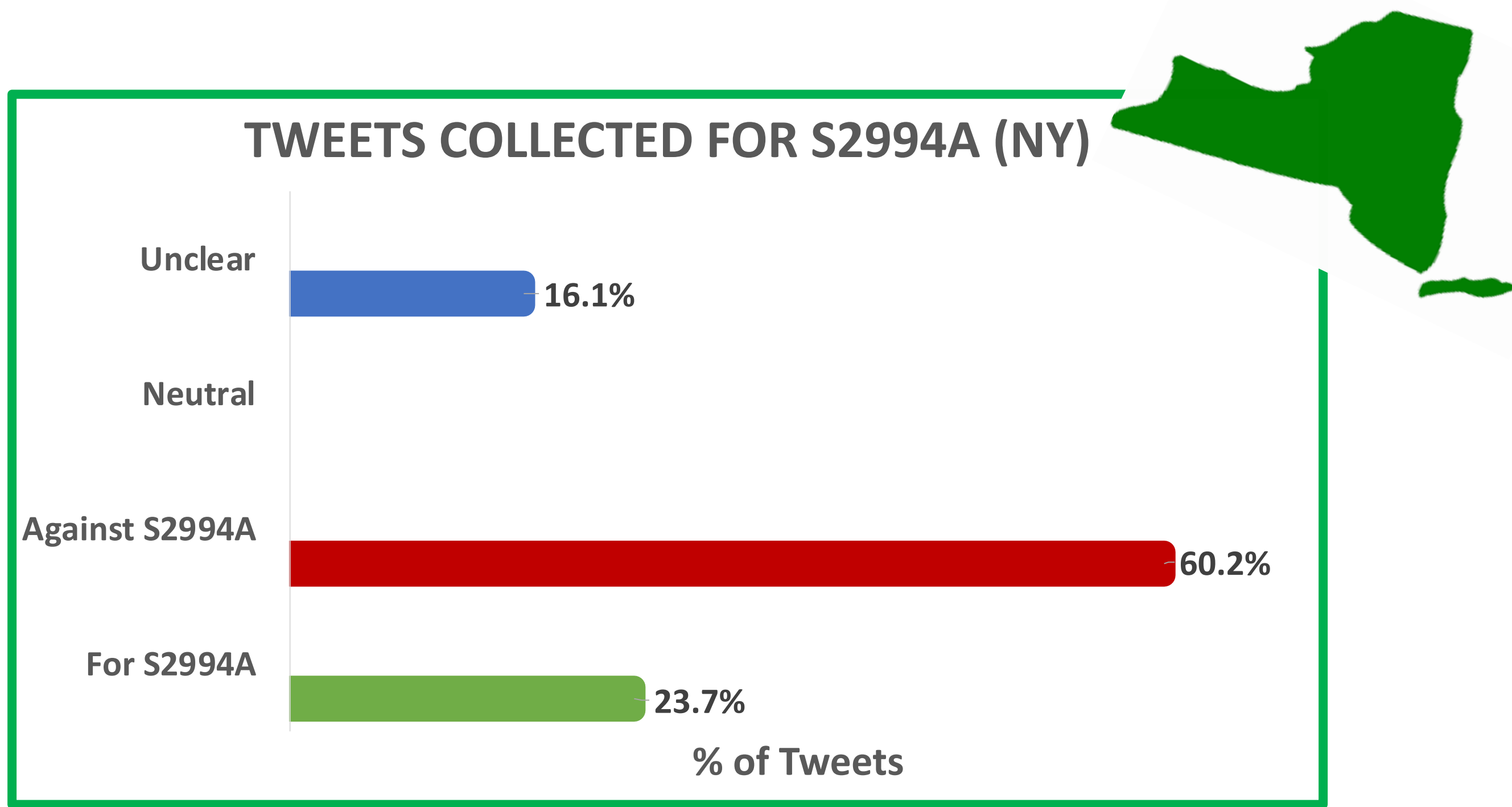


Figure 3. Sentiment analysis broken down for New York bill S2994A (n = 118)

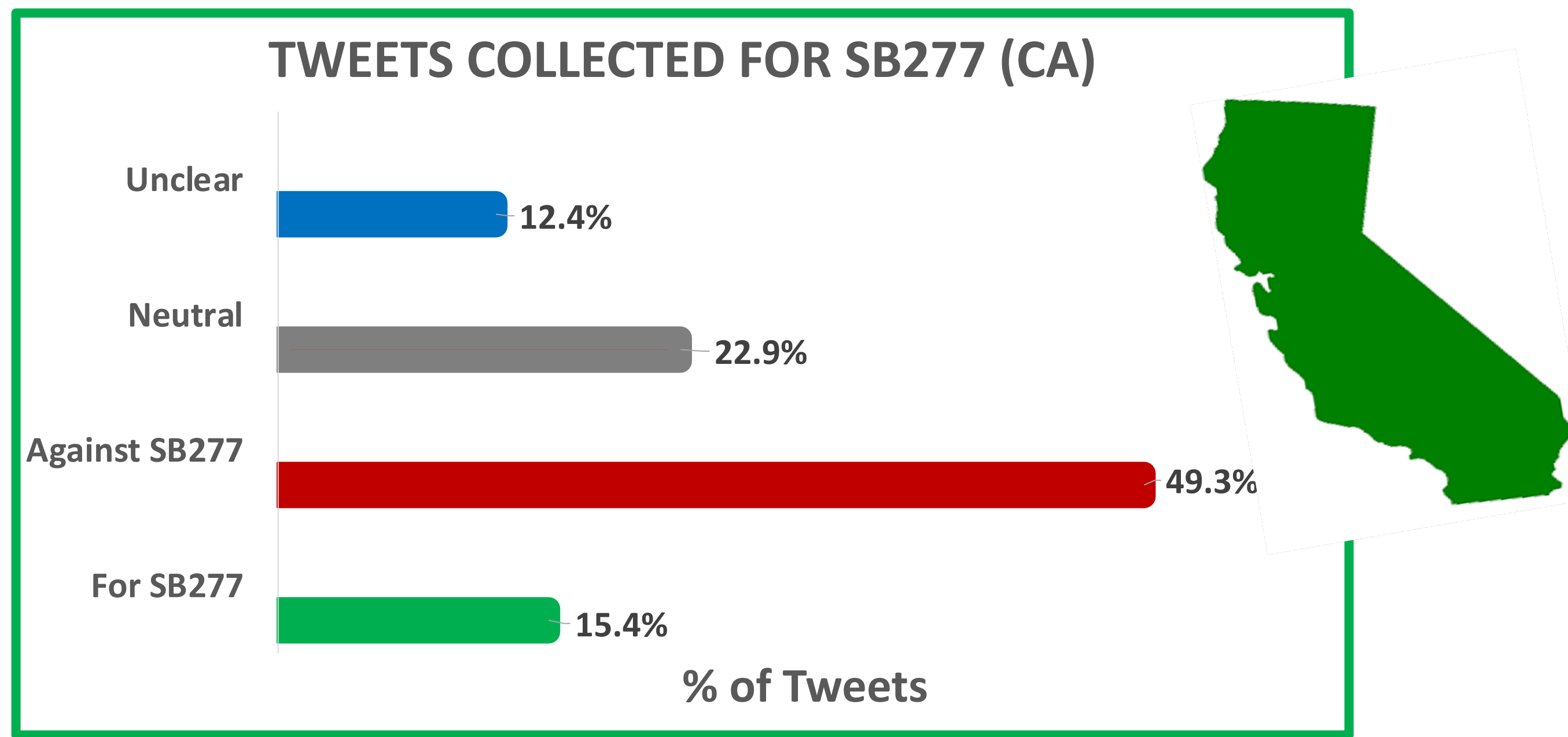


Figure 4. Sentiment analysis broken down for California bill SB277 (n = 201)

Research question 2: Is there a statistically significant relationship between public sentiment on Twitter and the bills’ outcomes?

- The results for sentiment predicting vaccine legislation did not reveal a significant test statistic, ($\chi^2(2) = 1.007$, $p = 0.60$, $\Phi = .06$).

CONCLUSIONS

- The decisions made regarding S2994A (NY), SB 277 (CA), HB 2470/ HB 2471/ HB 2472 (AZ), and HB 1490 (TX) were not made in response to, or in accordance with, the Twitter discussion during the specified time frames for the bills. Other potential sources may be more important to inform these legislative decisions.
- Although two were pro-vaccine and two were anti-vaccine, the majority of the discussion for all of them, as previously mentioned, was negative and in opposition, supporting the conclusion that no matter the nature of proposed legislation or in what context (position of the bill, political leanings of the state, etc), people prefer to voice negative opinions on Twitter more often rather than positive ones.

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