Spreading the Misinformation Agenda: Analysis of Social Media Communication on Vaccination

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Extended Abstract

Misinformation is one of the major contemporary concerns of communication scholars. We define misinformation as any information that is inaccurate, misleading, or false, with disinformation defined as the subset of misinformation that is spread cognizant of the information's veracity [1]. The growing volumes of such information are attributed to many contextual and technological factors. With the gate-keeping capacities of traditional media in decline [2,3], previously less prominent actors have obtained tools empowering them to influence the public agenda, including issues that can be heavily manipulated by misleading claims. Previous research has shown that manipulative and misleading claims travel faster than others across the web [4]. What influences the ability of misleading 'news-like' stories to diffuse across social media and set the agenda for public discussions online? The rapidly changing information environment raises the question of how we can explain and theorize the agenda-setting capabilities of online misinformation actors. Online anti-vaccine groups have flourished to organize like-minded people behind a united cause, and further an agenda to connect and influence a wider audience through sharing news-like information. As [5] show, even a small amount of persuasiveness coming from anti-vaccine narratives can produce a large part of the population that are rapidly exposed to such information. Pro-vaccine groups also exist online. For a long period, these groups have been institutional: governments, not-for-profits, or international organizations but a growing trend has been the development of specific initiatives and grassroots civil society groups. We concentrate on anti-vaccine and pro-vaccine groups as originators and sharers of vaccination content, and their role in vaccination agenda-setting. The mainstream news media also play a role in interacting with this content, affirming or rejecting news-like information and stories. In light of these developments, we ask how agenda-setting capabilities vary across the three groups covering vaccination.

To answer these questions, we conducted extensive computational network and content analysis paired with human coding for categorization of news outlets. First, we collected data from online public spaces on Facebook, Instagram, Reddit, and Twitter between the 28th of June 2022 and 22nd of September 2022. We used these platforms' official APIs to collect data and extracted all links, pointing to a domain contained in our expert curated dataset. The data collection was based on anti-vaccination, pro-vaccination, and mainstream media reporting in English and that are part of an existing actively curated list of health misinformation websites [6], which we supplemented with official, media, and watchdog organization reports and academic research. The anti-vaccination list consisted of 124 websites, pro-vaccination of 49 websites, and the mainstream media list consisted of 15 top UK online news media brands. The Reuters Institute Digital News Report 2022 published this list based on an audience survey [7]. In total, we collected 199,233 posts on social media with 15,427 of these posts being unique and complete newspaper articles with an associated domain. The majority (97.27%) of articles were written in English. Removing all non-English articles (or articles that did not contain sufficient text to be classified) reduced the total dataset to its final size of 14,352 articles.

Prior to analyzing the interlinkage of different domains, we investigated idiosyncratic characteristics of the aforementioned domain classifications. We find that anti-vaccination articles contain significantly more quotations than mainstream and pro-vaccination content. However, these quotations are significantly shorter, contain more subjective language, and

have a lower compound sentiment score. To further corroborate the differences between the classifications we compared theory-derived keywords pertaining to Neutral (neutral coverage of vaccinations), Harm (keywords implying that vaccines are harmful), and Control (keywords implying that vaccines are used to control a population) keywords. We find that anti-vaccination outlets mention neutral keywords significantly less, while significantly exceeding the relative frequency of usage for Harm and Control in comparison to pro-vaccine and mainstream media outlets. To showcase the difference in topics covered, we fit a BERTTopic topic-model. The results indicate that anti-vaccination activists cover a much larger variety of topics and insinuate that vaccine introductions have ulterior motives.

We used the R package *RNewsflow* to analyze the homogeneity of documents and news diffusion [8]. This method extracts similar articles that are published in close time proximity to create connections between outlets. We define an article as similar when it exceeds a cosine similarity of 0.42. We validated our results relying on the approach of [9]. Three authors manually coded 66 pairs of articles with different levels above our threshold of similarity. Reliability was measured through Krippendorff's alpha (0.65), which is an appropriate level for exploratory studies [10]. Articles were considered proximate in time when one article followed within a timeframe of 6 to 96 hours of another article. After performing these similarity calculations, we constructed a network based on content similarity across outlets and the two groups after combining mainstream and pro-vaccination outlets [Fig 1].

First, the analysis reveals that anti-vaccination producers set agendas within their own close-knitted networks, having clear leading voices whose agendas are often closely replicated by smaller anti-vaccine venues and outlets. Second, anti-vaccination content producers are more aggressive than their pro-vaccination and mainstream media peers in content production. Some outlets take a central role in the network, such as *gatewaypundit.com* for anti-vaccination, and *theguardian.com* for the mainstream category – both only having similarities with articles from other outlets that were shared only after their articles got posted on social media for the first time. Third, anti-vaccination content producers rarely influence these two other types of actors we studied. However, anti-vaccine outlets clearly follow the patterns of the news media cycle, with some of the agenda of anti-vaccine outlets being influenced by tabloid-style mainstream media such as *The Daily Mail*, as well as US-based media. In other words, some elements of the ecosystem of mainstream media shape news agendas for anti-vaccine outlets.

In conclusion, this work in progress demonstrates that while vaccination activists online are capable of influencing the agenda of other outlets, pro and anti-vaccination influencers are mostly confined to different subsections of the information space. Tabloids may potentially provide a bridge between communities. There is extensive opportunity for further research, particularly regarding "connecting outlets", and the idiosyncrasies of outlets in communicating to their target audience.

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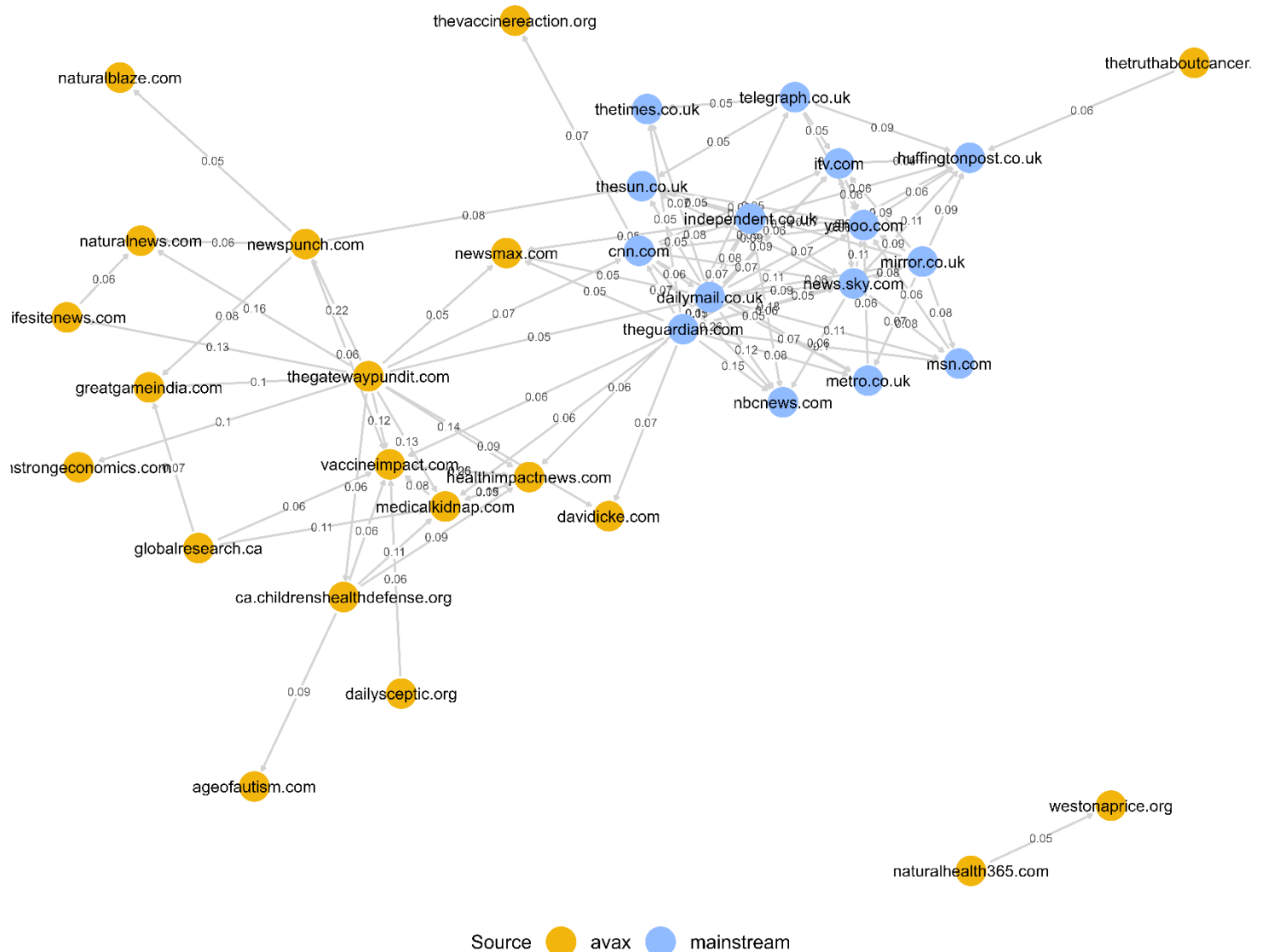
Figure 1. Agenda flows across sources (N = 35 with 15 mainstream and 20 antivax outlets remaining after filtering steps applied)