

# Mapping the Narrative Ecosystem of Conspiracy Theories in Online Anti-vaccination Discussions

Joshua Introne

School of Information Studies, Syracuse University,  
Syracuse, NY, USA  
jeintron@syr.edu

Leni Krsova

School of Information Studies, Syracuse University,  
Syracuse, NY, USA  
lkrsova@syr.edu

Ania Korsunska

School of Information Studies, Syracuse University,  
Syracuse, NY, USA  
akorsuns@syr.edu

Zefeng Zhang

School of Information Studies, Syracuse University,  
Syracuse, NY, USA  
zzhan208@syr.edu

## ABSTRACT

Recent research on conspiracy theories labels conspiracism as a distinct and deficient epistemic process. However, the tendency to pathologize conspiracism obscures the fact that it is a diverse and dynamic collective sensemaking process, transacted in public on the web. Here, we adopt a narrative framework to introduce a new analytical approach for examining online conspiracism. Narrative plays an important role because it is central to human cognition as well as being domain agnostic, and so can serve as a bridge between conspiracism and other modes of knowledge production. To illustrate the utility of our approach, we use it to analyze conspiracy theories identified in conversations across three different anti-vaccination discussion forums. Our approach enables us to capture more abstract categories without hiding the underlying diversity of the raw data. We find that there are dominant narrative themes across sites, but that there is also a tremendous amount of diversity within these themes. Our initial observations raise the possibility that different communities play different roles in the collective construction of conspiracy theories online. This offers one potential route for understanding not only cross-sectional differentiation, but the longitudinal dynamics of the narrative in future work. In particular, we are interested to examine how activity within the framework of the narrative shifts in response to news events and social media platforms' nascent efforts to control different types of misinformation. Such analysis will help us to better understand how collectively constructed conspiracy narratives adapt in a shifting media ecosystem.

## CCS CONCEPTS

• **Human-centered computing** → Collaborative and social computing .

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [permissions@acm.org](mailto:permissions@acm.org).

*SMSociety '20, July 22–24, 2020, Toronto, ON, Canada*

© 2020 Association for Computing Machinery.

ACM ISBN 978-1-4503-7688-4/20/07...\$15.00

<https://doi.org/10.1145/3400806.3400828>

## KEYWORDS

Narratives, Conspiracy Theories, Social Media, Misinformation

### ACM Reference Format:

Joshua Introne, Ania Korsunska, Leni Krsova, and Zefeng Zhang. 2020. Mapping the Narrative Ecosystem of Conspiracy Theories in Online Anti-vaccination Discussions. In *International Conference on Social Media and Society (SMSociety '20)*, July 22–24, 2020, Toronto, ON, Canada. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3400806.3400828>

## 1 INTRODUCTION

Conspiracy theories (CTheories) have long been a topic of interest in scholarly literature and popular press. Their prevalence in online media and recent appearances in public announcements from the highest levels of the US government have re-invigorated this interest. CTheories are thought to be problematic for various reasons: they provide a natural habitat for misinformation because they undercut trust in our traditional gatekeepers [2, 28], they help motivate extremist belief systems and acts [3, 38], they motivate disengagement with conventional modes of political activity [20], and they may help sustain online echo-chambers [10].

It is not surprising that many modern treatments pathologize both CTheories and the people who promote them. There are several potential pitfalls with this tendency. Attempts to build an understanding of conspiracism as a deficient alternative to other ways of knowing obscures the fact that the process of conspiracy theorizing is, like other forms of knowledge construction, a diverse and dynamic search for a collective “truth” that explains the observed world. CTheories may not draw their support from conventional sources of evidence, and theorists may not follow the scientific method, but that does not mean that the construction of CTheories is without its own logic. Some CTheories are more compelling than others for a reason, and it is unlikely that these reasons are completely unrelated to the social processes underlying the construction of non-conspiracy theories. Understanding the logic that governs the development of CTheories might not only help us understand how to intervene in those that are dangerous; it might help us arrive at a better understanding of how people collectively construct knowledge in general.

Another potential pitfall in the tendency for scholars and popular media to pathologize CTheories and their supporters is that this can become part of a broader cultural process of stigmatization, leading to bias and further balkanization. Belief in a CTheory does not

mean that a theorist is crazy or even necessarily wrong. Indeed, if this were the case, over half of Americans [30] could be so classified. Widespread stigmatization is likely to create powerful in- and out-group dynamics that could have more serious social consequences.

In this paper we consider CTheories as components of a broader, shifting narrative [12, 41], and then examine the collective production of this narrative across three different online anti-vaccination discussion communities. The most significant contributions of this paper are methodological: we present a rigorous approach for identifying online conspiracy theories and mapping them using a narrative framework that was previously developed to examine online pseudo-knowledge [18, 19]. Our approach allows us to organize and analyze a diverse variety of connected conspiracy theories across a set of topic-specific discussion communities at different levels of abstraction. We find that conspiracy theories make up a relatively small percentage of user-generated discussion posts (from 1 to 10 percent) in the forums we examined, although there are clear differences in their prevalence across sites. We also find evidence that some narrative elements and topics are more popular than others, but there are community differences here as well. Finally, and perhaps most importantly, we observe that despite the existence of common themes, there is an enormous amount of diversity amongst stories that become part of an overarching conspiracy narrative. Our analysis sets the stage for future, longitudinal analyses that examine how collectively maintained conspiracy theories develop over time across disparate communities and respond to external events.

## 2 BACKGROUND

Though diverse, CTheories tend to share a similar underlying structure. Samory and Mitra [33] reviewed numerous definitions and identified three common elements across them: actors, who are generally thought to be powerful and highly coordinated, motivated by a desire for power or some other type of gain; actions, which are performed in secret or with an intent to deceive; and targets, which are outcomes that enrich the conspirators while causing some harm to a victimized group.

Scholarly work on CTheories builds on an established tradition that portrays conspiracy theorization as antithetical to rational, scientific thought [17, 31]. Carrying on this tradition, studies within the last several decades have found that people who maintain CTheories feel like they are disempowered and lack control, are poorly educated, ideologically eccentric, and do not think analytically [11, 32, 40, 42]. As a social phenomenon, it is thought that CTheories may be a collective response to the threat of outsiders and other threatening circumstances [23]. They are amplified in echo chambers on the internet, and weaponized by those seeking political advantage [4]. Against this backdrop, there are efforts to produce taxonomies of CTheories [1, 5] and distinguish CTheory thinking from “normal” thinking [39]. Some scholars have suggested that conspiracist ideation is a kind of monological thought process, because people who believe in one tend to believe in others as well, even if they seem logically incompatible [11, 25]. Harvard Law School professor Cass Sunstein has gone so far as to suggest that conspiracy theorists suffer from a kind of “crippled epistemology” [37]. Across this literature, belief in CTheories is often interpreted

as a kind of mental disorder, and this interpretation is carried forth more broadly in Western culture [24]. As such, Lantian et al. [24] argue that this perspective motivates a fraught process of social stigmatization. On one hand, stigmatization paves the way for many injustices to potentially be visited upon the stigmatized population [26]. At the same time, those who are stigmatized develop a group identity around the stigmatized characteristic [14], and draw much needed social support from others who are part of this group [26]. This is particularly problematic when conspiracy theories become part of belief systems that motivate the rejection of scientifically justified behaviors that are important for the collective well-being of the broader population, like vaccination or reduced reliance on fossil fuels. Existing power structures might consider more authoritarian means for controlling this population (e.g., mandatory vaccination), but such policies reduce the autonomy of these individuals and, paradoxically, provide further evidence for their CTheories.

Some recent scholarship has sought to move beyond the tendency to pathologize CTheories. Several have argued that CTheories should not be considered to be irrational, because some are, in fact, true [9]. Philosopher Kurtis Hagen argues that apparent findings that conspiracy theorists adopt a monological thought process are not supported by the actual empirical data [15]. Others have suggested that conspiracy theories might better be understood as a socio-political response to distant and elite power structures that control the media and scientific knowledge production [16, 27]. Harambam and Aupers [16:466] characterize the struggle between CTheories and conventional knowledge as a “complex battle for epistemic authority in a broader field of knowledge contestation.” In other words, CTheories can be understood as an alternative to conventional and privileged ways of knowing, returning power to those who are excluded.

Considering CTheories and their construction as an alternative means of knowledge production rather than a pathological affliction of the mentally imbalanced helps move us away from the path to stigmatization and brings to light questions of just how CTheories are constructed over time. Legal scholar Mark Fenster [12] views CTheories as a type of narrative that can help bridge conspiracism and conventional epistemologies. In Fenster’s words, “[c]onspiracy theory... tells stories about the past, present, and future, and it presents an argument in narrative form for a contemporary audience about how power works” [[12]:121]. Narratives play a central role in all human cognition [6, 13, 34], and cognitive psychologist Jerome Bruner argued that narrative and argumentation are two primary and irreducible forms of cognition [6, 7]. Whereas the former guides everyday thought, the latter is used when carefully weighing evidence. Conspiracism might thus be understood as a type of narrative-centric cognition, whereas the production of scientific knowledge is heavily constrained by argumentative processes. However, while the rules of argumentation are well-understood, those that govern the production of narratives are not [6]. Examining online conspiracy theories might thus be understood as an investigation of the rules that govern the construction of good stories.

Adopting such a framing, Introne et al. [18] introduced a narrative approach to examine the development of pseudo-knowledge in an online discussion. They applied a story grammar that was originally developed by Stein and Glenn [36] to capture elements of

a pseudoscientific theory about ancient aliens. The story grammar centered upon the intentional actions performed by actors and their consequences, and it is clear that this organization bears much similarity to the definition of CTheories offered by Samory and Mitra [33]. That is, a conspiracy theory may be understood as a story about the intentionally deceitful actions of a coordinated group, which have the consequence of harming or otherwise disenfranchising a victim.

Drawing on the preceding observations, we apply this narrative lens to examine online conspiracy theories in order to develop empirical data about conspiracism as a form of collective narrative construction. As context for our analysis, we examine a set of online anti-vaccination discussion groups. This domain is of particular interest for several reasons. The recent growth of anti-vaccine sentiment in the United States has led to a resurgence of diseases that had previously been well-controlled, and it is thought that social media has had a significant role in this [22, 29]. Others have documented the prevalence of CTheories in online anti-vaccination groups [21, 22], and there is evidence that vaccine hesitant individuals face increasing stigma [8]. Because centralized efforts to boost vaccination rates are likely to further inflame anti-vaccination sentiments, there is a distinct need for new approaches to address the problem.

Cognizant of this need, the main goal of our paper is to provide the scientific community with a new set of analytical tools for examining the development of CTheories. In the following, we introduce our methods, and then apply them to investigate three questions:

1. How prevalent are conspiracy theories in online anti-vaccination discussions and how does the level of conspiracism vary across different communities?
2. How common are narrative elements across different anti-vaccination communities?
3. What can we say about the content of the narrative that is collectively constructed by people within and across different communities?

## 3 METHODS AND DATA

### 3.1 Data

Data for our final analysis was drawn from three anti-vaccination discussion forums identified in Kata's [22] analysis of social media anti-vaccination sentiments: Natural News [40], Mothering [44], and Above Top Secret [45]. We chose these sites in particular because they hosted a large set of publicly accessible discussions about vaccines, and we were interested in the organic process of conversation-based conspiracy theorization rather than analyzing curated sets of conspiracy theories. Because this data is public and does not contain personally identifying information, it was not considered human subjects' data by the authors' Institutional Review Board. Additionally, while all of these sites host anti-vaccination discussions, they are also quite diverse. Natural News is a blog that focuses on healthy living and alternative medicine, Mothering is a forum for mothers to share and discuss information, and Above Top Secret is an "alternative topics" discussion forum that is explicitly focused on conspiracy theories.

We scraped<sup>1</sup> discussion data using custom scrapers from these sites in October of 2019. The scraped data included all publicly available information associated with each post, including the username, date / time, reply structure, and text of the post. On Natural News we scraped all user-generated discussion threads that were associated with blog posts containing the word "vaccine," resulting in a set of 85,683 individual posts, spanning roughly six years. On Above Top Secret we scraped all discussion threads with the word "vaccine" appearing in the first post of a discussion, resulting in a set of 11,655 individual posts spanning about 17 years. For Mothering, we scraped all discussions in those forums that were categorized in the sites thread index as being about vaccines, resulting in a set of 344,805 posts spanning a period of about 16 years.

### 3.2 Identifying Conspiracy Theories

To perform our analysis, we developed a repeatable strategy for identifying conspiracy theories. To develop a codebook, we worked iteratively with a team of coders and pilot data that was distinct from the data used for the analysis presented here. We began with a working definition developed from prior work [e.g. 33], and asked a team of six coders (including the authors and several graduate students) to search for an initial set of CTheories in anti-vaccination sites discussed in prior literature [21, 22]. The team met on a weekly basis to discuss their findings and challenges, revising the definition of conspiracy theory as necessary. During this process, we encountered a large number of posts that strongly implied a conspiracist point of view (e.g., by using loaded terms like "New World Order") but did not themselves contain identifiable CTheories, and so we expanded the codebook to include a *conspiratorial thinking* (CThinking) category as well. We continued with this process until we had definitions for both categories that led to a high degree of intercoder agreement. Our final definitions blend prior work on CTheories and the story grammar previously discussed by Introne et al. [19]:

A conspiracy theory is a narrative explaining an **event or series of events** that involve **deceptive, coordinated actors** working together to achieve **a goal** through **an action or series of actions** that have **consequences** that intentionally disenfranchise or harm an **individual or population**

Definitions for the six emphasized terms (which we summarize as events, actors, goal, actions, consequences, and target) were further elaborated in our full codebook<sup>2</sup>. To code an instance of text as a CTheory, we required that coders identify four required categories: actors, actions, consequences, and a victim. To code a post as CThinking, coders were required to identify at least one of the six categories, and further determine that the post implied support for a CTheory.

To address our research questions, we randomly selected 1,800 posts from the total set of 440k posts, split evenly across the forums. In this exploratory study, we were interested both in testing our methods and obtaining a rough indicator of the prevalence and content of conspiracy theories in open online discussions, and our

<sup>1</sup>Full R code available at <https://github.com/c4-lab/SocialMediaSociety2020>

<sup>2</sup>The complete codebook is available online at [https://c4-lab.github.io/assets/files/codebook-CT-narratives\\_SMSociety2020.pdf](https://c4-lab.github.io/assets/files/codebook-CT-narratives_SMSociety2020.pdf)

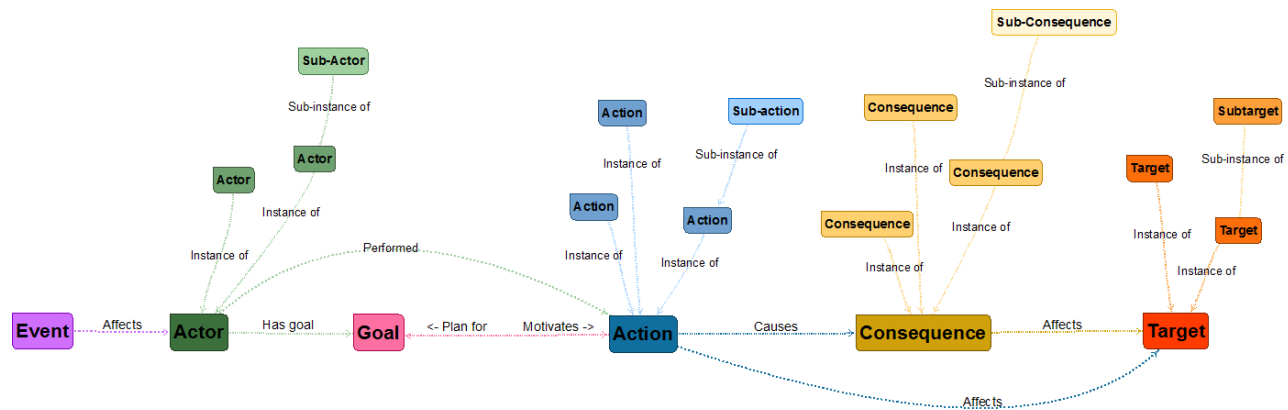


Figure 1: Template for mapping conspiracy narratives

only criteria for inclusion was that these posts could be generated by any self-registered (or possibly anonymous) visitor. Thus, while the three sites have different affordances, these differences were not germane to the current inquiry. Moreover, because we were interested in getting a sense of the true proportions of CTheories and CThinkings, we did not exclude empty or one-word posts from our set (we note however that there were very few such posts).

To validate the reliability of our coding approach, we first selected 90 posts that were longer than 10 words from the set of 1,800 posts, with even representation across our three sites. All of the authors and four additional coders who had helped to develop the codebook coded this set. Evaluating the final category assignments, we found that the coders achieved Krippendorff's  $\alpha = .88$  for this set of posts, which is generally considered to be an excellent level of inter-rater reliability. Any disagreements were subsequently resolved through discussion, and these results retained for our final analysis. Finally, the teams of coders worked individually to code the remaining posts, discussing any problematic posts as a group during weekly meetings.

### 3.3 Mapping the narrative

After coding the data, we then assembled the data into a map using mind-mapping software SimpleMind [46] in order to help us visualize the data and identify repeating categories of items. The mapping process was led by the second author, with assistance from the other authors. Figure 1 presents the template we used to guide the mapping process. As posts were added to the map, it grew as a tree. Elements drawn from the actual posts were first attached to relevant categories, referencing the unique identifier associated with the post. During this process, it became apparent that many items were instances of common categories based on how they were used and shared attributes (e.g., “Merck” and “corrupt medical system” both belong to a common class we labeled as “Big Pharma”). Therefore, following a narrow type of taxonomic analysis [35], whenever we encountered two items that were both “a kind of” a common class (subjectively assessed by the second author), a parent node was introduced. As the map was constructed, the broader team reviewed these category assignments, which were

adjusted as necessary. Whenever we encountered an item that we had already seen, we simply added the identifier of the post to that item. Moving through the posts in this manner, we occasionally encountered posts that we felt were problematic. We discussed these as a team and updated the codes as necessary. Thus, the mapping process served as a final check on the quality of the final coding. Both CTheories and CThinking were added to the map.

## 4 FINDINGS

To help illustrate the kinds of CTheories and instances of CThinking our coders found, we have included examples of each category of post below. In each case, we have fixed minor spelling and grammatical errors, and highlighted identified story categories:

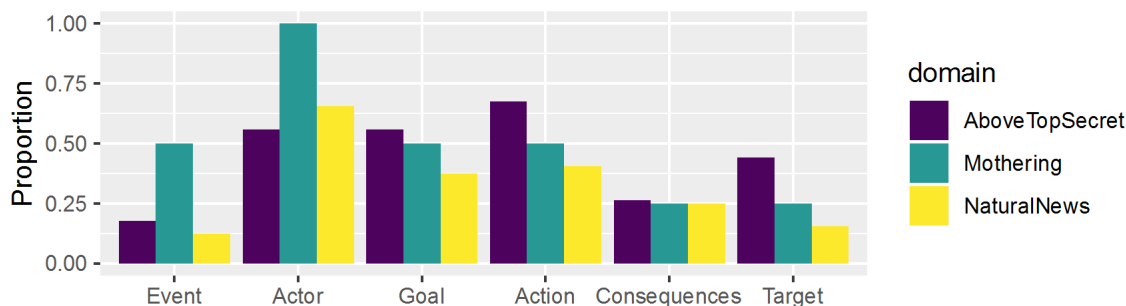
**Conspiracy Theory:** I’m not saying it’s not dangerous, I think that would be a given since they are **rolling it out with practically no testing**. All I was saying is it has nothing to do with FEMA camps, mass graves/lots of coffins or depopulation. It’s **big pharma** trying to **make money** by **creating a pandemic** and **raking in the cash** for **making a vaccine**. And I have already seen what goes into vaccines from various sources. (*AboveTopSecret.com; the general population is the implied target in “rolling it out”*)

**Conspiratorial Thinking:** *Quote: Public health specialists and manufacturers are working frantically to develop vaccines, drugs, strategies . . . Oh, I’ll just bet they are. The SARS “epidemic” fizzled, so they need to focus on something else. These **scare tactics** benefit the **pharmaceutical industry**, including the **doctors who pimp for them**.? (*Mothering.com; implication that epidemics are deliberate, but unclear consequences or target*)*

**None:** I’ve never had a flu vaccine, nor will I ever. Back in 1957 I was told I got the Asian flu. No fun, that’s for sure, but I sweated it out and haven’t had the flu since then. I did have a nasty cold in 2000, but other

**Table 1: Coding results.**

Site	Word Count Distribution	Number CTheories (%)	Number CThinking (%)	Total (%)
Mothering	1/33/74/136/1666	1 (0.17 %)	4 (0.67 %)	5 (0.83%)
Natural News	0/14/35/75/1267	15 (2.5%)	32 (5.3%)	57 (7.8%)
Above Top Secret	5/49/99/188/1112	27 (4.5%)	34 (5.7%)	61 (10.2%)
<b>Total</b>	–	43 (2.4%)	70 (3.9%)	113 (6.3%)

**Figure 2: Categories of story elements used by site**

than that.... It's horrible what's going on in the world of **Big Pharma and their lemming-like medical docs and patients.** (*NaturalNews.com*; *unclear that this is describing a conspiracy theory*)

Table 1 presents overall statistics from our coding process. Addressing our first research question, we find that complete conspiracy theories are relatively rare, instances of conspiratorial thinking are roughly three times as prevalent, and that there are clear differences amongst the different sites, with Mothering exhibiting the least prevalence of conspiracism and Above Top Secret exhibiting the most. Table 1 also includes summary statistics for the number of words in each post, suggesting that the prevalence of conspiracy theories was not a simple function of the general verbosity of the forum. Word count distribution reflects the number of words per post and includes (Min/1<sup>st</sup> Q/Median/3<sup>rd</sup> Q/Max).

We note that these numbers only reflect the quantity of observable conspiracism in posts that are taken out of context, and that our method does not capture the quantity of posters that voice agreement or disagreement with posts. In the course of our coding we observed many such posts across all sites.

Addressing our second research question, we first examined the overall proportions of the story roles present in just the CTheory posts. As illustrated in Figure 2, the pattern of category use is relatively consistent across the sites, even given the relatively small number of CTheory posts on Mothering. In general, conspiracist posts seem to dwell primarily on actors, followed by actions, and then the other categories, with events being the least prevalent. The prevalence of actors and actions are consistent with the finding reported in Samory and Mitra [33]. However, we also note that Above Top Secret seems to emphasize actions and targets more than the others. A Chi-squared test revealed that these differences

were weakly significant in the “Target” category ( $p < .05$ ), but with our limited sample, it is unclear how meaningful this trend is, and we return to this observation in the discussion.

After calculating these general statistics, we turned our attention to the narrative itself. To help summarize the content of the map, we calculated the number of instances of each subcategory of the six top-level story categories. These results are summarized in Table 2. For those instances in which either higher level categories are not yet apparent, or no specific examples were provided, the example column is left blank. As is apparent in the table, there are several dominant categories found across all conspiracy theories. Following our narrative template, we might summarize the collected CTheories as the following: Big Pharma and other powerful institutions distribute dangerous and toxic vaccines to the general public and other disadvantaged or powerless groups in order to make money or gain power, and these vaccines cause harm, suffering, and possibly death.

However, the value of the map as an analytical tool lies in its ability to make apparent the extraordinary diversity of the individual stories and story elements that sustain this overall narrative. The complete map contains 171 nodes, and it is too large to include in this manuscript in a legible format. Figure 3 includes an overview view of the map, and a more detailed view is shown in Figure 4. The complete map is available to view in detail online<sup>4</sup>.

## 5 DISCUSSION AND CONCLUSIONS

We have presented an approach for analyzing online CTheory content through a narrative lens. Our aim is to shed light on the collective processes through which CTheories are developed without

<sup>4</sup>Full map available to view online at <https://c4-lab.github.io/assets/files/map-CTs-SMSociety2020.pdf>



**Table 2: Summary of topics across each of the story categories and forums analyzed**

	Topic	Examples	ATS	NN	M	Total
<b>Event</b>	Cover up	Outbreaks of disease in vaccinated populations; industry whistleblowers	4	0	0	4
	Agreement/Legislation	Passage of the NVCIP <sup>3</sup> ; Industrial mergers	2	1	0	3
	Outbreak/Epidemic	Flu outbreak; Anticipated pandemic	1	2	1	4
	Court Settlement	Awards through the NVCIP <sup>2</sup>	2	0	0	2
	Inscriptions on the Georgia Guide stones	-	0	1	0	1
	Sterilization hormones in vaccines	-	2	0	0	2
	Vaccinations given at a specific point in time	Salk polio vaccine; vaccinations in school	2	0	0	2
<b>Actor</b>	Big Pharma	Merck; corrupt medical system	15	6	1	22
	Government, Institutions, Universities	US Government; CDC; Rotary Club; Rockefeller Foundation	6	5	1	12
	Individual People	Brian Deer, Bill Gates, Obama	4	1	0	5
	Media	Jimmy Kimmel; Corporate media	1	3	0	4
	Non-specific Nefarious	The eugenicists; evil rich people; the powers	1	3	0	4
	Conspirator	that be; deepstate nwo guys				
	Unethical doctor	Jonas Salk; Paul Offit	2	0	0	2
<b>Goal</b>	Make Money	Sell vaccines; medical dependency	10	6	0	16
	Cause Harm	Depopulation; cause autism	5	4	0	9
	Save money	-	2	0	0	2
<b>Action</b>	Distribution of bad quality/harmful vaccine	Vaccine adjuvants; Vaccine microchips; Hormones; Other diseases	19	9	1	29
	Pushing an agenda	Brainwashing; Stop competitors; Keep up the CDC vaccine schedule	0	6	1	7
	Cover Up/Withholding of information	Research fraud; Criminal collusion; Media fairy tales about illness	4	1	0	5
<b>Conseq.</b>	Health-related Suffering	Autism; Other illnesses; Mental infirmity; Fertility issues	15	10	0	25
	Death	-	7	7	0	14
	Loss of freedom	Chip implant; Unable to protect oneself	3	1	0	4
	Professional Harm	Ruin the reputations of good scientists (Wakefield)	2	0	0	2
<b>Target</b>	The general population	Sheeple, brain damaged gullible masses	10	4	1	15
	Children	Infants and specific individuals	5	3	2	10
	Nationality/Citizens	Africans, Third-world countries	2	2	0	4
	Individual People	John Novecke	2	0	0	2
	Scientists	-	2	0	0	2

pathologizing conspiracism. Using narrative as a vehicle for this purpose is valuable because the process of narrative construction is a central and ubiquitous activity across many domains of human knowledge. Thus, while our analysis has focused on conspiracy theories in online anti-vaccination discussions, our approach could be applied more broadly across other kinds of stories as well.

This raises the possibility of comparative analyses that contrasts CTheories with other kinds of knowledge. Our initial results suggest that, while the production of complete CTheories is relatively rare across online discussion posts, we find that there are both dominant themes and a striking amount of diversity within them. An important question is whether and how these patterns differ across other

domains, for instance, within the narratives that develop around political events or scientific theories. Building on Bruner's work [7] we have proposed that conspiracism is a type of story construction that is liberated from slower, more deliberate verification processes. Thus, we anticipate that the level of diversity we have observed here is a unique property of collective conspiracism. This may have important implications for how quickly a conspiracy narrative can adapt over time.

Our data also suggests that there may be differences amongst anti-vaccination discussion communities with respect to the types of story elements they focus on and topics they emphasize. For example, posts on Above Top Secret focus relatively more attention

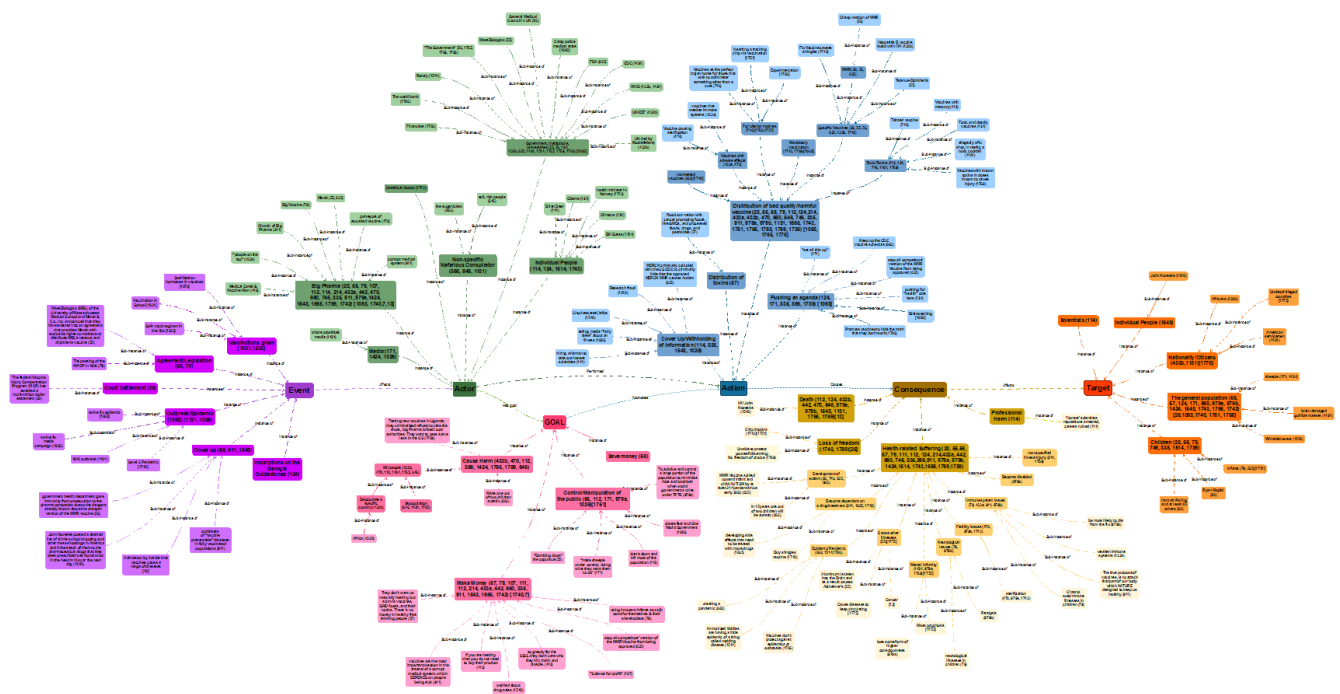
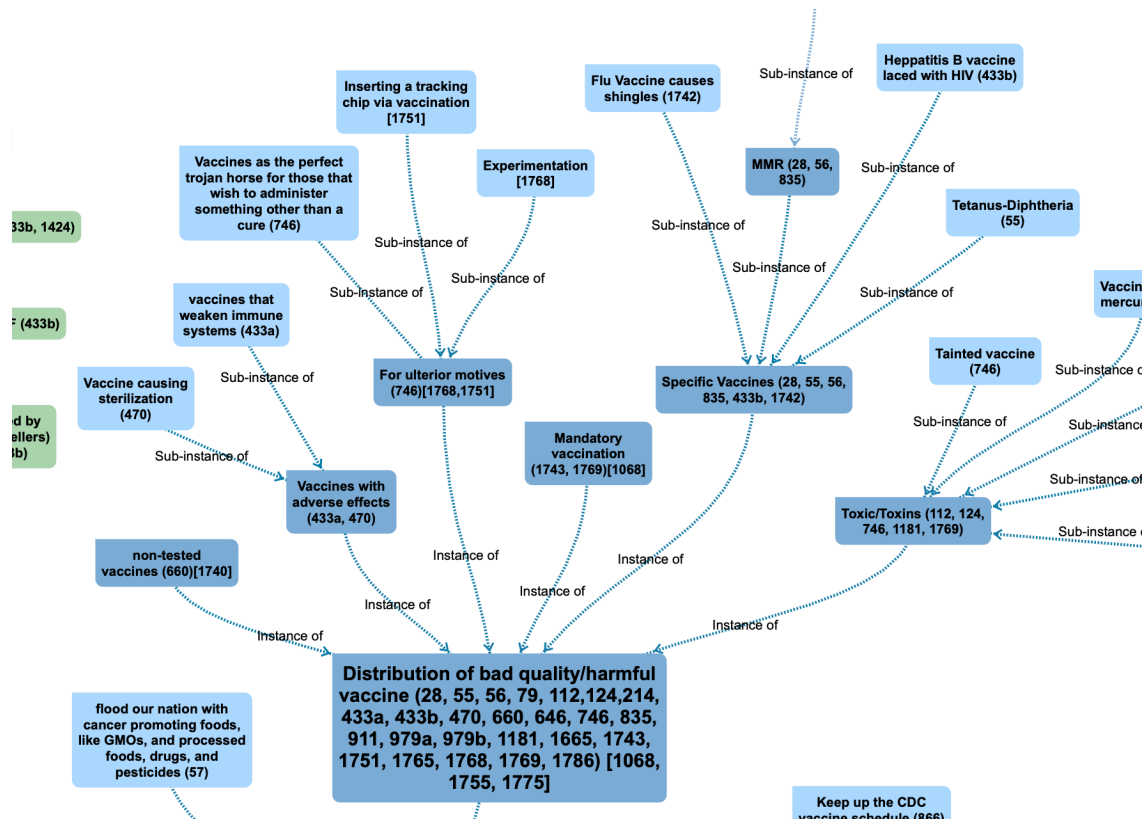
Figure 3: General view of the full map<sup>4</sup>

Figure 4: A detailed view of the "Action" section of the map

on the targets of conspiracy theories (Table 1) in general as well as actions related to “pushing an agenda” (Table 2). We cannot make any strong claims yet, but these initial observations raise the possibility that different communities play different roles in the collective construction of conspiracy theories online. If future work chooses to examine longitudinal dynamics of the narrative, which is a dimension that has not been covered in our analysis, it might shed light on another aspect of how these ecosystems work in concert to narrate conspiracy theories.

We believe our initial results offer one potential route for understanding not only cross-sectional differentiation, but the longitudinal dynamics of the narrative. In particular, we are interested in examining how activity within the framework of the narrative shifts in response to news events and social media platforms’ nascent efforts to control different types of misinformation. Such analysis will help us to better understand how collectively constructed conspiracy narratives adapt in a shifting media ecosystem.

## ACKNOWLEDGMENTS

This research is supported by the National Science Foundation under grant no.1908407. We thank Sehrish Ahmed, Jingxian Sun, Zimo Xu, Yankun Wang and Mingkang Zhang for their help with coding and data scraping. We also thank our reviewers for their valuable comments.

## REFERENCES

- [1] Michael Barkun. 2013. *A Culture of Conspiracy: Apocalyptic Visions in Contemporary America*. Univ of California Press.
- [2] Michael Barkun. 2016. Conspiracy Theories as Stigmatized Knowledge. *Diogenes* (October 2016). DOI:https://doi.org/10.1177/0392192116669288
- [3] Jamie Bartlett and Carl Miller. 2010. *The Power of Unreason*. Demos, London.
- [4] David A. Broniatowski, Amelia M. Jamison, SiHua 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. *Am J Public Health* 108, 10 (August 2018), 1378–1384. DOI:https://doi.org/10.2105/AJPH.2018.304567
- [5] Robert Brotherton, Christopher C. French, and Alan D. Pickering. 2013. Measuring Belief in Conspiracy Theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology* 4, (2013). DOI:https://doi.org/10.3389/fpsyg.2013.00279
- [6] Jerome Bruner. 1991. The Narrative Construction of Reality. *Critical Inquiry* 18, 1 (1991), 1–22. DOI:https://doi.org/10.1086/448619
- [7] Jerome S Bruner. 1986. *Actual Minds, Possible Worlds*. Harvard University Press. Harvard University Press.
- [8] Richard M. Carpiano and Nicholas S. Fitz. 2017. Public attitudes toward child undervaccination: A randomized experiment on evaluations, stigmatizing orientations, and support for policies. *Social Science & Medicine* 185, (July 2017), 127–136. DOI:https://doi.org/10.1016/j.socscimed.2017.05.014
- [9] David Coady. 2012. *What to Believe Now: Applying Epistemology to Contemporary Issues*. John Wiley & Sons.
- [10] Michela Del Vicario, Gianna Vivaldo, Alessandro Bessi, Fabiana Zollo, Antonio Scala, Guido Caldarelli, and Walter Quattrociocchi. 2016. Echo Chambers: Emotional Contagion and Group Polarization on Facebook. *Scientific Reports* 6, 1 (December 2016). DOI:https://doi.org/10.1038/srep37825
- [11] Karen M. Douglas, Robbie M. Sutton, Mitchell J. Callan, Rael J. Dawtry, and Annelie J. Harvey. 2016. Someone is pulling the strings: hypersensitive agency detection and belief in conspiracy theories. *Thinking & Reasoning* 22, 1 (January 2016), 57–77. DOI:https://doi.org/10.1080/13546783.2015.1051586
- [12] Mark Fenster. 2008. *Conspiracy theories: secrecy and power in American culture* (Rev. and updated ed.). University of Minnesota Press, Minneapolis.
- [13] Walter R Fisher. 1989. *Human communication as narration: Toward a philosophy of reason, value, and action*. University of South Carolina Press.
- [14] Erving Goffman. 2009. *Stigma: Notes on the Management of Spoiled Identity*. Simon and Schuster.
- [15] Kurtis Hagen. 2018. Conspiracy Theorists and Monological Belief Systems. In *Taking Conspiracy Theories Seriously*. Rowman & Littlefield Publishers, Lanham.
- [16] Jaron Harambam and Stef Aupers. 2015. Contesting epistemic authority: Conspiracy theories on the boundaries of science. *Public Understanding of Science* 24, 4 (May 2015), 466–480. DOI:https://doi.org/10.1177/0963662514559891
- [17] Richard Hofstadter. 2012. *The paranoid style in American politics*. Vintage.
- [18] Joshua Introne, Irem Gokce Yildirim, Luca Iandoli, Julia DeCook, and Shaima Elzeini. 2018. How People Weave Online Information Into Pseudoknowledge. *Social Media + Society* 4, 3 (July 2018), 205630511878563. DOI:https://doi.org/10.1177/2056305118785639
- [19] Joshua Introne, Luca Iandoli, Julia DeCook, Irem Gokce Yildirim, and Shaima Elzeini. 2017. The Collaborative Construction and Evolution of Pseudoknowledge in Online Conversations. In *Proceedings of the 8th International Conference on Social Media & Society - #SMSociety17*, ACM Press, Toronto, ON, Canada, 1–10. DOI:https://doi.org/10.1145/3097286.3097297
- [20] Daniel Jolley and Karen M. Douglas. 2014. The social consequences of conspiracism: Exposure to conspiracy theories decreases intentions to engage in politics and to reduce one’s carbon footprint. *British Journal of Psychology* 105, 1 (February 2014), 35–56. DOI:https://doi.org/10.1111/bjop.12018
- [21] Anna Kata. 2010. A postmodern Pandora’s box: Anti-vaccination misinformation on the Internet. *Vaccine* 28, 7 (February 2010), 1709–1716. DOI:https://doi.org/10.1016/j.vaccine.2009.12.022
- [22] Anna Kata. 2012. Anti-vaccine activists, Web 2.0, and the postmodern paradigm – An overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine* 30, 25 (May 2012), 3778–3789. DOI:https://doi.org/10.1016/j.vaccine.2011.11.112
- [23] Péter Kerkó. 2015. Conspiracy theory as collective motivated cognition. In *The psychology of conspiracy*. Routledge/Taylor & Francis Group, New York, NY, US, 62–75.
- [24] Anthony Lantian, Dominique Muller, Cécile Nurra, Olivier Klein, Sophie Berjot, and Myrto Pantazi. 2018. Stigmatized beliefs: Conspiracy theories, anticipated negative evaluation of the self, and fear of social exclusion. *European Journal of Social Psychology* 48, 7 (2018), 939–954. DOI:https://doi.org/10.1002/ejsp.2498
- [25] Stephan Lewandowsky, Klaus Oberauer, and Gilles E. Gignac. 2013. NASA Faked the Moon Landing—Therefore, (Climate) Science Is a Hoax: An Anatomy of the Motivated Rejection of Science. *Psychological Science* 24, 5 (May 2013), 622–633. DOI:https://doi.org/10.1177/0956797612457686
- [26] Bruce G. Link and Jo C. Phelan. 2001. Conceptualizing Stigma. *Annual Review of Sociology* 27, 1 (August 2001), 363–385. DOI:https://doi.org/10.1146/annurev.soc.27.1.363
- [27] Stephen M. E. Marmura. 2014. Likely and Unlikely Stories: Conspiracy Theories in an Age of Propaganda. *International Journal of Communication* 8, 0 (September 2014), 19.
- [28] Paul Mihailidis and Samantha Viotty. 2017. Spreadable Spectacle in Digital Culture: Civic Expression, Fake News, and the Role of Media Literacies in “Post-Fact” Society. *American Behavioral Scientist* 61, 4 (April 2017), 441–454. DOI:https://doi.org/10.1177/0002764217701217
- [29] Brendan Nyhan, Jason Reifler, and Sean Richey. 2012. The Role of Social Networks in Influenza Vaccine Attitudes and Intentions Among College Students in the Southeastern United States. *Journal of Adolescent Health* 51, 3 (September 2012), 302–304. DOI:https://doi.org/10.1016/j.jadohealth.2012.02.014
- [30] J. Eric Oliver and Thomas J. Wood. 2014. Conspiracy Theories and the Paranoid Style(s) of Mass Opinion. *American Journal of Political Science* 58, 4 (2014), 952–966. DOI:https://doi.org/10.1111/ajps.12084
- [31] Karl Popper. 2012. *The Open Society and its Enemies*. Routledge. DOI:https://doi.org/10.4324/9780203820377
- [32] Jan-Willem van Prooijen and Nils B. Jostmann. 2013. Belief in conspiracy theories: The influence of uncertainty and perceived morality: Belief in conspiracy theories. *European Journal of Social Psychology* 43, 1 (February 2013), 109–115. DOI:https://doi.org/10.1002/ejsp.1922
- [33] Mattia Samory and Tanushree Mitra. 2018. “The Government Spies Using Our Webcams”: The Language of Conspiracy Theories in Online Discussions. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (November 2018), 1–24. DOI:https://doi.org/10.1145/3274421
- [34] Roger C. Schank and Robert P. Abelson. 1995. Knowledge and memory: The real story. In *Knowledge and memory: The real story*. Lawrence Erlbaum Associates, Inc, Hillsdale, NJ, US, 1–85.
- [35] James P. Spradley. 2016. *The Ethnographic Interview*. Waveland Press.
- [36] NL Stein and CG Glenn. 1979. An analysis of story comprehension in elementary children, vol. 2. Norwood, NJ: Ablex (1979).
- [37] Cass R. Sunstein. 2014. *Conspiracy Theories and Other Dangerous Ideas*. Simon and Schuster.
- [38] Cass R. Sunstein and Adrian Vermeule. 2009. Conspiracy Theories: Causes and Cures. *Journal of Political Philosophy* 17, 2 (June 2009), 202–227. DOI:https://doi.org/10.1111/j.1467-9760.2008.00325.x
- [39] Viren Swami, David Barron, Laura Weis, Martin Voracek, Stefan Stieger, and Adrian Furnham. 2017. An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE* 12, 2 (February 2017), e0172617. DOI:https://doi.org/10.1371/journal.pone.0172617
- [40] Viren Swami, Martin Voracek, Stefan Stieger, Ulrich S. Tran, and Adrian Furnham. 2014. Analytic thinking reduces belief in conspiracy theories. *Cognition* 133, 3 (December 2014), 572–585. DOI:https://doi.org/10.1016/j.cognition.2014.08.006



- [41] Katharina Thalmann. 2019. *The Stigmatization of Conspiracy Theory since the 1950s: "A Plot to Make us Look Foolish."* Routledge. DOI:<https://doi.org/10.4324/9780429020353>
- [42] J. A. Whitson and A. D. Galinsky. 2008. Lacking Control Increases Illusory Pattern Perception. *Science* 322, 5898 (October 2008), 115–117. DOI:<https://doi.org/10.1126/science.1159845>
- [43] Natural News. Retrieved from <https://naturalnews.com>
- [44] Mothering. Retrieved from <https://mothering.com>
- [45] AboveTopSecret. Retrieved from <https://abovetopsecret.com>
- [46] *SimpleMind*. ModelMaker Tools BV - SimpleApps. Retrieved from <https://simplemind.eu/>