The Polyvocality of Online COVID-19 Vaccine Narratives that Invoke Medical Racism

Lindsay Levkoff Diamond
Department of Information Science
University of Colorado Boulder
Boulder, Colorado, USA
lindsay.diamond@colorado.edu

Hande Batan
Department of Information Science
University of Colorado Boulder
Boulder, Colorado, USA
hande.batan@colorado.edu

Jennings Anderson
Department of Computer Science
University of Colorado Boulder
Boulder, Colorado, USA
jennings.anderson@colorado.edu

Leysia Palen
Department of Information Science
Department of Computer Science
University of Colorado Boulder
Boulder, Colorado, USA
palen@colorado.edu

ABSTRACT

Vaccine hesitancy has always been a public health concern, and anti-vaccine campaigns that proliferate disinformation have gained traction across the US in the last 25 years. The demographics of resistance are varied, with health, religious, and, increasingly, political concerns cited as reasons. With the COVID-19 pandemic igniting the fastest development of vaccines to date, mis- and disinformation about them have become inflammatory, with campaigning allegedly including racial targeting. Through a primarily qualitative investigation, this study inductively examines a large online vaccine discussion space that invokes references to the unethical Tuskegee Syphilis Study to understand how tactics of racial targeting of Black Americans might appear publicly. We find that such targeting is entangled with a genuine discussion about medical racism and vaccine hesitancy. Across 12 distinct voices that address race, medical racism, and vaccines, we discuss how mis- and disinformation sit alongside accurate information in a "polyvocal" space.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**.

KEYWORDS

Anti-Vaccine, COVID-19, Disinformation, Medical Racism, Misinformation, Pandemic, Public Health, Social Media, Vaccines

ACM Reference Format:
Lindsay Levkoff Diamond, Hande Batan, Jennings Anderson, and Leysia Palen. 2022. The Polyvocality of Online COVID-19 Vaccine Narratives that Invoke Medical Racism. In *CHI Conference on Human Factors in Computing Systems (CHI '22), April 29-May 5, 2022, New Orleans, LA, USA.* ACM, New York, NY, USA, 21 pages. https://doi.org/10.1145/3491102.3501892

CHI '22, April 29-May 5, 2022, New Orleans, LA, USA

ACM ISBN 978-1-4503-9157-3/22/04.
https://doi.org/10.1145/3491102.3501892

1 INTRODUCTION

For as long as there have been vaccines, there has been vaccine hesitancy. Even in the early 1800s, objectors listed religious beliefs, distrust in medicine, and a belief that vaccination violated personal liberty as reasons for refusing vaccination, which eventually resulted in the founding of the Anti Vaccination Society of America in 1879.

In the 1900s, mass deployment of vaccines became routine with protection against diphtheria, pertussis, and tetanus. The polio vaccine was approved in 1955, but only 0.6% of U.S. teens were immunized in 1956 despite the damage the disease had wrought. However, six months after Elvis Presley received his vaccine live on The Ed Sullivan Show, youth vaccination rates rose to 80%. Hershfield and Brody [38] explain that Presley's public vaccination contained three crucial elements for behavioral change: it exerted 1) social influence to 2) establish a social norm with a 3) vivid example. The collective efforts of Teens Against Polio, which produced pamphlets and staged events like "Salk Hops" (named after Jonas Salk), also helped to change vaccine perception. Today, social media platforms are rich with social influence, but influence exists to both resist and comply with vaccine initiatives. As we will show, anti-vaccine efforts are highly organized and targeted, with numerous root causes of sub-optimal vaccination, including access, physical fear, as well as distrust of government, science, and the pharmaceutical industry [60, 79]. Annual influenza vaccine compliance shows that there is still work to do. In the U.S., only 48% of adults and 64% of children were vaccinated in 2019-2020, despite wide availability [10].

The COVID-19 pandemic that began in early 2020 and continues at the time of this writing heralded the fastest development and deployment of vaccine innovation. By December 2020, multiple labs worldwide had a viable product. In the U.S., under emergency use authorization (EUA), the distribution of vaccines began in January 2021. However, after an initial surge in demand that supported the institution of mass vaccination clinics around the country, interest in the vaccine soon waned. Despite widespread availability, only 53% of eligible US Americans were fully vaccinated in early September 2021 [61]. In April 2020, epidemiologists initially estimated that 70% of a population would need immunity to quiet viral spread

[24]. Without it, variants emerge, as we are now seeing with the highly contagious delta and omicron variants at the time of this writing.

1.1 Racial Differences and Concerns

In a November 2020 survey, Funk and Tyson [30] showed that while 83% of Asian-Americans, 63% of Latinx, and 61% of White people indicated an intent to take a COVID-19 vaccine, only 42% of Black Americans expressed a desire to be vaccinated. The reasons for vaccine refusal or hesitancy are more complex than for other racial groups who have political or personal health ideologies that do not include concerns about racial injustice. For people of color, historical and ongoing racism in relation to healthcare is cited as a reason for their concern. By March 2021, in a follow-up survey, Johnson and Funk [43] showed that 61% of Black Americans reported that they would definitely or probably get a COVID-19 vaccine compared with 69% of White adults, 70% of Latinx adults, and 91% of Asian-American adults; it also showed that Black adults expressed heightened concern about COVID-19 and lower trust in vaccine research and development.

A popular blog post [85] in the second Spring of the pandemic debunked the narrative that Black Americans are dubious of vaccines because of conspiracy theories and instead pointed to a long history of medical racism, including the well-known cases of Henrietta Lacks and the Tuskegee Syphilis Study. It does not help that distrust in the healthcare system is accompanied by multiple barriers to access, barriers felt at an institutional level as much as an individual one. Concerted efforts are needed in vulnerable communities to cultivate high-profile vaccination champions, such as opinion leaders, faith groups, and political and civic leaders [31].

1.2 Research Objective

However, there is reason to fear that even more problems are afoot: what happens when those who fear or doubt vaccines out of mistrust of government, political party, or scientific authority see a new frontier to evangelize to those who are legitimately fearful of medical racism? Prompted by evidence of anti-vaccine organizations having a physical presence during the Black Lives Matter protests that occurred during the pandemic [5, 42], our early examination of social media discourse about vaccine distrust among people of color suggested that there were similar online efforts to purposefully exploit fears of medical racism. One reference made with frequency was the Tuskegee Syphilis Study in combination with discussion of COVID-19 vaccines. This research aims to understand how those who are concerned about medical racism speak about vaccine compliance concerns in relation to the COVID-19 pandemic, whether disinformation activity that exploits medical racism is happening, and to what extent spaces that are traditionally the province of Black Twitter [6, 15, 29, 45] are infiltrated by people with intent to disrupt.

To these ends, we examined a discussion space on Twitter that we discovered to have surprisingly high activity—a space created by the combined invocation of the Tuskegee Syphilis Study and vaccinations—to understand how vaccine trust and medical racism are argued. It is important to appreciate that vaccines were not a part of the Tuskegee Study, meaning that this co-occurrence of terms—which increases dramatically during the pandemic—is a signal of new social behavior. Who participates in this space? What do they aim to do with their postings?

We discover a "polyvocality" of voices [2] writing about the relationship between medical racism and vaccine compliance. We hear reasoned, nuanced, and pained voices, and learn that some vaccine hesitancy cannot be simply converted with persuasive messaging. We learn that some voices make connections between race and vaccines in ways that are unsubtle and ugly. Some messages seem to fall unquestionably into the broad category of disinformation—that is, deliberate falsehoods designed to mislead. But other messages, while not technically accurate, are reasoned on well-grounded historical suspicion. Thus, they deserve to be understood as something other than "disinformation" and conspiratorial pathology [41]. We seek to illuminate the organization of the ideas voiced in this space so that we might clarify what comprises "disinformation," "misinformation," and how they come to co-create a single discursive space.

2 ANTI-VACCINE CAMPAIGNING

2.1 Pre-existing ties between anti-vaccine sentiments and medical racism

No more than 10% of people have strong anti-vaccine convictions, but a far more significant proportion could be categorized as being "hesitant" [49, 50]. Dubé et al. [25] model vaccine hesitancy as an individual behavior influenced by a range of factors and is also the result of the historical, political, and socio-cultural contexts. Risk perception is linked with trust in health professionals, government, public health institutions, and the interplay between these entities [25]. Vaccination has also become a source of fear and a target for misinformation [55], with a great deal shared online [18]. In addition, as Freelon et al. [29] demonstrate, in the American context, race is a key vulnerability ripe for exploitation by disinformation purveyors.

The most recent wave of the modern anti-vaccine movement was ignited by the publication of the since-retracted 1998 Wakefield paper [56]. Since becoming convinced of a link between mercury and autism in 2005, Robert F. Kennedy Jr. has been a key figure among a lengthy roster of anti-vaccine activists due to his societal and political clout. Eventually, anti-vaccine efforts shifted to targeted advocacy of racial and religious minority communities [37, 69]; Kennedy has repeatedly invoked the Holocaust [86] and the Tuskegee Syphilis Study [44]. Kennedy and his organization, the Children's Health Defense, have had tremendous influence online. He is included in what the Center for Countering Digital Hate dubbed the "dirty dozen," a group of anti-vaccine activists responsible for two-thirds of the anti-vaccine content circulating on social media platforms [12].

In addition, Children's Health Defense was one of two buyers accounting for 54% of anti-vaccine advertising content on Facebook [42]. The anti-vaccine movement still represents a small portion of the population, but, in some places, aided by the amplifying power of social media, it has gained prominence out of proportion to its size [78]. These efforts have been successful in converting what Introne et al. [40] call "false narratives" in anti-vaccine discourse

that graduate to "pseudoknowledge" status through "unconventional epistemic strategies"—the making of unexpected and new connections or logics between topics.

2.2 Information Disorder and its Impact on COVID-19 Vaccine Disinformation

On speaking of the sociology of rumor, Shibutani [71] wrote that "what makes decisions in such unsettled times so important is that crises are the crucibles out of which many innovations emerge." Much health-related misinformation is driven by collective sensemaking online, whereby people anxiously pursue knowledge to fill in gaps either with accurate information or, worrisomely, false rumors, which are readily available online [72]. Gui et al. [35] found that during the Zika epidemic, people dealt with uncertainty and ambiguity by seeking information as local to sources as possible to minimize risk. Valecha et al. [81] showed how social media users, also in the context of the Zika crisis, shared fake news of both threatening and protection tweets to relieve anxiety and regain control.

Studies suggest that misinformation can spread on social media more quickly than accurate information, spurred by users who engage with it through likes, shares, and replies [7, 34, 82]. Social media has the ability to increase accessibility and access to health information, but those benefits are subject to information quality, particularly for populations that may lack the requisite health and media literacy skills to evaluate the encountered information [14].

Fictitious information emerges from both the direct production of disinformation as well as information overload. Modern science generates a multitude of highly specialized, fragmented, temporary, and often contradictory results, especially in the biomedical field [64]. The excessive amount of available scientific data means that even contradictory and ill-formed opinions can be supported by scientific argument. Peretti-Watel et al. [64] argue that this "balkanization of knowledge" is reinforced by new ICT where each modern controversy has its own experts.

In the act of collective sensemaking in online spaces, users are exposed to a variety of information sources. Lewandowsky et al. [52] outline a set of features with which people evaluate the truth value of information, which include logical compatibility of the information with other facts and beliefs, the plausibility and coherence of a story, an evaluation of a source's credibility, and the social consensus. Repetition effects may create a perceived social consensus even when none exists, and social-consensus information is particularly powerful when it pertains to one's reference group. The underlying design of social media platforms lends itself to repetition and, therefore, frequently, a false sense of social consensus, which may solidify belief in fictitious information.

In the last decade, considerable scholarship has been contributed to the areas of online rumor and mis- and disinformation (e.g., [53, 58, 59, 75, 76]), false news [48, 82], and conspiracies (e.g., [19, 68, 74]). Automatic detection and classification through natural language processing and data mining techniques have been the focus of much of this work (e.g., [9, 22, 63, 65, 70, 88–90]). However, a lesson from the study presented by this research paper on a public health issue in the context of the coronavirus pandemic shows that there are subtleties in information disordering that are beyond detection of many such solutions.

The coronavirus pandemic has seen a marked rise in medical disinformation across social media. Assertions include that COVID-19 is a hoax, that SARS-CoV-2 was deliberately manufactured as a bioweapon, and that "big" pharmaceutical companies orchestrated the pandemic. An estimated 30% of some populations subscribe to a COVID-19 medico-scientific conspiracy narrative, with detrimental impacts for themselves and others [33]. Some of the current claims appear as extensions of the 1980s Soviet disinformation campaign entitled Operation INFEKTION.

Although most content originates in groups with genuine anti-vaccine beliefs, Broniatowski et al. [7] discovered that social media trolls affiliated with a Russian intelligence service, Internet Research Agency (IRA), spread vaccine content with the apparent intent of sowing discord around a polarizing and divisive issue in the U.S. Interestingly, the actors did not just share misinformation. Instead, they propagated messages both against and for, thereby increasing the scale of the debate [2, 7, 15]. Walter et al. [83] demonstrate how IRA accounts discussed vaccines to sow discord and credibly flesh out their "American" personalities. They argue that even if small in magnitude, the intentional IRA spread of anti-vaccine thought targeted at specific subpopulations could be the beginning of a new front in the ongoing informational cyberwar [83].

Collins-Dexter [16] conducted multi-sited digital ethnography to track how conspiracies and disinformation spread in Black communities. Some of the misinformation appeared to be targeted directly by outsiders, while some had grown organically within specific Black communities. Wardle [84] explains that "as people have clamored for simple explanations to make sense of the pandemic, disparate fringe groups have allied into united blocs. Members of QAnon, anti-vaxxers, New Age communities, and Second Amendment enthusiasts are coming together in social media groups" [84]. Regardless of authenticity, these online conversation spaces, where people source information to make vaccine decisions, are awash with misinformation.

2.3 Medical Racism and Anti-Vaccine Campaigning

The COVID-19 vaccines provided a new opportunity for anti-vaccine targeting. In March 2021, a division of Children's Health Defense, CHD Films, produced the anti-vaccine documentary Medical Racism: The New Apartheid. The film juxtaposes real examples of medical racism with vaccine misinformation and COVID-19 conspiracy theories to push their agenda in marginalized communities of color. For the release, CHD's marketing materials co-opted the feminist slogan related to the rights of bodily autonomy with respect to abortion, "My Body, My Choice" [13].

The anti-vaccine movement frequently appropriates language from racial, social, and health justice movements. In July 2021, Uché Blackstock, a prominent doctor who has served as a vital source of COVID-19 information and who appeared in our data collection, tweeted about her experience discovering anti-vaccine activists handing out propaganda at the African Arts Festival in Brooklyn, NY, writing:

> *I was horrified yesterday to see supporters from RFK Jr.'s Children's Health Defense distributing anti-vaxx propaganda disguised as "Medical Racism" flyers at the African Arts Festival in Brooklyn, one of the oldest and largest gathering of Black Brooklynites. With my children in tow, I approached both individuals, a white man and woman, standing in separate locations. I told them I knew their organization and that they were causing harm to Black communities by being there…I felt enraged that these two individuals were at this sacred gathering that I've attended since I was a little girl, disseminating misinformation to my family.*

The anti-vaccine movement also hijacks historical events to push its agenda. During the pandemic, anti-vaccine activists wore "No Vaccination" yellow Star of David patches to symbolize their belief that the COVID-19 vaccination efforts are similar to the medical experimentation conducted in the Nazi concentration camps [51]. However, the most dominant narrative put forth as a call to arms was comparing the COVID-19 vaccine trials and subsequent vaccination efforts to the Tuskegee Syphilis Study.

3 THE TUSKEGEE SYPHILIS STUDY

In 1932, the U.S. Public Health Service (USPHS) collaborated with the Tuskegee Institute to study the natural course of syphilis. The Tuskegee Syphilis Study initially involved 600 Black men (399 men with syphilis and 201 men who did not have the disease). Participants were told they were being treated for "bad blood," a term used to describe several ailments, including syphilis, anemia, and fatigue. Importantly, researchers did not collect informed consent. By 1943, penicillin became the widely available treatment of choice for syphilis, but the participants in the study were not offered it.

In 1972, the Associated Press reported on the study leading the Assistant Secretary for Health and Scientific Affairs to appoint an advisory panel that concluded the study was "ethically unjustified." The study ended later that year. Soon after, the USPHS extended all necessary medical care to the study survivors. During 1973-1975, the participants received an out-of-court settlement from a class-action lawsuit and an extension of benefits to their wives, widows, and children. In 1995, the program was expanded to include health and medical benefits. On May 16, 1997, President Bill Clinton issued a formal Presidential Apology for the study [11].

The research implications that followed the review of the Tuskegee Syphilis Study include the 1974 National Research Act and the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, which paved the way for voluntary informed consent, Institutional Review Boards, and the 1979 Belmont Report [11].

It is important to note that the misrepresentation of the events of the Tuskegee Syphilis Study is a frequent occurrence and meaningful in our data collection. As we will show, an overwhelming majority of vaccine distrustful social media posters mistakenly refer to the events of the study as the participants having been given syphilis and sometimes, more specifically, through the use of vaccines—so much so that it has become a false narrative that nevertheless sounds plausible [40]. The atrocity of Tuskegee was in denying care when penicillin became available early in the study's lifespan; no participants were given syphilis.

4 METHODS

On January 30, 2020, the World Health Organization issued a Public Health Emergency of International Concern [87]. On January 31, 2020, US Health and Human Services declared a public health emergency to aid the nation's healthcare community in responding to the 2019 novel coronavirus [21]. Our data collection is organized around February 1, 2020, as the transition from pre-pandemic (before February 1, 2020) to peri-pandemic (February 1, 2020 to May 31, 2021—for the purposes of this study, though the pandemic continues).

As we further explain, we retroactively extended the data collection period from January 1, 2018, to provide two full years of Twitter data that pertained to the tuskegee+vaccination conversation space prior to the novel coronavirus threat.

4.1 Twitter Data Collection

We approached the collection and subsequent analysis of Twitter data with two goals in mind [77]; the primary goal was to enable a qualitative inductive thematic analysis [20] of vaccine discourse and their speakers. The second was to build network graphs to visualize the interaction of those voices. The criteria for the data collection from Twitter and post-processing filtering steps were the same for both these forms of analysis, with the network graph work requiring additional data pulls. We also shortened the time periods to allow direct and equal visual comparison of tweet volume (Figure 1). Data collection required using two Twitter APIs: the filter (streaming) API and the academic API, which provides researchers limited access to Twitter's history. Using both APIs to optimize collection as we developed the search method during preliminary analysis, we collected tweets, retweets, and quote tweets on the term "tuskegee" and its misspellings: "tuskagee," "tuskeegee," or "tuskeygee." Next, we searched for the occurrence of "vax" or "vacc" in the text to perform a vaccine-related stem search within the Tuskegee tweet set. (This effectively removed references to the city of Tuskegee or Tuskegee University; remaining references were manually separated.)

4.1.1 Dataset for Qualitative Coding and Analysis. After filtering the dataset to contain tweets (including retweets and quote tweets) from accounts that made at least one authored tweet —what we call "an original tweet," 17,442 tweets remained. The dataset was then divided into two temporal periods: pre-pandemic and peri-pandemic. Pre-pandemic accounts are a category of those that posted at least one tweet in each pre-pandemic and peri-pandemic phase. We wanted to attempt to study cross-period changes but recognized that we had fewer overall accounts to study. Peri-pandemic accounts did not exist in this discussion space in the pre-pandemic period, but there were many accounts in the long tail of the pandemic period (11,387 accounts). Therefore, after empirical inspection, we set a threshold for including accounts with a minimum of four tweets (with at least one original tweet), creating a large sample of accounts with enough content for a monologue that enabled ambitious but thorough qualitative coding.

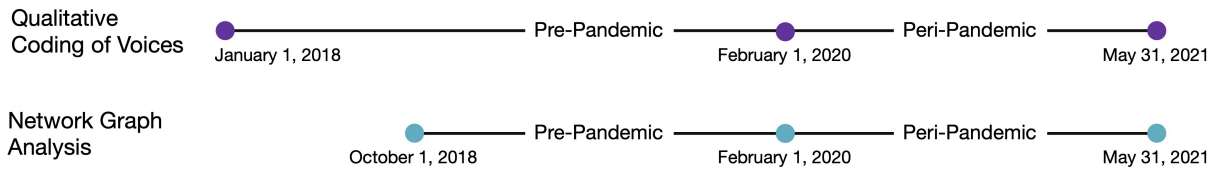

Figure 1: Temporal Description of our data collection

After removing news media accounts, 538 accounts matched these criteria—149 pre-pandemic and 389 peri-pandemic. Together they produced a total of 3,025 tweets that matched the search terms. When we did a final check on the account list on June 1, 2021, we found 41 accounts that had originally matched the selection criteria fell below the tweet count threshold during the peri-pandemic period. We hypothesize that the change was due to accounts deleting tweets or the suspension/deletion of accounts that they retweeted. These 41 accounts remain in the dataset as they matched the criteria at the time of the ongoing data collection and analysis. We can further report that as of August 2021, 5% of accounts identified in May were either deleted, suspended, or protected, meaning all of their tweets are now inaccessible.

4.1.2 Dataset for Network Graph Analysis. To construct the account mentions network graphs, we collected all of the tweets—the full contextual streams [46, 62] posted by the 538 accounts, even those tweets that did not include Tuskegee and vaccine search terms. In other words, through this approach, we can discover who speaks to or about whom among the accounts under study, even on other topics. The Academic API permitted full contextual stream requests for 499 of the 538 accounts, meaning that 39 accounts under study had a change in status. We collected full contextual stream data between October 1, 2018 and May 31, 2021 to have equivalent pre- and peri- time periods of 16 months (Figure 1), yielding a total of 19M tweets. For each of these accounts, we searched their entire contextual stream for mentions of any of the other accounts in the dataset. We then constructed a network in which nodes represent accounts and edges represent a mention of another account that connects the nodes. Note that a retweet involves mentioning the original author, as does a manually specified mention. The number of times an account mentions another account weights the edge.

4.2 Qualitatively Coding the Data

The research team read through the data until we knew whether to make tweets or accounts the unit of analysis to be coded and analyzed. This deep familiarization with the data revealed a range of vaccine narratives with respect to medical racism. For this reason, we decided to analyze the data at the level of account. A coding scheme emerged inductively over many passes of the data [20], examining the monologues of accounts [3, 4]. There were features that expressed vaccine support and distrust. In addition, we found that some speakers wrote from a publicly declared position of identity that included political, racial, and religious features. They used language, hashtags, slogans, bio content, and images in consistent ways across the tweets that pertained to the discussion and their "contextual streams"—that is, across the whole of their available tweet histories. We coded for those declared identities as they emerged and, in the end, found that some political identities and some racial identities were regularly invoked.

It is important to note that once we understood that someone identified as "politically conservative," for example, it did not necessitate an equivalent category of "politically liberal" unless that public identification regularly appeared in the set. In other words, we only marked what the participants themselves made plain and was an explicit aspect of their positionality. As another example, we cannot report the overall racial composition of the population under study, even though we do discuss the expressed positionality of race.

After these matters were settled through close reading, inspection, and reflection, only then did we set out to "qualitatively code" in the classic sense of reducing data to further analytically treat. Two of the researchers coded the content, conducting multiple passes and checks until there was high agreement. In addition to the collected dataset, coders referenced the most recent (3000-5000) tweets containing "vacc" or "vax" for each account as of June 30, 2021, to capture any detectable change in vaccine sentiment. The two coders randomly sampled three sets of 20 accounts to check inter-rater reliability (IRR). The Cohen's Kappa scores calculated for the individual coding labels between coders ranged from 0.92-1.0. There was one outlier label (politically conservative) that had a Cohen's Kappa of 0.71. After further discussion between coders to align on identifying politically conservative content, the inter-rater reliability improved. The coders did a full first-pass on half the sets independently except for those deemed edge cases. Some posts contain images, capitalization, emojis, and punctuation that alter the intended tone or emphasis. During the peri-pandemic period, in particular, many of the tweets contained embedded URLs with preview text and images but no original content. All "challenging" or "edge case" accounts were marked and discussed to ensure the highest agreement between coders.

Even with high reliability between coders, for a final confirmation of codes, one researcher with a great deal of experience with social media-based vaccine discourse did a full pass check of all coding to ensure consistency, focusing on the most challenging cases. During the final pass, accounts were labeled as "suspicious" if they participated in repetitive tweeting or only tweeted the same content, showed a high degree of overlap between friends and followers, had no-to-low follower counts, or their output suggested

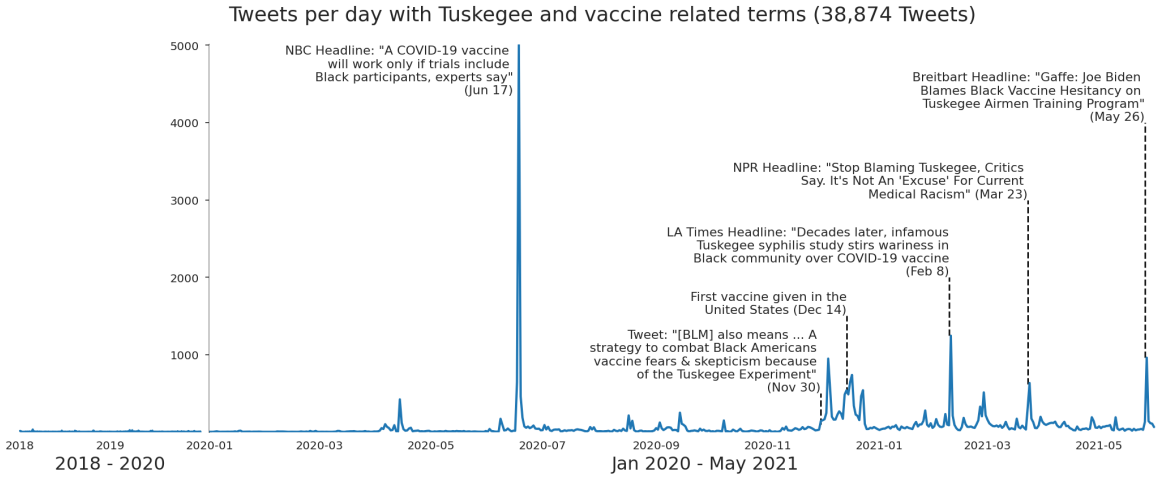

Figure 2: Frequency of tweets and retweets with terms containing Tuskegee and vaccine terms (including abbreviations, plural forms, verb forms, and misspellings) January 1, 2018-May 31, 2021 for a total of 38,873.

a high degree of "bottiness." In our collection of 538 accounts, 45 were coded as suspicious (8.4% of accounts), and 41 accounts were suspended, deleted, or temporarily restricted (7.6% of accounts) over the course of our analysis.

4.3 Analysis of Qualitatively Coded Data

For the analytical phase of the research, we assembled the coded accounts into in-kind groupings resulting in 15 groups. We returned to the account tweet streams to find similarities and dissimilarities in the group narratives. When in combination, the codes—emergent from the ways the accounts expressed themselves—usually resolved to a mostly unified voice. This analysis resolved to 12 composite vaccine narrative voices, which are described at length as the main contribution of this paper in section 5.2.

4.4 Researcher Positionality

While some authors have intersectional identities, none identify as Black. The descriptive analysis was completed with great care to represent the participants—and the resulting "voice" constructs—as justly as possible.

4.5 Treatment of Data and Participants

The authors respect the privacy of individuals who may not understand that their content is public, persistent, or open to study. In keeping with best research practices concerning social media data [27], this paper anonymizes most account names except those of high-profile, public people who appear in other mass media fora and include politicians, scientists, and newspaper and blog authors. We summarize tweet content, except when using a high-profile account's exact words to respect the message. We avoid using gender pronouns when it is not relevant in anonymized reporting.

5 FINDINGS

5.1 Frequencies of Data Across Pre- and Peri Pandemic Periods

Figure 2 shows the frequency of tweets and retweets of posts containing "tuskegee" and all verb, plural, and colloquial forms of "vaccine," along with common misspellings of both. Recall that February 1, 2020, is the start of the "peri-pandemic period." Note how the frequency is low until April 2020, when the volume increases overall. In the pre-pandemic period of January 1, 2018 to January 31, 2020, there were 1320 total tweets and retweets in this discussion space—low, but still a persistent place for exchanges about vaccines and both genuine and disingenuous concerns for Black Americans. But in April 2020, we see an increase in volume sustained through to the end of the data collection period, marking a change in the interest in this topic.

This discussion space is heavily influenced by the narratives in the mainstream media, which appear as corresponding spikes in the frequency distribution in Figure 2, which we summarize here. In June 2020, the narrative focused on the need for more Black Americans to participate in the clinical trials. In November 2020, this discussion space responded to Congresswoman Ayanna Pressley's tweet, which emphasized the importance of Black Lives Matter, meaning that the vaccines need to address the health disparities, access and distribution, and fears in the Black community. In early December, the Biden administration announced Marcella Nunez-Smith, a co-chair of President Biden's COVID-19 advisory board, would lead a new White House task force dedicated to health equity.

In mid-December, the Emergency Use Authorizations for both the Pfizer-BioNTech and Moderna vaccines were approved by the FDA, and Sandra Lindsay, a nurse in New York, received the first publicly available COVID-19 vaccine. Shortly thereafter, a series of articles focused on descendants of the Tuskegee Syphilis Study participants expressing their support for the vaccine, Black doctors sharing pro-vaccine messaging, and profiles on the Black American designer of one of the COVID-19 vaccines, Kizzmekia Corbett. In

Table 1: Voices 1-12 with their corresponding label and color assignments that tabulate the number of sampled accounts in the pre- and peri-pandemic time periods.

Voice			Sampled User Counts				
					Suspicious		
			Pre	Peri	Pre	Peri	Total
	1	Vaccine distrustful speakers who invoke political conservatism	32	36	3	6	77
	2	Vaccine distrustful speakers who do not offer strong positions of identity	13	23	3	13	52
	3	Pro-Vaccine speakers who do not offer strong positions of identity	17	38	0	2	57
	4	Pro-vaccine, Black-presenting speakers					
	5	Vaccine distrustful, Black-presenting speakers	16	95	0	0	111
	6	Vaccine distrustful, Black presenting speakers who make lineage/reparations connections	28	52	2	7	89
	7	Pro-vaccine, Black-presenting speakers who make lineage/reparations connections	8	28	0	2	38
	8	Vaccine distrustful, Black-presenting speakers with Nation of Islam affiliations	1	0	0	0	1
	9	Vaccine distrustful, Black-presenting speakers who are politically conservative	4	16	0	0	20
	10	Vaccine distrustful, Black-presenting speakers who also identify as politically conservative and make lineage/reparations connections	0	4	0	1	5
	11	Vaccine distrust to pro-vaccine	0	2	0	0	2
	12	Mixed content	8	18	0	1	27
		Total	132	320	8	37	497

February 2021, a series of mainstream media pieces focused on the distrust in the Black community and its ties to the Tuskegee Syphilis Study. These articles created a surge in the discussion, with some accounts sharing validation in feelings of distrust, while others responded to the articles with messages emphasizing the crucial differences between the Tuskegee Syphilis Study and COVID-19 vaccines.

One month later, in March 2021, NPR ran an article focused on the importance of recognizing current medical racism as a source of distrust rather than leaning on historical examples like the Tuskegee Syphilis Study. The final spike is a product of the amplification of a Breitbart article focused on President Biden mistakenly referring to the Tuskegee Airmen (instead of the participants of the Tuskegee Syphilis Study) as a source of distrust about the COVID-19 vaccine. The retweet activity around the Breitbart article is primarily driven by the politically conservative, vaccine distrust accounts.

5.2 Polyvocality in Contentious Vaccine Spaces that Engage with Medical Racism

Our analysis of the 538 speakers resulted in 12 distinct "voices" (Table 1) that speak to vaccines in the light of medical racism. During the study, 41 accounts were either suspended or deleted resulting in the 497 total users listed in Table 1. We begin by discussing the voices present in the pre-pandemic period and describe the addition of new voices and amplification of existing ones as the pandemic begins and ensues.

Figure 3 depicts the relative volume between pre- and peri-pandemic periods for each voice and in relation to other voices in the same period. We discuss each voice in detail in this section. As a high-level summary, the voice that dominated the pre-pandemic period is a vaccine distrust voice that also identifies as politically conservative. In the peri-pandemic period, it drops in proportion to other voices that rise. These include the top two Black-presenting voices that surge, one of which is vaccine distrustful and the other vaccine trustful. Despite the valiant efforts of the pro-vaccine voices in our collection to correct the vaccine misinformation in this conversation space, the volume of vaccine distrust tweets was 1.5x greater than pro-vaccine tweets in the peri-pandemic period. This observation is consistent with reports of how effective crowd-correction of misinformation is [76].

The pandemic changed the proportions of some features of the participation in this space, with both vaccine distrustful and supporting voices still present but, as we discovered, debating using different arguments than the vaccine distrustful politically conservative voice that drove a lot of the pre-pandemic discussion. In the material that follows, we discuss these and other voices extensively. All are combining vaccines and medical racism in some way. Some speak authoritatively, while others' credibility is questionable. Some carry messages that are direct and operating on simple arguments. Others invoke reasonings based on long, multi-generational histories and racial, religious, and political identities. Still others attempt to deepen the reasoning for what medical racism means in denying a large population the vaccine through disinformation and fearmongering.

In the pre-pandemic period, the most dominant voice is a vaccine distrustful voice that argues from a politically conservative position. We begin with this voice because it set the stage for what the discussion space was initially oriented around. In this particular voice in the pre-pandemic period, there are no accounts that publicly identify as Black.

5.2.1 *Voices that Dominated the Pre-Pandemic Period and Persist into the Peri-Pandemic Period.*

VOICE 1: Vaccine distrustful speakers who invoke political conservatism. In the pre-pandemic period, vocal anti-vaccine activists referenced the Tuskegee Syphilis Study as a reason to prevent the pharmaceutical and medical industries from dictating what

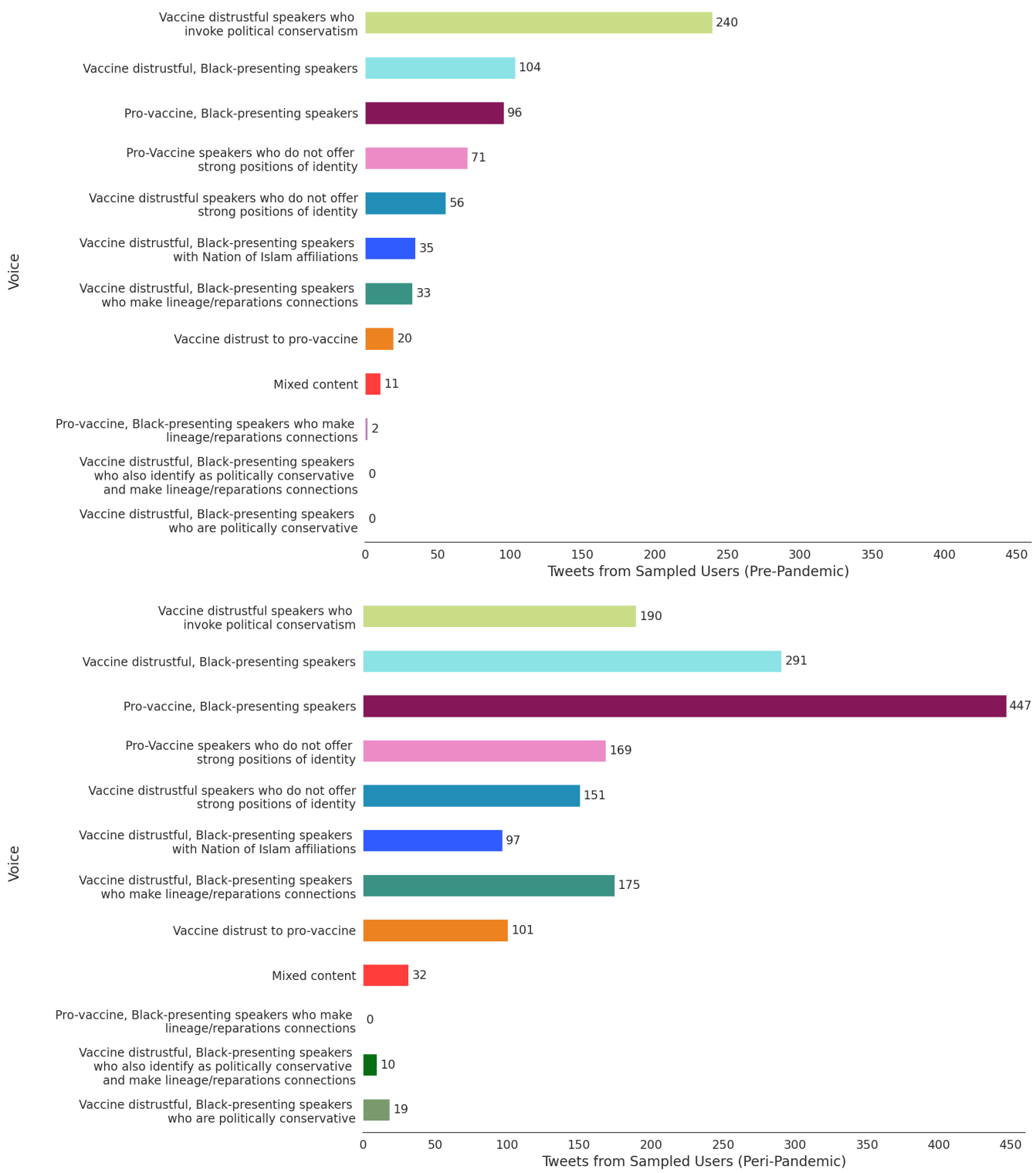

Figure 3: Tweet Volume by Sampled Accounts in the Pre- and Peri-Pandemic Periods. Data are not displayed on the same chart as the sampling strategies were necessarily different for each.

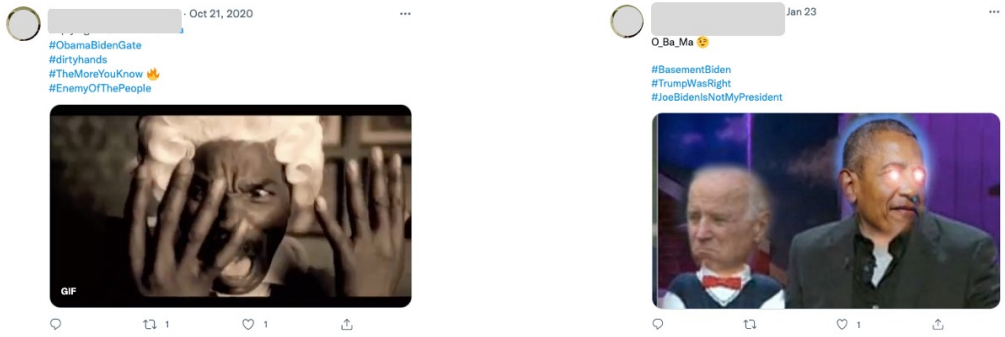

Figure 4: A sample of semi-anonymized (re)tweets from an account coded as Vaccine distrust and politically conservative that juxtaposes "concern" for Black Americans regarding the COVID-19 vaccine while also using the #AllLivesMatter hashtag (see text) as well as GIFs that would be described as digital blackface [32].

is injected into people. These accounts also deliberately use the concept of "safe vaccines" to distance themselves from the term "anti-vaccine." Note that the accounting of Tuskegee erroneously claims that syphilis was delivered to the men enrolled in the study through vaccines.

The messaging invoked similar arguments during the pandemic but narrowed the scope of attention to the COVID-19 vaccines on the horizon. As illustrations of the kind of language employed by these accounts, in June 2020, when there was national interest in the wake of Black Lives Matter protests to make sure that people of color were included in public health safety, accounts in this voice claimed that the government was "pushing people to the front of the line" for an "untested vaccine" while employing the #NoMandates hashtag to resist any perception of government control.

One account's tweet monologue succinctly captures the sentiment of and mixed messaging used by this voice. Before this account appeared in our vaccine collection, it replied to a right-wing political commentator with a GIF that could be described as acting in digital blackface [32], which refers to white people using GIFs, memes, emoji, and other images of Black people to express various emotional reactions online. Then in December 2020, this same account called for Angie Stanton-King and Candace Owens—politically prominent, conservative Black women—to ask the Black community to "say no" to "Biden's vaccines" while also employing the curious mix of #RememberTuskegee, #TuskegeeMassacre, as well as #AllLivesMatter hashtags—the last of which is an explicit form of resistance to the Black Lives Matter movement for racial justice. Here we see concern seemingly expressed about Black Americans but followed by a display of digital blackface. Some months later, this account then calls for investigations of violence into Black Lives Matter protests—protests that were overwhelmingly peaceful [1]. The bio for this account self-identifies as a naturalized US citizen and references their Christian faith and military ties (Figure 4).

This extended illustration powerfully captures this voice. It begs the question: What is the point of invoking Tuskegee? For this voice, the reasons could be entangled and include exploiting existing real fear in medical racism, invoking conspiratorial fear of government, and/or making a political party statement of some kind ("Biden's vaccines"). Under the apparent guise of concern for the long-term effects of vaccines, this voice exploits the legacy of pain caused by the Tuskegee Study to ends that seem to be about the control of people of color.

VOICE 2. Vaccine distrustful speakers who do not offer strong positions of identity. The majority of the highly vocal vaccine distrust accounts existed in this conversation space prior to and continued through the pandemic. They do not argue from strong political, religious, or racial identities. One prominent account, Erin Elizabeth (@unhealthytruth), is another member of the "dirty dozen," a group that is responsible for two-thirds of anti-vaccine content on social media platforms [12]. Pre-pandemic, she tweets about a CDC coverup of Black males being injured by vaccines—"Just remind him of the Tuskegee experiment in which people were given an STD under the guise of a vaccine…" This behavior continues through the pandemic with respect to the COVID-19 vaccines. In May 2021, when a Black molecular biologist who debunks anti-vaccine misinformation on YouTube and social media questioned Elizabeth, she responded with overt racism:

> *"I'm still not sure how you got that PhD. But I have some ideas. Listing adjuvants in a vaccine isn't lying.* ***I learned that in college where I attended without any programs or assistance whatsoever.*** *Have a great day."*

She then adds:

> *"I will still defend my community and I will still educate those here who want to learn every day about the Tuskeegee experiment.* ***I've already done inner-city outreach programs for 25+ years*** *and now have people in every city to educate people on vaccines. We are getting stronger."*

In the pre-pandemic period, another prominent vaccine distrust account, @avoiceforchoice, tweeted about a connection between vaccines and female sterilization and the Tuskegee Experiment while using #PopulationControl, #Eugenics, #Tuskegee, #VaccinesKill, #VaccineInjuryIsReal, #Homeless, #HumanExperimentation, #InformedConsent, and #HumanRights hashtags. The account notably tweets about similar issues again by tagging both the CDC and Tuskegee University. Then, during the peri-pandemic period, the account refers to the COVID-19 vaccine as "Tuskegee 2.0." The

account also distributed the highly amplified tweet from Candace Owens, who, in response to the NBC News article headline that read "A COVID-19 vaccine will only work if trials include Black participants…," continues to perpetuate factually false associations:

> *"Remember the 40 year Tuskegee Experiment when our government pretended to give Black people a "vaccine"—but actually gave them syphillis?"*

There are also accounts in this voice that amalgamate legitimate and conspiratorial government events to undermine the safety of COVID-19 vaccines. For example, one user criticized former President Trump's "big pharmaceutical vaccines" and asked readers to "Remember Tuskegee." This account also referenced conspiratorial terms and ideas, including "mass vaccination," a question about Bill Gates' activity in India, Jeffrey Epstein, September 11, Benghazi, an MI6 campaign to "vaccinate Africa against sickle cell in the 1970s" which led to AIDS, and more.

Voice 2, like Voice 1, expresses concern that is vague at best and racist at worst. Though similar to Voice 1, the arguments of Voice 2 tend to be more haphazard because they are not spoken from a particular position.

VOICE 3. Pro-Vaccine speakers who do not offer strong positions of identity. The pro-vaccine voice that does not obviously implicate their own political, racial, religious, or other identities speaks in support of vaccines and dispels misinformation about the details of the Tuskegee Syphilis Study. It is a clear voice with clear aims. It is heavily supported by medical, scientific, and legal experts who have worked diligently to dismantle anti-vaccine mis- and disinformation. In November 2018, Dorit Reiss (@doritmi), a professor of law, was engaged in a lengthy conversation with anti-vaccine activists about misrepresenting the details of the Tuskegee Syphilis Study (that vaccines did not deliver syphilis). This theme continues in her tweets in the peri-pandemic period. She argues that a lack of access to vaccines for Black Americans is more akin to Tuskegee than the vaccine availability that anti-vaxxers argue vehemently against.

In both the pre- and peri-pandemic periods, another prominent vaccine scientist and pediatrician who specializes in global health, Peter Hotez (@PeterHotez), called out the habitual racial and ethnic targeting of anti-vaccine tactics. These include mocking the Holocaust, invoking Tuskegee, questioning the motives of Asian American and Pacific Islander legislators who promote pro-vaccine legislation, and singling out Orthodox Jews in a recent New York measles outbreak. Another prominent medical voice, David Gorski (@gorskon), drew similar comparisons between anti-vaccine activists co-opting the Black Lives Matter movement for their anti-vaccine propaganda by claiming that vaccines harm African-American children more than white children, and by likening vaccines to the Tuskegee Syphilis Study as a way to appeal to the understandable distrust people of color have of doctors (June 2020). In March 2021, Gorski highlights that older white male anti-vaxxers play the "white savior" role, trying to "save" minorities from what they view as "vaccine injury." He points out that anti-vaccine activists even go so far as to portray their movement as the "new civil rights movement."

One could argue that this and other pro-vaccine voices exist in response to the vaccine distrust voices. While pro- and anti-vaccine sentiments have existed for as long as vaccines, the transition of the idea of vaccines from being a decision about health to a matter of identity speaks to Reich's [66] findings that vaccine distrust is rooted in a lack of trust in decision-makers and feelings of individual liberty.

5.2.2 Dominant Black-Presenting Voices: Pro-Vaccine and Vaccine Distrustful. The following two voices in this polyvocal space include accounts by people who publicly present as Black. The accounts present themselves as Black speakers through a persistent combination of profile textual information, visual information, and consistency across their past and present post content beyond what was captured using the keywords. One voice is of vaccine support; one is of vaccine distrust. They are both present in the pre-pandemic discussion but increase dramatically in the peri-pandemic period.

VOICE 4. Pro-vaccine speakers who publicly identify as Black. These accounts support COVID-19 vaccines and actively debunk Tuskegee Syphilis Study misinformation while acknowledging the justifiable distrust and fear that arise from historic and modern abuses, including health access issues. Like Voice 3, Voice 4 is heavily supported by medical and scientific experts. It is cohesive in its argumentation. Some accounts shared original content they wrote to dispel vaccine myths and clarify the facts of the Tuskegee Syphilis Study, while others retweeted authoritative content from physicians, scientists, healthcare workers, and other related experts who shared evidence-based information about COVID-19 and the vaccines. One of the most amplified tweets in our collection came from Massachusetts Representative Ayanna Pressley in November 2020:

> *Black Lives Matter also means: 1) Any vaccine must have efficacy for those w high blood pressure & diabetes 2) Priority distribution to communities hardest hit by COVID-19 3) A strategy to combat Black Americans vaccine fears & skepticism because of the Tuskegee Experiment etc.*

While this tweet served as a discussion point for both pro-vaccine and vaccine distrust voices, the accounts in this pro-vaccine voice emphasized the importance of improving vaccine access and compliance to reduce the COVID-19 burden in Black communities. An additional example includes a tweet from a well-known pediatrician and public health advocate, Rhea Boyd (@RheaBoydMD), who uses the vaccine discussion as well as Tuskegee to instead cast a light on modern medical racism and abuse (March 2021; bolding is our emphasis):

> ***The truth is, Black people don't hate vaccines. We hate exploitation, experimentation and neglect.*** *And many of us need not resurrect the ghosts of Tuskegee to recall moments in which we've endured such abuse.*

Unsurprisingly, debunking efforts frequently center on anti-vaccine mis- and disinformation spread by prominent accounts in the vaccine-distrust voices. Throughout the pre- and peri-pandemic periods, accounts drew attention to the overt "whiteness" in the anti-vaccine movement targeting Black people and the absurdity of white people using the Tuskegee Syphilis Study as a reason not to get the vaccine. One account tweeted tongue-in-cheek about how the impact of the Tuskegee Syphilis Study on a white woman was

her grandmother not getting milk one day because her milkman had syphilis.

A prominent and verified account speaks to the genuine concern of ongoing medical racism. It seeks to debunk the idea that vaccination and Tuskegee are a part of the same logic and that scaring Black people away from the vaccine is, in fact, the racist act. Beginning in late Spring 2021 as vaccines became more available, writer and media personality, Touré (@Toure), offered multiple expressions of this argument, with these highlighted examples:

> *I understand the medical community's racism has made many Black people nervous and skeptical. I respect that.* ***But "Tuskeegee" isn't relevant here.*** *That was a small evil study that withheld medicine from a specific group of Black people.* ***The Covid vax is global and for everyone.***
>
> *Black people are catching and dying from Covid more than other groups.* ***Only someone who hates Black people would tell Black people to beware the vaccine.*** *Anyone who tells you that is either a Klansman pretending to be Black or a Candance Owens burner account.*
>
> *I'm onto y'all—* ***trying to scare Black people away from the vaccine. In another few years you'll be back to scare Black people away from voting. Or scare them away from home ownership. Or the stock market. Anything that could help them move forward.***

While this voice existed pre-pandemic in support of vaccines (frequently in conversations and debates with anti-vaccine accounts), its overall volume—both in the number of accounts and number of tweets—grew dramatically throughout the pandemic.

VOICE 5: Vaccine distrustful speakers who publicly identify as Black. This voice is fundamentally concerned with medical racism and the Tuskegee Syphilis Study as evidence of historical, long-standing racism and a representative marker of the kind of medical racism that still happens in less noticeable ways in Black lives. This concern is the basis for this voice and most Black voices acting in this space, no matter their vaccine stance.

However, this vaccine distrust voice does something more: some accounts inaccurately relay the details of the inarguable atrocities of Tuskegee Syphilis Study in ways that implicate vaccines incorrectly. The frequent misrepresentation of the events acts as misinformation around the vaccines concepts in particular, with the implication that Black Americans are being experimented upon similarly with vaccines today. For those who seek improved public health for all, these perceptions are another tragic consequence of the American crime of Tuskegee: that an intervention that could protect so many people—a vaccine—is instead being exploited as a fear.

In the pre-pandemic period, this was the dominant messaging by this voice. To illustrate, an account in April 2019 told African families not to take the new malaria vaccine by comparing it to the Tuskegee "experiment." As the pandemic drew on, many accounts likened the media attention given to viral immunologist and vaccine designer Kizzmekia Corbett to that of Eunice Rivers, a nurse who served as the coordinator of the Tuskegee Syphilis Study—both of whom are Black women. Nurse Rivers is a complicated figure who invokes intersectional matters of race and class relations; nurse, gender, and race powerlessness; and medical responsibility [67]. The Tuskegee-COVID-19 link continued in other ways, too: in December 2020, an account with over 70k followers claimed that the same people who presided over Tuskegee were orchestrating the administration of the COVID-19 vaccine. This claim moves away from reporting misinformation about Tuskegee to an act of distributing disinformation.

There were other forms of disinformation as well. Some accounts made links between Tuskegee and eugenics. One account made religious or mystical connections to the vaccine argument, calling vaccine supporters "Satan's children," and inferred that the six-foot distance recommendation referred to 666, the devil's number. Another reported on the artificial inflation of case numbers in the Black community as a way to force vaccines to recreate a "Tuskegee 2.0." Another reported that "saying no" to vaccines was to honor the Tuskegee study participants. Some accounts suggested the culpability of the CDC and even the World Health Organization in Tuskegee, accusing the organizations of a "genocide criminal record" that rushed the COVID-19 vaccine process. One account likened the vaccine advocacy efforts in communities of color to Josef Mengele experimenting on Jews while pretending to fight antisemitism, claiming that:

> *"Instead of addressing the root causes of racism, #JabJihadists in government, media and beyond are appropriating the pains of African-Americans to manufacture 'vaccine' compliance just like they did during the Tuskegee experiments."*

Voice 5 commits to ensuring that the atrocities of the Tuskegee Syphilis Study are not forgotten. Worrisomely, however, the reasoning of this voice aligns to the politically conservative vaccine-distrusting voice (Voice 1) that does not publicly present as Black. Voice 1 has highly questionable intent concerning protecting Black health. Whereas Voice 5 expresses the historical pain and legacy threat that Tuskegee caused, Voice 1 orients toward current-day politics about the motivation for hurting Black people.

Voice 2 expresses itself with the truthful experience of medical racism but in the company of misinformation and some disinformation. Voice 1 expresses vaccine distrust on behalf of others—Black Americans—rather than for themselves, which means that incorrect information from Voice 1 has a quality of being designed to target with frequency and in relation to modern-day party politics and, therefore, reads as disinformation. Unfortunately, the messages of Voice 5 are consonant with Voice 1, even though the subtexts are different.

5.2.3 Distinctive Variations on Vaccine-Distrustful Voices Who Publicly Identify as Black. The following three voices overlap in their messaging with Voices 4 and 5, but they speak from positions of additional political, religious, and historical connections that make them distinctive.

VOICE 6. Vaccine distrustful, Black-presenting speakers who make lineage/reparations connections. While this voice has considerable overlap with Voice 5, there are narrative nuances that are attributable to concepts related to Black lineage and reparations. This voice includes accounts that identify with the American Descendants of Slavery (ADOS), which focuses on reparations for U.S.

slavery, and argues for the formation of a racial category that dissociates ADOS from modern Black African immigrants and Black immigrants from the Caribbean [73]. The voice also includes accounts that associate with Foundational Black Americans (FBA). Both are centered around lineage and reparations, though ADOS is a political movement and FBA is not.

One of the most amplified accounts in this voice is Tariq Nasheed (@tariqnasheed), media personality and founder of FBA, who has been vocal about his distrust of the COVID-19 vaccines. Nasheed was the person who first drew the comparison between Kizzmekia Corbett and Eunice Rivers, to highlight tactics used to gain Black trust. This illustrates an essential aspect of this voice, which is one of skepticism about Black Americans participating in the infrastructure surrounding the COVID-19 vaccines (e.g., scientists, healthcare workers, government employees). There is emphasis on differently felt racial experiences among Black Americans.

Nasheed continued to post across the pandemic. In July 2020, he made the point that unlimited resources were offered for COVID testing but that the "white powers in control" completely ignored the enduring request for "reparations, decent employment, decent education, decent housing, no police killings." In December 2020, he pointed out that "they are using yet another Black, non-FBA doctor to do the #CovidVaccine experiment on today...Notice no one has given a SCIENTIFIC reason as to why we are only seeing Black people injected with this new vaccine."

Some accounts, like those in other voices, posted disinformation. In what has become a controversial paper among supporters of the ADOS movement, Nkonde et al. [57] found that the ADOS network strategically used breaking news events to discourage Black voters from voting for the Democratic party. The researchers refer to this phenomenon as disinformation creep, a method of "combining legitimate grievances along with slight factual distortions and reinterpretations of breaking news events that culminate in a contradictory worldview, at odds with the interests the worldview purports to support." They also report that the ADOS network remained largely silent about the impact of the novel coronavirus on Black communities, undermining its claims that it works in the interests of Black Americans.

The atrocity of slavery in the U.S. strongly shaped the views of this voice. The Tuskegee Syphilis Study was an important reference point but, more so than Voice 5, it referenced the underlying structural racism that gave rise to atrocities like Tuskegee—structural racism that still exists. Like Nkonde et al. [57] found, this voice combined "legitimate grievances" with "slight factual distortions." It is a strong, pained voice, and it is persuasive in both its truths and untruths.

VOICE 7. Pro-vaccine, Black-presenting speakers who make lineage/reparations connections. This voice shares the identities of Voice 6 but supports vaccination. It is represented by just one account in our data collection, which publicly debates the safety of vaccines with Nasheed, a prominent FBA voice. The speaker captured in our data collection publicly and productively pushes back against Nasheed in the pre-pandemic period in support of vaccines while acknowledging the atrocities of Tuskegee. During the peri-pandemic period, this account again engages with Nasheed arguing for vaccines while acknowledging that Black Americans, and particularly American Descendants of Slavery, are, as a group, underrepresented in medical studies and health care provision. Voice 7, like Voice 3 but even more to the point because of the ADOS identification, is publicly navigating the trauma of the Black experience so that Black Americans today are not further injured because of fear of the COVID-19 vaccines.

VOICE 8: Vaccine distrustful, Black-presenting speakers with Nation of Islam affiliations. This voice expresses many of the same concerns as Voice 5 but is distinguished by its religious affiliation with the Nation of Islam (NOI) and the specific amplification of NOI-curated misinformation. Much of the tweet content is sourced from the NOI website's own vaccine page, which is riddled with distorted scientific findings and conspiratorial content suggesting that U.S. forces planned the pandemic. The page also amplifies anti-vaccine activists, including Judy Mikovitz, who is known for her discredited medical claims (including linking the COVID-19 vaccine to death and sterilization) and her role in the viral conspiracy theory Plandemic videos. NOI also collaborates with the Children's Health Defense on various anti-vaccine efforts and advocacy aimed explicitly at Black Americans [17].

During the pandemic, NOI released a brochure endorsed by Louis Farrakhan, the head of NOI, which lists bona fide historical events related to medical racism alongside questionable, debunked, and retracted scientific information. It includes the following declaration:

> *The Honorable Minister Louis Farrakhan warns the Black community against taking the COVID-19 Vaccine with the U.S. Government's treacherous history of experimentation, medications, and vaccines. This publication provides information, facts, and history to why we should not take "their vaccine" along with guidance on how to protect yourself, family, and community.*
>
> *Remember the vaccine that they gave us for polio that was cancer itself? So, how in the hell could you trust them with a vaccine after you know what they have done and that they are capable of doing it again on a bigger and broader level? It's government policy to reduce the population of the Earth by two to three billion people...We will not accept your vaccine!*

Of note, despite cautioning followers against taking the vaccine, NOI reinforces the legitimacy of the pandemic, and encourages other protective measures like mask-wearing, hand-washing, and social distancing. The focus of this voice is on the dangers of the vaccine itself, and specifically to Black Americans.

We report on the messages of an account that represents the total of this voice well. In the pre-pandemic period, this account said vaccines were being used to gatekeep school enrollment and mistakenly refers to the Tuskegee Syphilis Study as researchers advertising treatment for smallpox. Then, early in the pandemic, the account cautioned that the new virus was designed to help market vaccines to ensure that Black people are "sick, dead, or under their control." It amplified content from FBA about the tactics of advertising that a Black woman, Kizzmekia Corbett, helped develop a COVID-19 vaccine. In August and September 2020, the account shared content that highlighted how Robert Kennedy, Jr. "exposed the CDC" about the harmful effects of vaccines on the Black community. Later, it tweets about using Black people to help push the

"extermination and depopulation agenda," and takes up Farrakhan's polio and cancer narrative, saying that Black people did not have cancer before receiving the polio vaccine. Other accounts speaking with this voice further tie the vaccine campaigns to government and military efforts. One account tweeted about mass vaccinations being an effective method for the CIA to kill thousands of people at the same time. Another account stated that Pfizer and Moderna are military contractors paid by the Department of Defense to develop a novel vaccine platform and refers to mass vaccination programs as providing the Pentagon with "pharmacovigilance surveillance." Summatively, we think of this voice as speaking from experience with medical racism, reasoning that medical racism is intentionally propagated by new government initiatives.

VOICE 9: Vaccine distrustful, Black-presenting speakers who are politically conservative. This voice is more like Voice 1 than 5. The three voices share the same endgame of COVID-19 vaccine rejection, with an expression of distrust in the government because of the Tuskegee Syphilis Study precedent. Whereas we discussed Voice 5 as expressing a greater authenticity to the pain of Tuskegee than Voice 1 did, here we see expressed authenticity but with specific employment of messages from conservative politicians, media, and figureheads (e.g., Breitbart, FOX News, Dinesh D'Souza, Bongino Report). Some accounts in this voice also amplify Russian state media.

VOICE 10: Vaccine distrustful, Black-presenting speakers who also identify as politically conservative and make lineage/reparations connections. Only two accounts represent this still notable voice. Both accounts appear in the peri-pandemic period, amplifying anti-vaccine content from politically conservative accounts as well as those affiliated with lineage and reparations movements. Their main message is about vaccine distrust and pulls from sources that, on other issues, are often in strong disagreement. Regarding vaccines being about government control and inequity, particularly in relation to Black Americans, they repeat arguments that echo both the lineage and reparation distrust voice and the politically conservative distrust voice, both of which express the same endgame with the COVID-19 vaccine. Though the Twitter posts occasionally include reparations content, the voice more strongly reacts to recent events along modern-day party lines.

5.2.4 Voices that Reflect Change in or Confusion about Vaccine Decisions.

VOICE 11: Vaccine distrust to pro-vaccine. This voice expressed concerns, fears, or distrust in the pre-pandemic or early in the peri-pandemic period and, over time, expressed pro-vaccine sentiments or posted about being vaccinated. We did not hear differences in their decision-making in relation to features of identity.

We offer the journey of one account that illustrates how this voice develops over time. During the pre-pandemic period, this account participated in a conversation with multiple prominent pro-vaccine accounts around the term "anti-vaxxer." This account self-identified as an anti-vaxxer, mentioned knowing about the story of Henrietta Lacks, and hypothesized that altered vaccine serums might have been a source for the rise in autism cases. During the pandemic, this account said they were apprehensive about vaccines produced under the Trump administration, but in a later tweet, said they were considering accepting the Moderna vaccine as it was developed at Vanderbilt University and funded by Dolly Parton. As we will see in the next section, the accounts represented by this voice are "embedded" in the Voice 4 cluster in the network graphs, suggesting perhaps that credible pro-vaccine information helped push them from vaccine distrust to support.

VOICE 12: Mixed content. This voice is represented by the expression of both pro-vaccine and vaccine distrust sentiments without the linear transition from vaccine distrust to vaccine support and/or compliance. The mixed content may reflect an account's indecision, or perhaps just contrariness. We did not hear differences in their messaging in relation to features of identity.

An account in our collection tweeted from June 2020 through January 2021 about the "Tuskegee experiment," "Big Pharma," ethnic cleansing, and biological warfare (including a reference to AIDS being created in 1976 in Fort Detrick, Maryland). However, in May 2021, they argued (in reply to FBA's Nasheed) that one is more likely to die from COVID-19 than the vaccine. They noted that their whole family is vaccinated without problems but continued to express apprehension of the vaccine and "vaccine passports."

Other accounts explained their source of distrust as being due to the government using the "Tuskegee airmen" and military members as guinea pigs for spreading syphilis (a misrepresentation of the study design and participants), testing vaccines in foreign countries, and knowingly spreading syphilis in Guatemala. The accounts raised concerns about "forced vaccinations" being similar to the "Tuskegee experiments," yet also stated that they do not believe vaccines are dangerous. An additional account in this voice, tweeting in the pre-pandemic period, criticized the American Medical Association as the problem and anti-vaxxers as the symptom. In April 2021, they curiously tweeted that people who have snorted cocaine in a bathroom should not be worried about the vaccine, perhaps indicating that they received the vaccine after all.

5.3 Suspicious Accounts

Of the 45 suspicious accounts in our sample, 82% belong to a distrust voice, 11% belong to a mixed voice, 4% belong to the pro voice, and 2% belong to the distrust-to-pro voice (Figure 5). If we look at suspicious accounts based on voices with or without strong identity features, 60% do not publicly present as Black, while 27% do. There is precedent for targeted disinformation in this conversation space. Social media accounts from Russia's Internet Research Agency (IRA) masqueraded as a variety of identities, including liberal and conservative speakers. The IRA agents also used paid advertising to target Black Americans [23, 39], employing "digital blackface" to exploit American racial divisions for geopolitical advantage [29]. These "sockpuppet" accounts purport to be American citizens with strong political interests.

5.4 Voice Connections and Disconnections

We next examine the relationship between the 12 voices through visual inspection of network graphs. Figure 6 shows all 12 voices in the pre- and peri-pandemic periods in a network graph, where the nodes are the accounts and the edges are @mentions (which include @mentions that are generated by retweets) using the full contextual streams from October 1, 2018, to May 31, 2021. (Please

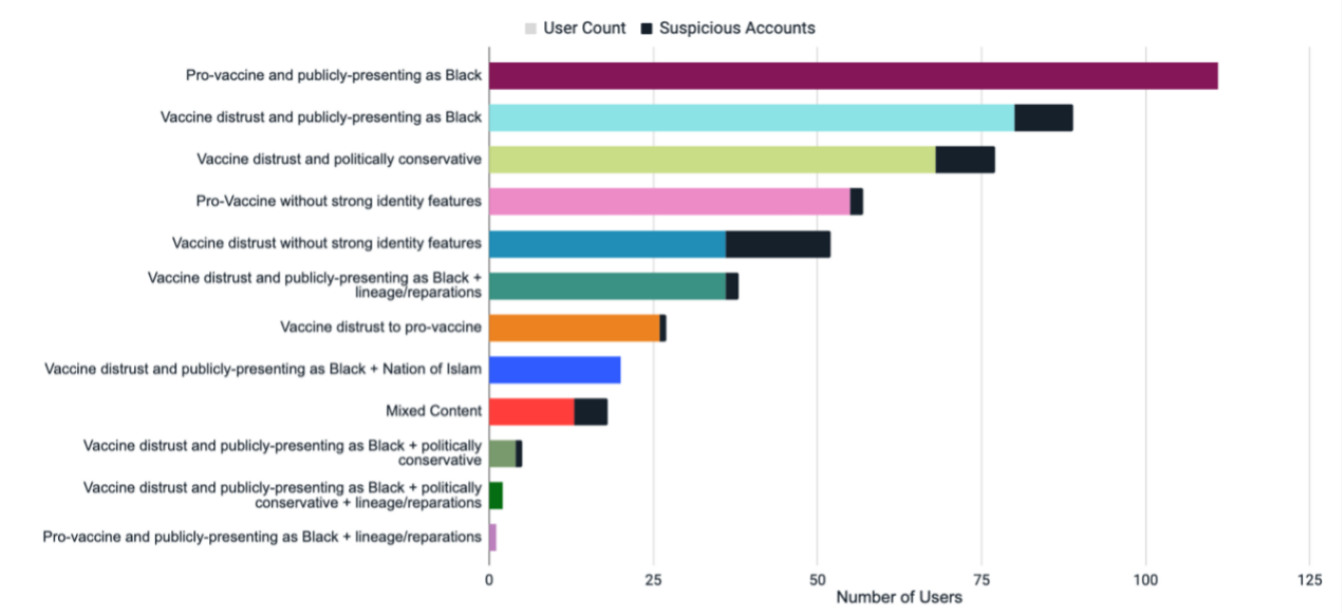

Figure 5: Total number of sampled users, including suspicious accounts, per voice.

see the Method section for further details about how these network graphs were constructed).

The distinct clustering of colors offers confirmation that the voices were constructed inductively in a way that matches the reality of conversational interaction, as the network graphs show homophily among the voices. Most accounts in each voice are clustered near each other, and neighboring voices are adjacent.

Voice 4, which is vaccine-supporting and Black-presenting, becomes more prominent and more central throughout the space during the pandemic. This cluster of nodes sits in the tension between the Black-presenting with vaccine distrust voices (Voices 5, 6, 8-10) and the vaccine distrust with and without political identity features (Voices 1 & 2). Voice 4 accounts are caught in the middle of this discussion space, actively dispelling myths and debunking both distrust voice clusters' mis- and disinformation.

We note that the distrust-to-pro vaccine speakers (Voice 11; light orange) and the mixed content speakers (Voice 12; bright orange) are intermixed throughout the conversational space. A majority of these sit more centrally with the pro-vaccine, Black-presenting speakers (Voice 4) in the peri-pandemic period, suggesting that perhaps there is some influence from exposure to pro-vaccine content.

For Voices 1 and 2, we discover that perhaps their voices are at least structurally more similar than their identifying features would suggest. Voice 2 does not bring political, religious, or racial positioning into discussing their vaccine distrust, whereas Voice 1 does. When we consider the accounts that comprise Voice 2, we characterize it as a legacy voice—a long-time voice in the anti-vaccine movement predating the rise of the specific and highly conservative group that often identifies with the "MAGA" or the Trump-conservative movement. Voices 1 and 2 may have existed as a unified voice prior to the Trump era. Together, they seem to be operating in a similar antagonistic role in the Tuskegee+vaccine discussion. We say "antagonistic" because it is not clear if the vaccine-supporting voices would otherwise occupy this space so strongly—on a topic that is not directly about vaccines—if it were not for the vaccine distrusting voices.

Next, we further examine the relationships between the distrusting voices. The accounts in Voices 1 and 2 (lime green and dark teal) have strong ties to the organized anti-vaccine movement known for racial and religious targeting. The accounts with strong politically conservative identities often amplify content from political leaders and figureheads who support policies that further harm communities of color. Guilbeault et al. [36] suggest that just the knowledge that a social media post is from someone of a different political party is often enough to turn an individual off to its message.

As a summarized view, we might think of the Figure 7 peri-pandemic graph as showing two vaccine distrust "superclusters" consisting of Voices 1 and 2 and Voices 5, 6, 8, 9, 10. Even though those voices share a stance on vaccine distrust, the two superclusters are largely distinct in the pre-pandemic period. Of note, the largest politically-conservative vaccine distrust account positioned at the boundary between the two superclusters (@Thomas1774Paine) is a self-described "Nonpartisan Investigative Journalist" with 230k followers who heavily amplified the Breitbart article responsible for the final spike in Figure 2. The density of the complete network graphs makes it challenging to further discern patterns of connection given the scope of this paper; however, we know that the interactions grew significantly once the pandemic began: the number of connections between the two distrust superclusters increased by 84% in the peri-pandemic period.

Voice 5 (light blue), which is vaccine distrusting, Black-presenting only, sits adjacent to and intermixes with Voices 6 and 8 (Black-presenting with lineage/reparations and NOI affiliations). Voice 5 has more accounts that interface with the non-Black-presenting

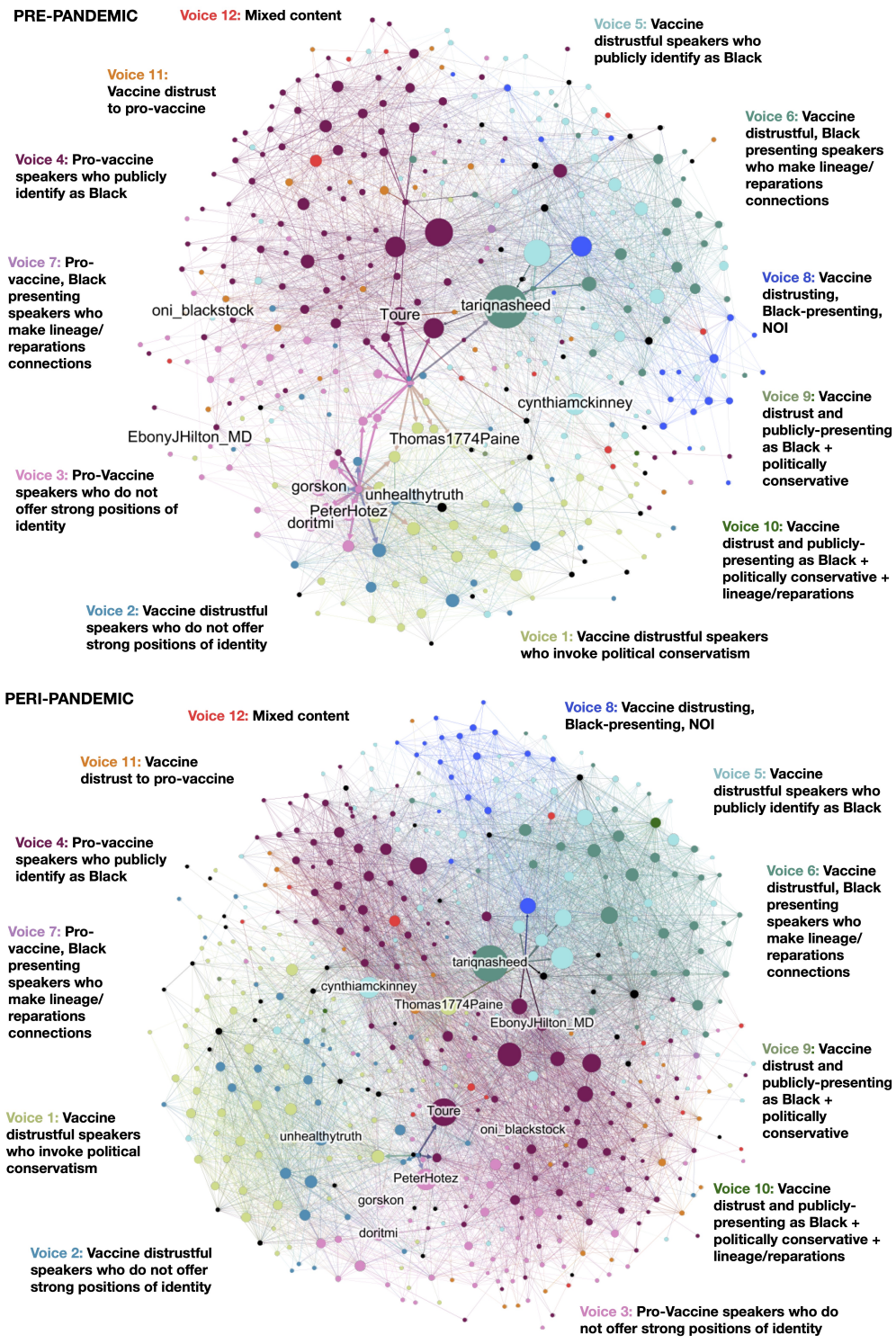

Figure 6: The 12 Voices in the Pre- (top) and Peri-Pandemic Periods (bottom) using a @Mentions (including @Retweets) network graph. Color assignment matches that of Figure 3 which first described the frequency of tweets by each voice. We label some of the larger voices and rely on the legend and the body text to resolve the rest of the voices.

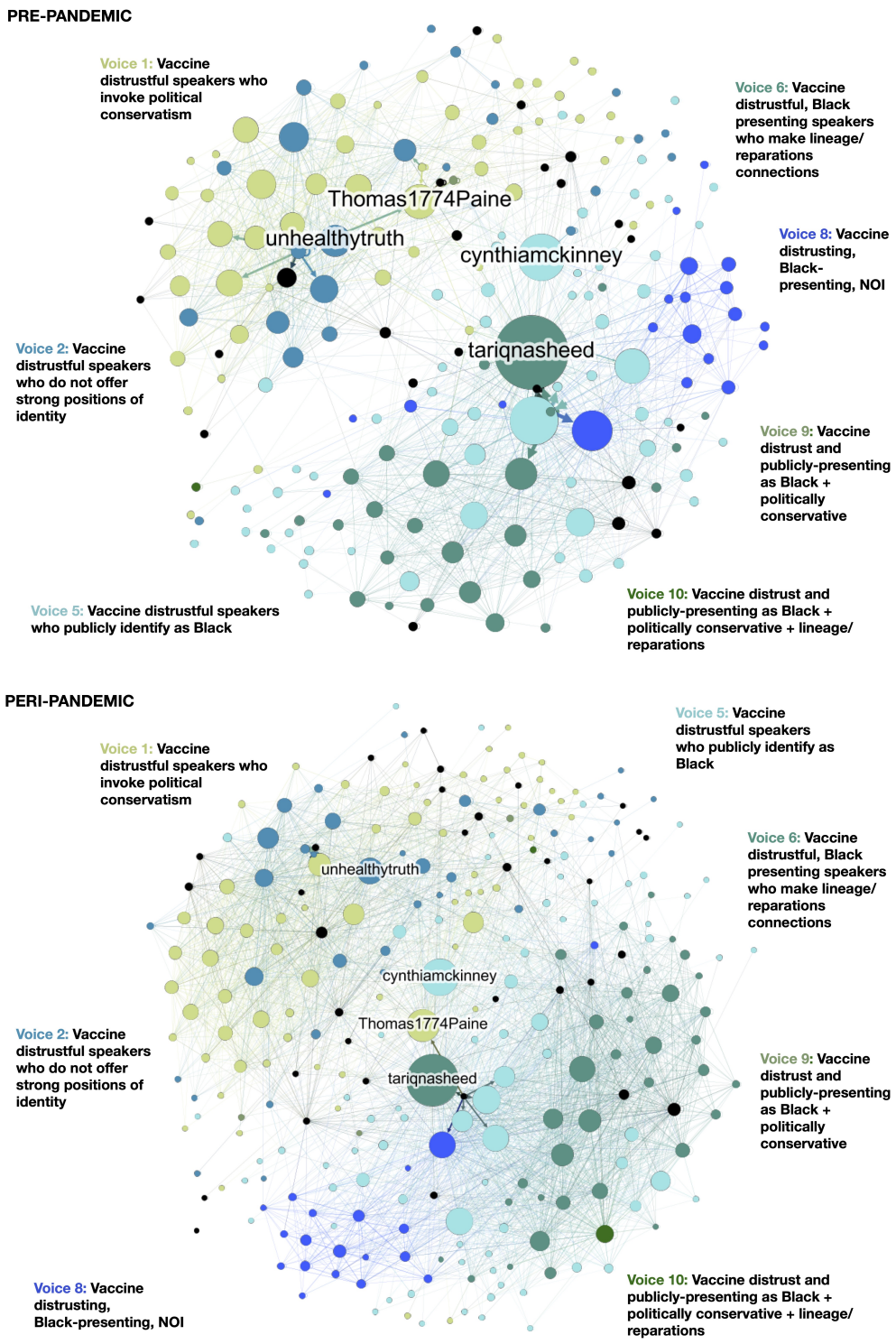

Figure 7: Network graphs of vaccine-distrusting voices (1, 2, 5, 6, 8, 9, 10) in the Pre- (top) and Peri-Pandemic (bottom) Periods

anti-vaccine cluster on the left than other Black-presenting vaccine distrust voices (except for Tariq Nasheed of Voice 6). A Voice 8 account also sits centrally. Voice 5 looks to be interacting with all of them, perhaps by bridging them or fielding an interesting array of vaccine distrust statements that are a mix of modern-day party politics along with long-lived historical political reasoning around medical racism. Based on the quality of Voice 5, which focused on the underlying medical racism that supported the Tuskegee Syphilis Study, we hypothesize that these accounts might be exposed to messages different from their own and that they are the kind of account that other distrusting voices want to persuade further. In this way, they become unknowingly involved in what Starbird et al. [75] describe as a kind of "collaborative disinformation operation," where disinformation is propagated by "orchestrated agents and organic crowds"...that "take advantage of and resonate with the design of social media platforms."

Additionally, this filtered view makes the suspicious accounts—the black color nodes—more prominent. Remember that these behave in a way that suggests some kind of inauthenticity or "bottiness," and 82% of the 45 suspicious accounts were vaccine distrusting, which is why they are so visible here. They appear throughout the space creating connections but are more dominantly co-located with Voices 1 and 2. This location suggests an ability to amplify a particular kind of anti-vaccine mis- and disinformation.

6 DISCUSSION AND IMPLICATIONS

The concept of "polyvocality" speaks to the many voices that express different opinions and reasonings about a concern, in this case, vaccines. Vaccine debate concerning the Tuskegee Syphilis Study gives rise to confusion as vaccines themselves were never a part of the study, though medical racism was. The lessons to the participants of the space are unclear because the arguments about medical racism are unclear. The intentions of some voices are veiled, and some even predatory. This advocacy space—for vaccines, for no vaccines, for Black health, and acknowledgment of the virus but not of its prevention—is convoluted. From it, we gain some insight into misinformation and disinformation.

6.1 On the Nature of Disinformation

A Site of Interaction that Allows Intentions to be Deliberately Confused. The invocation of the atrocity of the Tuskegee Syphilis Study clouds intention because it blurs the ability to understand another's reasoning. The truth of the Tuskegee Syphilis Study is so offensive that it takes a moment to explain that parts of it are hijacked to tell untruths that cause yet further harm. Speakers who attempt to correct misinformation can easily be incorrectly perceived as the ones who deny medical racism. In contrast, those spreading mis- and disinformation about the event appear to be, on the surface, fighting medical racism—when the opposite is true.

This research provides important lessons for public health and advocacy organizations. Medical racism past and present will continue to haunt public health recommendations, and atrocities such as the Tuskegee Syphilis Study need to be ongoingly addressed in public health messaging. Misinformation told as stories is powerful and challenging to undo, particularly when they invoke legitimate tragedies. As such, public health communications today must still address past offenses, even when the events seem to have little connection to the matter at hand. What we see here is part of the ongoing tragedy and impact of the Tuskegee Syphilis Study. To address valid concerns, public health and advocacy groups must attend to the speakers in local communities—even the speakers who have the facts wrong. Health communicators and advocates can look to these amplified voices and conversations to create better, more specific messaging that attends to the nuances of the concerns that arise.

Disinformation as an Act of Exploitation. Those who correct facts about the Tuskegee Syphilis Study so that the historical event cannot be hijacked to cause further medical harm are operating in protective roles, and they are predominantly Black-presenting. Those propagating Tuskegee untruths are both Black-presenting and non-Black-presenting—but the quality of their expressed voices reveals that their intentions appear to be alarmingly different. Black-presenting speakers who claim concern for Black health but have confused the details of the Tuskegee Syphilis Study provide reasoning that is not tied to recent politics but rather to the long-lived experiences and politics of civil rights. The non-Black-presenting speakers who claim concern about further medical racism with vaccines are not concerned about Black health. Their arguments are straightforward and are easy to adopt but, when following their throughline of reasoning across posts, we discover that it is superficial and tied to highly recent American politics.

This latter group is *further exploiting the Tuskegee atrocity*. Even more, such speakers are exploiting the Tuskegee atrocity to advocate for an issue that they themselves might not feel strongly about in "real life" (vaccine noncompliance). The disinforming act, then, is *"purposively" designed* [8] *to deliberately target people, not necessarily to target an issue*. We might say that Black-presenting speakers who write from a position of the long-lived politics of civil rights are making incorrect use of the Tuskegee atrocity *to target an issue*–that of medical racism—but *not to target specific people*.

Disinformation as a Foreground/Background Trick. This is what disinformation is: it ostensibly speaks to one foregrounded issue but cleverly keeps its consumers blind to the real agenda, which lurks in the background and often requires the ability to read longitudinally and across the multiplicity of voices to detect—what we call *polyvocal readership* and discuss below. The foregrounded topic is a masquerade and wastes the labor of its defenders who attempt to dispute, dispel, educate. We know this is true with the topic of vaccines, as there are plenty of other aspects of medical racism that persist and are signaled directly by the lessons of the Tuskegee Syphilis Study. Yet, instead of addressing topics of equity or access—real problems affecting vaccine compliance in communities of color—anti-vaccine activists co-opt medical racism for political purposes and deny the value of vaccines altogether.

6.2 On Technological Responsibility

Social Media Platforms Validate All Voices. The emergent voices in this space around what is otherwise a binary choice of vaccine compliance are what invoked Bakhtin's writings on polyphony, which come from multiple voices or polyvocality [2]. For Bakhtin, the imaginary was a move beyond monophony—single authorship—to create dialogic experiences in which other views can be expressed. It was a perspective to decenter authorship [26] by enabling a "plurality of independent and unmerged voices and

consciousnesses." When he was writing of this mid-century, one wonders—if he could have imagined today's Twitter—if other more productive paths could have decentered the single, unquestioned voice. Perhaps we find a thread to pull when Bakhtin spoke of attaining "a genuine polyphony of fully valid voices" [2]. Here, we might question what or who renders a voice valid, and if this is where the polyvocal space gives way to a convolution of intentions and argument. Twitter as a platform is the de facto proxy for validity. If an account can be created, Twitter automatically deems the voice with which it speaks to be valid. In fact, social media platforms presume validity; invalidity must be proven (and it is a challenging case to make). It is technology as authority. A single author may no longer be at the center of things—instead, the platform is. In the early days of social media, one hope was that the crowd could be self-correcting [54, 62] or that unimpressive follower count would mean a voice could be effectively discounted or ignored. What that missed were the entanglements of the foreground/background trick and the willingness of people to exploit vulnerabilities.

We see some attempts for Twitter to push back on health misinformation. In March 2021, it instituted a practice of labeling COVID-19 health misinformation [80]. More recently, it launched a reporting feature that institutes violations related to "False or misleading information about the efficacy and/or safety of preventative measures, treatments, or other precautions to mitigate or treat the disease" [80]. Policies like these help, but more powerful would be solutions that would make social media feature sets less sparse so as to make impersonation more difficult.

Usability Favors Disinforming Voices. What Twitter has done is make a platform so easy to join, so inviting to enter text, so simple to publish and scroll, that the interface hardly seems to be there at all. There are no obstacles to proving that one is who one is, or indeed, is even human. It is so easy and fast to use that even humans can appear to be behaviorally like bots! The curse of usability, in this case, is that whatever is behind an account is unknown, not just because the platform decided to stay largely blind to that, but also because the interaction with its features leaves little trace of who or what was there and for how long. Through close reading and extended research like that done in this study—over hundreds or thousands of hours—readership of a polyvocal space can be retrospectively achieved, and we can see the voices for what they are.

Polyvocal Authorship Demands Polyvocal Readership. We can take up where Bakhtin left off: for there to be polyvocal authorship, there also needs to be support for polyvocal readership—the capacity to read high degrees of polyvocality. Even if we can hold tech companies accountable for granting validity far too liberally, unquestioned readership also renders judgment on validity. This is already a problem because readers of social media generally do not have sufficient context about a speaker and their prior actions to read critically and with speed in such a sparse, fast-moving environment. At the moment, for there to be reciprocal readership to authorship in a polyvocal space, then we must have armies of people—or armies of machines, or both—to respond to the world's chatter. Polyvocality does not scale in relation to capacities for readership.

Platforms have been designed for polyvocality and should now be obligated to design for polyvocal readership. We propose that one solution is to make the world's technical stages a little harder to use. Building in design frictions is a way of making users more aware of the tasks they are about to engage in [28] and has particular relevance here with Korn and Voida's conceptualization of enabling moments of contestation in civic engagement [47]. But perhaps the obligation of who should feel the weight of the design friction is not the users but the platform corporations themselves.

We need to think about the usability of highly interactive platforms differently—the usability requirements are not meaningfully about button sizes and icon legibility, but about how an account behaves across information spaces: What is its story arc? What does it bring to the table? How patient is it? How angry? How interactive? To whom does it listen? Why shouldn't we as easily know this when reading posts as we can create a brand new account at the quick push of a button?

In this way, polyvocal readership does not just describe the number of listeners or listening agents to be equal or greater in number to the number of voices, though enabling this kind of augmented listening is an important direction, too. Polyvocal readership is also about providing readers with contextual information layered on to the surrounding circumstances of a posts that are so easily cast off—this is the kind of context a researcher-reader achieves only after painstaking reading of carefully collected monologues, profiles, and more.

The Constructed Discussion "Site" as Unit of Analysis for Monitoring. If the response to the convolutions of polyvocality is polyvocal readership, we are faced with asking what the crowd, the machines, and policies that govern machines can do about exploitative distortions of truth. A prevailing goal is to target those who target vulnerable people and populations at all costs. A last lesson from this work is that the construction of the discussion "site" has analytical value. We discovered the Tuskegee+vaccine discussion site in our early exploratory analysis when its activity dramatically increased. Automated interceptions, detections, and remedies that operate at the level of a newly appearing "site" combined with current practices of machine monitoring of "source," volatile terms, and emergent hashtags could lend analytical power to find and quickly squelch racist and other predatory behavior.

7 LIMITATIONS

This research discovered and studied a site of interaction constructed from terms that social media posters used to address issues of medical racism in relation to COVID-19 vaccines. We consider the site to be important on its own, but one that also offers an acute focus on this issue that might be hard to create elsewhere because topics of medical racism are often present but elusive. The findings from studying this site can be used to inform understanding of medical racism discourse that can be found elsewhere, including how mis- and disinforming behaviors turn on it. The findings are not intended to describe how much medical racism is discussed in relation to COVID-19 vaccines on Twitter or elsewhere.

8 CONCLUSION

Disinformation is not just a collection of single pieces of incorrect information; its production is wrapped up in positionality

and intention to attack in uncertain situations. Sophisticated disinformation efforts exploit by co-opting elements from unrelated collective movements and destabilizing logics. From this study, we learn about an extended effort to co-opt significant history—that of the Tuskegee Syphilis Study— retold and released to an audience in an arena where mistrust abounds. Polyvocality describes this mixed space of positions, agendas, and their resulting logics. A response is required to sort out expressions of genuine truth-seeking, misconceptions, and deep-seated fears from their simulacra that intermingle with the truth to undermine efforts to reduce uncertainty, improve public health, and raise awareness of ongoing matters of medical racism. Ease of platform use favors the ability to disinform. Human and machine methods of removing acts of disinformation and repeated acts of misinformation are required, but so too are features, tools, visualizations, and policies that augment the human experience and enable "polyvocal readership" of the mix of valid, questionable, and predatory voices that coexist in emergent discussion spaces

ACKNOWLEDGMENTS

The authors thank our colleagues James Dykes, Max Gannett, Tajanae Harris, Clark Mousaw, Deepika Rama Subramanian, Erin Robinson, and Madelyn Zander for their support of this research. The authors also thank the anonymous participants who were the subject of study of this research. This research was funded by NSF grant 2127545.

REFERENCES

[1] ACLED. 2020. Demonstrations & Political Violence in America: New Data for Summer 2020 | ACLED. https://acleddata.com/2020/09/03/demonstrations-political-violence-in-america-new-data-for-summer-2020/

[2] Mikhail Bakhtin. 1984. *Problems of Dostoevsky's Poetics.* University of Minnesota Press, Minneapolis, MN.

[3] Melissa Bica, Leysia Palen, Jennifer Henderson, Jennifer Spinney, Joy Weinberg, and Erik. R. Nielsen. 2021. "Can't think of anything more to do": Public displays of power, privilege, and surrender in social media disaster monologues. *Human-Computer Interaction* (2021). https://doi.org/10.1080/07370024.2021.1982390

[4] Melissa Bica, Joy Weinberg, and Leysia Palen. 2020. Achieving Accuracy through Ambiguity: the Interactivity of Risk Communication in Severe Weather Events. *Computer Supported Cooperative Work (CSCW) 2020 29:5* 29, 5 (10 2020), 587–623. https://doi.org/10.1007/S10606-020-09380-2

[5] Rae Ellen Bichell. 2020. Anti-Vaccine Movement, Racism And COVID-19 Collide In Colorado. https://www.kunr.org/post/anti-vaccine-movement-racism-and-covid-19-collide-colorado#stream/0

[6] André Brock. 2012. From the Blackhand Side: Twitter as a Cultural Conversation. *Journal of Broadcasting & Electronic Media* 56, 4 (10 2012), 529–549. https://doi.org/10.1080/08838151.2012.732147

[7] David A. Broniatowski, Amelia M. Jamison, Si Hua Qi, Lulwah AlKulaib, Tao Chen, Adrian Benton, Sandra C. Quinn, and Mark Dredze. 2018. Weaponized health communication: Twitter bots and Russian trolls amplify the vaccine debate. *American Journal of Public Health* 108, 10 (2018), 1378–1384. https://doi.org/10.2105/AJPH.2018.304567

[8] Ryan Calo, Chris Coward, Emma S. Spiro, Kate Starbird, and Jevin D. West. 2021. How do you solve a problem like misinformation? *Science Advances* 7, 50 (12 2021). https://doi.org/10.1126/sciadv.abn0481

[9] Carlos Castillo, Marcelo Mendoza, and Barbara Poblete. 2011. Information credibility on Twitter. *Proceedings of the 20th International Conference Companion on World Wide Web, WWW 2011* (2011), 675–684. https://doi.org/10.1145/1963405.1963500

[10] CDC. 2021. Flu Vaccination Coverage, United States, 2019–20 Influenza Season. https://www.cdc.gov/flu/fluvaxview/coverage-1920estimates.htm

[11] CDC. 2021. Tuskegee Study - Timeline - CDC - NCHHSTP. https://www.cdc.gov/tuskegee/timeline.htm

[12] Center for Countering Digital Hate. 2021. *The Disinformation Dozen.* Technical Report. Center for Countering Digital Hate. https://www.counterhate.com/disinformationdozen

[13] Children's Health Defense. 2021. medical-racism-meme-our-bodies-our-choice-1500.jpg (1500×1500). https://medicalracism.childrenshealthdefense.org/wp-content/uploads/medical-racism-meme-our-bodies-our-choice-1500.jpg

[14] Wen Ying Sylvia Chou, Anna Gaysynsky, Neha Trivedi, and Robin C. Vanderpool. 2021. Using Social Media for Health: National Data from HINTS 2019. *Journal of Health Communication* 26, 3 (2021), 184–193. https://doi.org/10.1080/10810730.2021.1903627

[15] Meredith Clark. 2014. *To tweet our own cause: A mixed-methods study of the online phenomenon "Black Twitter" | ID: gt54kn18h | Carolina Digital Repository.* Ph. D. Dissertation. University of North Carolina Chapel Hill. https://doi.org/10.17615/7bfs-rp55

[16] Brandi Collins-Dexter. 2020. Canaries in the Coal Mine: COVID-19 Misinformation and Black Communities. https://doi.org/10.37016/TASC-2020-01

[17] CSPAN. 2020. User Clip: RFK Jr told Louis Farrakhan CDC trying to kill black boys | C-SPAN.org. https://www.c-span.org/video/?c4910041/user-clip-rfk-jr-told-louis-farrakhan-cdc-kill-black-boys

[18] P. Davies and S. Chapman. 2002. Antivaccination activists on the world wide web. (2002). https://doi.org/10.1136/adc.87.1.22

[19] Michela Del Vicario, Alessandro Bessi, Fabiana Zollo, Fabio Petroni, Antonio Scala, Guido Caldarelli, H. Eugene Stanley, and Walter Quattrociocchi. 2016. The spreading of misinformation online. *Proceedings of the National Academy of Sciences of the United States of America* 113, 3 (1 2016), 554–559. https://doi.org/10.1073/PNAS.1517441113/-/DCSUPPLEMENTAL

[20] Norman K. Denzin and Yvonna S. Lincoln. 2006. *The Sage Handbook of Qualitative Research, 2nd ed. Edited by Norman K. Denzin, and Yvonna S. Lincoln.* Vol. 28.

[21] Department of Health and Human Services. 2020. Secretary Azar Declares Public Health Emergency for United States for 2019 Novel Coronavirus. https://web.archive.org/web/20210814142045/https://www.hhs.gov/about/news/2020/01/31/secretary-azar-declares-public-health-emergency-us-2019-novel-coronavirus.html

[22] Leon Derczynski, Kalina Bontcheva, Michal Lukasik, Thierry Declerck, Arno Scharl, and Georgi Georgiev. 2015. Pheme: Computing Veracity – the Fourth Challenge of Big Social Data. In *Proceeedings of the Extended Semantic Web Conference EU Project Networking Session.*

[23] Renee Diresta, Kris Shaffer, Becky Ruppel, David Sullivan, Robert Matney, Ryan Fox, Jonathan Albright, and Ben Johnson. 2018. *The Tactics & Tropes of the Internet Research Agency.* Technical Report.

[24] Gypsyamber D'Souza and David Dowdy. 2020. What Is Herd Immunity and How Can We Achieve It With Covid-19 | Johns Hopkins Bloomberg School of Public Health. https://publichealth.jhu.edu/2020/what-is-herd-immunity-and-how-can-we-achieve-it-with-covid-19

[25] Eve Dubé, Caroline Laberge, Maryse Guay, Paul Bramadat, Réal Roy, and Julie A Bettinger. 2013. Human Vaccines & Immunotherapeutics Vaccine hesitancy An overview. 8 (2013), 1763–1773. https://doi.org/10.4161/hv.24657

[26] Caryl Emerson and Mikhail Bakhtin. 2019. *Filosofia: An Encyclopedia of Russian Thought.*

[27] Casey Fiesler and Nicholas Proferes. 2018. "Participant" Perceptions of Twitter Research Ethics:. *Social Media + Society* 4, 1 (3 2018). https://doi.org/10.1177/2056305118763366

[28] Laura Forlano and Anijo Mathew. 2014. From Design Fiction to Design Friction: Speculative and Participatory Design of Values-Embedded Urban Technology. *https://doi.org/10.1080/10630732.2014.971525* 21, 4 (10 2014), 7–24. https://doi.org/10.1080/10630732.2014.971525

[29] Deen Freelon, Michael Bossetta, Chris Wells, Josephine Lukito, Yiping Xia, and Kristen Adams. 2020. Black Trolls Matter: Racial and Ideological Asymmetries in Social Media Disinformation. *Social Science Computer Review* (2020). https://doi.org/10.1177/0894439320914853

[30] Cary Funk and Alec Tyson. 2021. Growing Share of Americans Say They Plan To Get a COVID-19 Vaccine – or Already Have | Pew Research Center. https://www.pewresearch.org/science/2021/03/05/growing-share-of-americans-say-they-plan-to-get-a-covid-19-vaccine-or-already-have/

[31] Helene D Gayle and James F Childress. 2021. Race, Racism, and Structural Injustice: Equitable Allocation and Distribution of Vaccines for the COVID-19. *The American journal of bioethics : AJOB* 21, 3 (2021), 4–7. https://doi.org/10.1080/15265161.2021.1877011

[32] Joshua Lumpkin Green. 2006. *Digital Blackface: The Repackaging of the Black Masculine Image.* Ph. D. Dissertation. Miami University.

[33] David Robert Grimes. 2021. Medical disinformation and the unviable nature of COVID-19 conspiracy theories. *PLOS ONE* 16, 3 (3 2021), e0245900. https://doi.org/10.1371/JOURNAL.PONE.0245900

[34] Nir Grinberg, Kenneth Joseph, Lisa Friedland, Briony Swire-Thompson, and David Lazer. 2019. Fake news on Twitter during the 2016 U.S. presidential election. *Science* 363, 6425 (1 2019), 374–378. https://doi.org/10.1126/SCIENCE.AAU2706

[35] Xinning Gui, Yubo Kou, Kathleen H Pine, and Yunan Chen. 2017. Managing uncertainty: Using social media for risk assessment during a public health crisis. In *Conference on Human Factors in Computing Systems - Proceedings*, Vol. 2017-May. ACM, New York, NY, USA, 4520–4533. https://doi.org/10.1145/3025453.3025891

[36] Douglas Guilbeault, Joshua Becker, and Damon Centola. 2018. Social learning and partisan bias in the interpretation of climate trends. *Proceedings of the National Academy of Sciences* 115, 39 (9 2018), 9714–9719. https://doi.org/10.1073/PNAS.1722664115

[37] J.B. Handley. 2008. An Open Letter to the Somali Parents of Minnesota - AGE OF AUTISM. https://www.ageofautism.com/2008/11/an-open-letter.html

[38] Hal Hershfield and Ilana Brody. 2021. How Elvis Got Americans to Accept the Polio Vaccine - Scientific American. https://www.scientificamerican.com/article/how-elvis-got-americans-to-accept-the-polio-vaccine/

[39] Philip Howard, Bharath Ganesh, Dimitra Liotsiou, John Kelly, and Camille François. 2018. The IRA, Social Media and Political Polarization in the United States, 2012-2018. *undefined* (2018).

[40] Joshua Introne, Irem Gokce Yildirim, Luca Iandoli, Julia DeCook, and Shaima Elzeini. 2018. How People Weave Online Information Into Pseudoknowledge. *Social Media and Society* 4, 3 (7 2018). https://doi.org/10.1177/2056305118785639

[41] Joshua Introne, Ania Korsunska, Leni Krsova, and Zefeng Zhang. 2020. Mapping the Narrative Ecosystem of Conspiracy Theories in Online Anti-vaccination Discussions. *ACM International Conference Proceeding Series* 20 (7 2020), 184–192. https://doi.org/10.1145/3400806.3400828

[42] Peter Jamison. 2020. Anti-vaccination leaders fuel black mistrust of coronavirus vaccine with Tuskegee history - The Washington Post. https://www.washingtonpost.com/dc-md-va/2020/07/17/black-anti-vaccine-coronavirus-tuskegee-syphilis/

[43] Courtney Johnson and Cary Funk. 2021. Black Americans stand out for their concern about COVID-19 | Pew Research Center. https://www.pewresearch.org/fact-tank/2021/03/09/black-americans-stand-out-for-their-concern-about-covid-19-61-say-they-plan-to-get-vaccinated-or-already-have/?amp=1

[44] Robert F. Kennedy. 2015. Robert F. Kennedy Jr.: The CDC's Latest Tuskegee Experiment and the Link Between Autism in Black Americans & Vaccines. https://www.ora.tv/offthegrid/article/2015/7/14/robert--kennedy-jr-cdc-latest-tuskegee-experiment--link-african-american-autism--vaccines

[45] Shamika Klassen, Sara Kingsley, Kalyn McCall, Joy Weinberg, and Casey Fiesler. 2021. More than a Modern Day Green Book: Exploring the Online Community of Black Twitter. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (10 2021). https://doi.org/10.1145/3479602

[46] Marina Kogan and Leysia Palen. 2018. Conversations in the Eye of the Storm: At-Scale Features of Conversational Structure in a High-Tempo, High-Stakes Microblogging Environment. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (2018). https://doi.org/10.1145/3173574

[47] Matthias Korn and Amy Voida. 2015. Creating Friction: Infrastructuring Civic Engagement in Everyday Life. *Aarhus Series on Human Centered Computing* 1, 1 (10 2015), 12. https://doi.org/10.7146/AAHCC.V1I1.21198

[48] David M.J. Lazer, Matthew A. Baum, Yochai Benkler, Adam J. Berinsky, Kelly M. Greenhill, Filippo Menczer, Miriam J. Metzger, Brendan Nyhan, Gordon Pennycook, David Rothschild, Michael Schudson, Steven A. Sloman, Cass R. Sunstein, Emily A. Thorson, Duncan J. Watts, and Jonathan L. Zittrain. 2018. The science of fake news: Addressing fake news requires a multidisciplinary effort. *Science* 359, 6380 (3 2018), 1094–1096. https://doi.org/10.1126/SCIENCE.AAO2998/SUPPL{_}FILE/AAO2998{_}LAZER{_}SM.PDF

[49] Julie Leask. 2011. Target the fence-sitters. , 443–445 pages. https://doi.org/10.1038/473443a

[50] Julie Leask, Paul Kinnersley, Cath Jackson, Francine Cheater, Helen Bedford, and Greg Rowles. 2012. Communicating with parents about vaccination: a framework for health professionals. *BMC Pediatrics 2012 12:1* 12, 1 (9 2012), 1–11. https://doi.org/10.1186/1471-2431-12-154

[51] Bruce Y. Lee. 2021. HatWRKS Sells 'Not Vaccinated' Yellow Star Of David-like Patches, Here Are The Responses. https://www.forbes.com/sites/brucelee/2021/05/30/nashville-shop-sells-not-vaccinated-yellow-star-patches-here-are-the-responses/?sh=4a0fddb83435

[52] Stephan Lewandowsky, Ullrich K.H. Ecker, Colleen M. Seifert, Norbert Schwarz, and John Cook. 2012. Misinformation and Its Correction: Continued Influence and Successful Debiasing. *Psychological Science in the Public Interest* 13, 3 (9 2012), 106–131. https://doi.org/10.1177/1529100612451018

[53] Alice Marwick and Rebecca Lewis. 2017. Media Manipulation and Disinformation Online. https://datasociety.net/library/media-manipulation-and-disinfo-online/

[54] Marcelo Mendoza, Barbara Poblete, and Carlos Castillo. 2010. Twitter under crisis: Can we trust what we RT? *SOMA 2010 - Proceedings of the 1st Workshop on Social Media Analytics* (2010), 71–79. https://doi.org/10.1145/1964858.1964869

[55] Seth Mnookin. 2011. *The panic virus: a true story of medicine, science, and fear.* Simon & Schuster, New York.

[56] Simon H. Murch, Andrew Wakefield, John Linnell, David M. Casson, Mohsin Malik, Mark Berelowitz, A.P. Dhillon, M. A. Thomson, P. Harvey, A. Valentine, S. E. Davies, and J. A. Walker-Smith. 1998. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet* 351, 9103 (2 1998), 637–641. https://doi.org/10.1016/S0140-6736(97)11096-0

[57] Mutale Nkonde, Maria Y. Rodriguez, Leonard Cortana, Joan K. Mukogosi, Shakira King, Ray Serrato, Natalie Martinez, Mary Drummer, Ann Lewis, and Momin M. Malik. 2021. Disinformation creep: ADOS and the strategic weaponization of breaking news. *Harvard Kennedy School Misinformation Review* (1 2021). https://doi.org/10.37016/MR-2020-52

[58] Onook Oh, Manish Agrawal, and Raghav Rao. 2013. Community Intelligence and Social Media Services: A Rumor Theoretic Analysis of Tweets During Social Crises. *Management Information Systems Quarterly* 37, 2 (6 2013). https://aisel.aisnet.org/misq/vol37/iss2/7

[59] Jonathan Ong and Jason Vincent Cabañes. 2018. Architects of Networked Disinformation: Behind the Scenes of Troll Accounts and Fake News Production in the Philippines. *University of Massachusetts Amherst* (1 2018). https://doi.org/10.7275/2cq4-5396

[60] Douglas J. Opel, James A. Taylor, Rita Mangione-Smith, Cam Solomon, Chuan Zhao, Sheryl Catz, and Diane Martin. 2011. Validity and reliability of a survey to identify vaccine-hesitant parents. *Vaccine* 29, 38 (9 2011), 6598–6605. https://doi.org/10.1016/J.VACCINE.2011.06.115

[61] Our World in Data. 2021. Coronavirus (COVID-19) Vaccinations - Statistics and Research. https://ourworldindata.org/covid-vaccinations?country=USA

[62] Leysia Palen and Kenneth M. Anderson. 2016. Crisis informatics-new data for extraordinary times: Focus on behaviors, not on fetishizing social media tools. *Science* 353, 6296 (7 2016), 224–225. https://doi.org/10.1126/SCIENCE.AAG2579

[63] Kellin Pelrine, Jacob Danovitch, and Reihaneh Rabbany. 2021. The surprising performance of simple baselines for misinformation detection. *The Web Conference 2021 - Proceedings of the World Wide Web Conference, WWW 2021* (4 2021), 3432–3441. https://doi.org/10.1145/3442381.3450111

[64] P. Peretti-Watel, J. Ward, R. Lutaud, and V. Seror. 2019. Lyme disease: Insight from social sciences. *Médecine et Maladies Infectieuses* 49, 2 (3 2019), 133–139. https://doi.org/10.1016/J.MEDMAL.2018.12.005

[65] Vahed Qazvinian, Emily Rosengren, Dragomir R Radev, and Qiaozhu Mei. 2011. Rumor has it: Identifying Misinformation in Microblogs. In *Proceedings of the 2011 Conference on Empirical Methods in Natural Language Processing*. Edinburgh, 1589–1599. https://aclanthology.org/D11-1147

[66] Jennifer Reich. 2016. *Calling the Shots: Why Parents Reject Vaccines.* NY Press, New York, New York, USA.

[67] Susan Reverby. 1999. Rethinking the Tuskegee Syphilis Study. Nurse Rivers, silence and the meaning of treatment - PubMed. https://pubmed.ncbi.nlm.nih.gov/10063364/

[68] Mattia Samory and Tanushree Mitra. 2018. Conspiracies Online: User Discussions in a Conspiracy Community Following Dramatic Events. *Proceedings of the International AAAI Conference on Web and Social Media* 12, 1 (6 2018). https://ojs.aaai.org/index.php/ICWSM/article/view/15039

[69] Erin Schumaker. 2019. Anti-vaccine leaders targeting minority becomes growing concern at NYC forum. https://abcnews.go.com/amp/Health/rfk-jrs-york-city-vaccine-forum-highlights-concerns/story?id=66158336

[70] Chengcheng Shao, Giovanni Luca Ciampaglia, Alessandro Flammini, and Filippo Menczer. 2016. Hoaxy: A Platform for Tracking Online Misinformation. In *WWW '16 Companion: Proceedings of the 25th International Conference Companion on World Wide Web*. Association for Computing Machinery (ACM), 745–750. https://doi.org/10.1145/2872518.2890098

[71] Tamotsu Shibutani. 1966. *Improvised News.* Irvington Pub, New York.

[72] Rory Smith, Seb Cubbon, Claire Wardle, Jack Berkefeld, and Tommy Shane. 2020. Under the surface" COVID-19 vaccine narratives, misinformation and data deficits on social media. *First Draft* (2020).

[73] Gracie Bonds Staples. 2020. OPINION: Why ADOS is unapologetic in seeking reparations, black agenda. https://www.ajc.com/lifestyles/opinion-why-ados-unapologetic-seeking-reparations-black-agenda/upCHlNX8ldfLqKFxoOxDgN/

[74] Kate Starbird. 2017. Examining the Alternative Media Ecosystem Through the Production of Alternative Narratives of Mass Shooting Events on Twitter. *Proceedings of the International AAAI Conference on Web and Social Media* 11, 1 (5 2017), 230–239. https://ojs.aaai.org/index.php/ICWSM/article/view/14878

[75] Kate Starbird, Ahmer Arif, and Tom Wilson. 2019. Disinformation as collaborative work: Surfacing the participatory nature of strategic information operations. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (11 2019). https://doi.org/10.1145/3359229

[76] Kate Starbird, K Maddock, J Orand, M Achterman, and P M Mason. 2014. Rumors, False Flags, and Digital Vigilantes: Misinformation on Twitter after the 2013 Boston Marathon Bombing. In *iConference 2014 Proceedings*. 654–662. https://doi.org/10.9776/14308

[77] Leo G. Stewart, Ahmer Arif, A. Conrad Nied, Emma S. Spiro, and Kate Starbird. 2017. Drawing the lines of contention: Networked frame contests within #BlackLivesMatter discourse. *Proceedings of the ACM on Human-Computer Interaction* 1, CSCW (11 2017), 96. https://doi.org/10.1145/3134920

[78] The Aspen Institute and Sabin Vaccine Institute. 2020. *Meeting the Challenge of Vaccination Hesitancy.* Technical Report. 48–86 pages. https://www.sabin.org/sites/sabin.org/files/sabin-aspen-report-2020_meeting_the_challenge_of_vaccine_hesitancy.pdf

[79] Angus Thomson, Karis Robinson, and Gaëlle Vallée-Tourangeau. 2016. The 5As: A practical taxonomy for the determinants of vaccine uptake. *Vaccine* 34, 8 (2 2016), 1018–1024. https://doi.org/10.1016/J.VACCINE.2015.11.065

[80] Twitter. 2021. COVID-19 misleading information policy. https://help.twitter.com/en/rules-and-policies/medical-misinformation-policy

[81] Rohit Valecha, Srikrishna Krishnarao Srinivasan, San K Antonio HAZEL KWON, H Raghav Rao, Tejaswi Volety, K Hazel Kwon, Manish Agrawal, S K Srinivasan, M Agrawal, and K H Kwon. 2021. Fake News Sharing: An Investigation of Threat and Coping Cues in the Context of the Zika Virus. *Digit. Threat.: Res. Pract* 2, 2 (2021), 16. https://doi.org/10.1145/3410025

[82] Soroush Vosoughi, Deb Roy, and Sinan Aral. 2018. The spread of true and false news online. *Science* 359, 6380 (2018), 1146–1151. https://doi.org/10.1126/science.aap9559

[83] Dror Walter, Yotam Ophir, and Kathleen Hall Jamieson. 2020. Russian twitter accounts and the partisan polarization of vaccine discourse, 2015–2017. *American Journal of Public Health* 110, 5 (5 2020), 715–724. https://doi.org/10.2105/AJPH.2019.305564

[84] Claire Wardle. 2020. The drip, drip, drip of misinformation on COVID-19 vaccine - The Boston Globe. https://www.bostonglobe.com/2020/11/12/opinion/drip-drip-drip-misinformation-covid-19-vaccine/

[85] Paul Watkins. 2021. Black Health in America: Exploring Racial Disparities in COVID-19 Vaccination Data.

[86] Jeremy White. 2015. Robert Kennedy Jr. warns of vaccine-linked 'holocaust'. http://www.sacbee.com/news/politics-government/capitol-alert/article17814440.html

[87] World Health Organization. 2020. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)

[88] Fan Yang, Xiaohui Yu, Yang Liu, and Min Yang. 2012. Automatic detection of rumor on Sina Weibo. In *Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*. https://doi.org/10.1145/2350190.2350203

[89] Zhe Zhao, Paul Resnick, and Qiaozhu Mei. 2015. Enquiring minds: Early detection of rumors in social media from enquiry posts. In *WWW 2015 - Proceedings of the 24th International Conference on World Wide Web*. Association for Computing Machinery, Inc, 1395–1405. https://doi.org/10.1145/2736277.2741637

[90] Arkaitz Zubiaga, Ahmet Aker, Kalina Bontcheva, Maria Liakata, and Rob Procter. 2018. Detection and Resolution of Rumours in Social Media. *ACM Computing Surveys (CSUR)* 51, 2 (2 2018), 32. https://doi.org/10.1145/3161603