**Language, Vaccines, and Tweets, Oh My!**

**Exploring the Influence of Twitter and Language on the Vaccine Debate**

**THE RUN DOWN**

How many characters does it take to influence an opinion? Twitter gives you 280, but do you even need that many? Up to this point, I’ve already used around 130. Nothing profound came out of those 130 characters, but they do make an interesting point about how complex language can be within a simple tweet.

I say we play a game. First, I’m going to write an informative report (or try to) about the influence of language and what I’m going to call “feigned” language on social media surrounding vaccinations. Then, I’m going to slowly reduce the same report down to the length of a single tweet in an attempt to show how language can be both limited and divisive.

**PURE “ACADEMIA”**

To many, the Twitter-verse seems like a hodgepodge of mediocre humor and politically fueled outbursts. In a sense, it is, but these Twitter antics and scuffles influence how we view others and can act to further polarize discussion. I’m not arguing that Tweets completely alter one’s viewpoints. Rather, I am arguing that tweets reinforce the ways people tend to follow, like, and repeat things they already agree with, strengthening a person’s existing beliefs.[1]

Twitter bots aim to do just that. These programmable, variably annoying, little critters exist for a myriad of reasons, but the most famous involve politics. Bots can perform all the actions of a real person on Twitter, but their functionality has a distinct purpose. By subjecting users to “echo chambers,” or spaces where a person’s own opinions are represented in the content they see, Twitter bots solidify certain ideologies.[2] Conversely, these bots can also inject themselves into an opposing chamber, rousing frustration by the opposition that further divides groups. The more stubborn the person, the more effective the bot. As humans, we love to have a sense of belonging, and bots give us that. However, they also do the opposite, which makes them dangerous.

With the frequency of annual, “trendy” outbreaks of disease, it becomes easy to see differences in bot activity related to real-time concerns of contagious disease and misinformation related to it. As with the current coronavirus outbreak or the Ebola epidemic aorund 2015, the pure frequency and discourse about the ailment on social media can be staggering. Outbreak control becomes extremely important in instances like this. In many cases, health information circulating on social media platforms can potentially save lives, with misinformation flowing at very low rates.[4] Twitter bots have little reason to spread misinformation on the coronavirus or Ebola outside of driving traffic to news outlets for potential profit. There is no political gain to be had and the outbreak will (hopefully) be cured soon after Patient X is identified, reducing any longevity the trend will have.

*A close up of a device

Description automatically generated*The vaccination debate remains an outlier. Adam Wakefield’s notorious, and since debunked, “medical” report linking vaccinations to autism in children almost 20 years ago has acted as a catalyst and vehicle for ongoing debate, and bots are partly to blame for its continuation. An overzealous British media allowed this news to spread incredibly quickly, utilizing public fear and engaging headlines to continue nationwide doubt towards vaccines. Over time, this ambiguous advertising of stories became more mainstream, turning into the modern phrases “fake news” and “clickbait”.

**Figure 1. Word Map of Phrases Associated with Anti-Vax**

Using an existing issue such as “clickbait,” bots link these disputes with other controversial topics, particularly political controversies. Politics are arguably the most divisive entity in modern history. So, tying disruptive words like “Conservatives” and “Choice” to a Tweet creates more tension and interaction than one only incorporating “Antivax”. **Figure 1** links trends and relevant groups to establish a network of discourse, allowing us to view various kinds of interactions and evaluate why certain trends occur.

A close up of a map

Description automatically generated

**Figure 2. Vaccination Stances Online vs. Measles Cases**

As evidenced in **Figure 2**, there was a strong relationship between Anti-vaccine tweets and Measles cases in 2015. However, as the number of Pro-vaccine tweets trounces Anti-vaccine tweets, we can see that activity in both cases increased with the outbreak. By enabling these aforementioned “echo chambers,” social media has created a certain amount of ideological isolation. From **Figure 2**, we can see these echo chambers in action. The more a tweet spreads, the more interaction it receives. People on both ends of the spectrum continued tweeting about the issue because, much like an echo, there points were continually thrown back at them. Furthermore, people tend to follow trends in their thought processes. If they believe one conspiracy, they are likely more susceptible to similar belief systems. This point reigns true for the dangerous spread of health misinformation. If a group blatantly distrusts a source on one front, why would they turn to them for other information? Someone’s political beliefs may interfere with their trust in health resources, enabling trends like the ones shown above. Utilizing this distrust to their advantage, Twitter bots not only encourage misinformation spread, but they pit people against one another to create a virtual “scene.”

Bots are not necessarily smart, but they are manipulative. In recent years, there have been numerous counterprograms to identify bots, and more recently to identify them in any language. Sites like [Botometer](https://botometer.iuni.iu.edu/#!/) make these Twitter bots easily detectable by monitoring an account’s frequency, language, and time of activity. You can program a bot to act “human” by having it sleep between certain hours or limit its frequency of tweets on certain days, but that does not make it real. As I said, they may not be smart on their own, but they remain abundantly divisive. Their use of “feigned” language, or programmable discourse and action surrounding a topic, allows them to continue dividing the online climate. Twitter culture allows for choppy sentences and non-existent grammar, allowing many bots to effortlessly pass as a real person without much coordination.

Twitter and social media as a whole are dangerous. But, in many cases, they are a necessary evil. With the demographics on Twitter being so wide, information can reach an incredibly large audience very quickly. As previously mentioned, there are dangers to having an unchecked information system, which Twitter and other outlets have begun to remedy by marking certain tweets and articles as potentially misleading. However, the ability to know where a disease is most prevalent, where the latest incident occurred, and how something can be prevented is invaluable. But, the vaccination issue and others like it are directly affected by the weaknesses of social media and its facilitation of echo chambers. Trying to identify Twitter bots using “feigned” language, although fairly simple, is not something most of the population cares to do while aimlessly scrolling through Twitter. Herein lies our biggest problem, we like to isolate ourselves. We see the retweets of our friends and people we trust and take that information at face value. Divisive language engages us because we don’t like being opposed, which further empowers these bots to suppress neutral, civilized arguments and replace them with disruptive instances that get people talking.

**CONDENSED “ACADEMIA”**

Twitter bots have become a problem in the last decade, controlling the flow of conversation and creating division between real people online. Bots amplify “echo chambers,” wherein people mainly interact with those with similar belief systems. These dynamics have furthered bad blood within the vaccination debate. Anti-vax Twitter users have been on the rise despite increasing Pro-vax users. Sophisticated language and ties to divisive issues allows Twitter bots to mimic certain behaviors of real users and thrive. With the auto-pilot nature of these bots, they can incessantly create conflict. New programs have enabled a quick way to distinguish bot from human based on language and frequency of activity, but still bots can enable isolation in ideology through “feigned” language and conduct. At the same time, they are inherently poor at spreading health misinformation related to contagious outbreaks of disease. Because of this, Twitter remains a quick and important source of information for a large demographic, despite its furthering of division on issues like vaccination.

**TWEET: 280 CHARCTERS (CIRCA 2020)**

Ever since Twitter bots became a thing, infuriating tweets have become more and more common. New programs were invented to detect them, but most people are too lazy to use them or don’t care enough to check. Anti-vaxxers don’t care about hard evidence.

**TWEET: 140 CHARACTERS (CIRCA 2016)**

Twitter bots suck. They make people even more spiteful and unwilling to change. They allow Anti-vaxxers to continue being a nuisance.

**CITATIONS**

“Bots and Russian Trolls Influenced Vaccine Discussion on Twitter, Research Finds.” *ScienceDaily*, ScienceDaily, 23 Aug. 2018, [www.sciencedaily.com/releases/2018/08/180823171035.htm](http://www.sciencedaily.com/releases/2018/08/180823171035.htm).

“Social Media Has Remarkably Small Impact on Americans' Beliefs, Research Finds.” *ScienceDaily*, ScienceDaily, 27 Mar. 2019, [www.sciencedaily.com/releases/2019/03/190327142108.htm](http://www.sciencedaily.com/releases/2019/03/190327142108.htm).

“The American Journal of Public Health (AJPH) from the American Public Health Association (APHA) Publications.” *American Public Health Association (APHA) Publications*, ajph.aphapublications.org/doi/full/10.2105/ajph.2018.304567.

Aalto University, Science X. “2.7 Billion Tweets Confirm Echo Chambers in Twitter Are Very Real.” *Phys.org*, Phys.org, 24 Apr. 2018, phys.org/news/2018-04-billion-tweets-echo-chambers-twitter.html.

Fung, Isaac Chun-Hai, et al. “Social Media's Initial Reaction to Information and Misinformation on Ebola, August 2014: Facts and Rumors.” *Public Health Reports (Washington, D.C. : 1974)*, Association of Schools of Public Health, 2016, www.ncbi.nlm.nih.gov/pmc/articles/PMC4869079/#B21.

Garimella, et al. “Political Discourse on Social Media: Echo Chambers, Gatekeepers, and the Price of Bipartisanship.” *ArXiv.org*, 19 Feb. 2018, arxiv.org/abs/1801.01665.

Garrett, R. Kelly. “Social Media's Contribution to Political Misperceptions in U.S. Presidential Elections.” *PLOS ONE*, Public Library of Science, journals.plos.org/plosone/article?id=10.1371/journal.pone.0213500.

Gunaratne, Keith, et al. “Temporal Trends in Anti-Vaccine Discourse on Twitter.” *Vaccine*, Elsevier, 9 July 2019, [www.sciencedirect.com/science/article/pii/S0264410X1930876X](http://www.sciencedirect.com/science/article/pii/S0264410X1930876X).

Lotan, Renee DiResta and Gilad. “Anti-Vaxxers Are Using Twitter to Manipulate a Vaccine Bill.” *Wired*, Conde Nast, 3 June 2017, [www.wired.com/2015/06/antivaxxers-influencing-legislation/](http://www.wired.com/2015/06/antivaxxers-influencing-legislation/).

Trethewey, Samuel P., et al. “Medical Misinformation on Social Media.” *Circulation*, 30 Sept. 2019, www.ahajournals.org/doi/full/10.1161/CIRCULATIONAHA.119.041719.