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THESIS

**MISINFORMATION CONTAGION:
A VIEW THROUGH AN EPIDEMIOLOGICAL LENS**

by

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December 2019

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**MISINFORMATION CONTAGION: A VIEW THROUGH
AN EPIDEMIOLOGICAL LENS**

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ABSTRACT

Misinformation and disinformation have increasingly been a focus of public and media scrutiny in recent years. What differentiates past forms of misinformation from present-day are the new tools of information warfare—primarily the internet, and specifically social media platforms—which have effectively weaponized intentional false narratives directed at populations most vulnerable to manipulation. Where there is a lack of diverse populations willing to think critically about important issues, the mass nudging of social and political opinion via misinformation and disinformation both widens societal divides and stimulates action (or sometimes inaction) based on a false narrative. This thesis explores how we can better understand and address the proliferation of misinformation by viewing it through an epidemiological lens. To aid in this examination, the processes of cognitive bias will be explained as they relate to interventional opportunities to prevent contraction and spread, develop immunity, and treat the disease of misinformation. Recommendations focus on building individual and herd immunity to false narratives, reducing the virulence of these messages, and making online environments less conducive to the spread of misinformation. These steps require significant commitment to policies that will be difficult to achieve in a partisan and polarized sociopolitical environment, but they are necessary to support fact-based democratic discourse and decision-making.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACA	Affordable Care Act
AIDS	acquired immune deficiency syndrome
CBD	cannabidiol
CDC	Centers for Disease Control and Prevention
CIE	continued influence effect
DNI	Director of National Intelligence
EU	European Union
FTC	Federal Trade Commission
IRA	Internet Research Agency
ITE	illusory truth effect
MMR	Measles Mumps Rubella
NHSTA	National Highway Safety Transportation Administration
TPP	third-person perception

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EXECUTIVE SUMMARY

The problem of misinformation in modern society has reached epidemic proportions, with intentional disinformation campaigns and their misinformation fallout becoming a weaponized war of words across the globe. In general, the intent of those behind these assaults is to destabilize democratic states by spreading doubt, fueling discontent, and interfering with fact-based decision making. Such tactics have been used by foreign actors against other countries and, increasingly, within a country to further the narrative and political goals of a leader. Intelligence experts agree that attacks on our own election process have taken place and continue to occur as we near another presidential election cycle.¹

In the modern world of the internet and social media platforms, there are few barriers to entry for a would-be purveyor of misinformation, and we are only beginning to understand the depth and complexity of the problem. The solution is even more elusive, considering the unpredictable dynamics of which meme or conspiracy theory might “go viral” with a particular section of society. Where are the intervention points? If false or misleading information is intentionally released to infect our public discourse, who is responsible for preventing it, or keeping it from spreading, or curing us from its ill effects? The questions related to these problems share a common lexicon—misinformation behaves much like a disease and can be described and understood in these terms. The branch of science dedicated to studying the phenomenon of cause, origin, and spread of disease or other health-related issues is epidemiology, and it serves as a logical lens through which we can view the disease of misinformation.

In its search for an end cure, epidemiology starts at the origin of the disease, which at its simplest level needs three things to exist: a disease agent or pathogen, an environment supportive of the agent’s life and reproduction, and a host to carry and eventually spread

¹ U.S. Senate, *Report of the Select Committee on Intelligence, United States Senate, on Russian Active Measures Campaigns and Interference in the 2016 U.S. Election*, vol. 1 (Washington, DC: U.S. Senate, 2019), https://www.intelligence.senate.gov/sites/default/files/documents/Report_Volume1.pdf.

the infectious agent.² Misinformation's agent can be either the person creating a false narrative or one passing it along as truthful. The environment in which misinformation thrives is related to both current socio-political divides and the echo chambers that perpetuate them. Fear is a primary driver of human behavior, and the more polarized a population is, the more these fears create an environment that helps to spread misinformation. This agent/host/environment construct is central to the epidemiological approach of this thesis, as are the related concepts of building host immunity, reducing agent virulence, and working to make the surrounding environmental medium less conducive to spreading misinformation.

As the unwitting hosts of misinformation, humans show differing levels of immunity, often correlating positively with exposure to more sources of information.³ As we experience fewer and more homogenous narratives and points of view, we tend to be more susceptible to misinformation that either supports our worldview or speaks to something that might threaten those beliefs. Social media platforms help us support and defend the ideas that we like, without the discomfort of seeing or trying to understand what we dislike. And the more we engage in the feedback mechanisms for social media, the better their algorithms can further reinforce these echo chambers of confirmation bias.⁴ In order to build individual host and collective herd immunity against false or misleading information, we must understand the cognitive shortcuts, or *heuristics*, our brains use to process and then retain or reject information.⁵ If misinformation is rejected by the brain, then prevention efforts have been effective. If it is accepted, then the epidemiological approach looks for a cure through a process of narrative correction. As with traditional disease models, prevention is preferable to intervening with an infected host.

² Department of Health and Human Services, *Principles of Epidemiology in Public Health Practice*, 3rd ed. (Atlanta: U.S. Department of Health and Human Services, 2012).

³ Katherine W. Phillips, "How Diversity Makes Us Smarter," *Scientific American*, October 1, 2014, <https://doi.org/10.1038/scientificamerican1014-42>.

⁴ R. Kelly Garrett, "Echo Chambers Online?: Politically Motivated Selective Exposure among Internet News Users," *Journal of Computer-Mediated Communication* 14, no. 2 (January 2009): 265–85, <https://doi.org/10.1111/j.1083-6101.2009.01440.x>.

⁵ Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011).

Impacting the epidemiological environment is another important strategy in the fight against misinformation, and there has been growing sentiment among legislators and citizens to consider regulating social media companies, the content they allow, and the methods by which they verify the veracity of content. As with other issues, constitutional concerns enter the discussion when free speech, fiercely protected in the United States, is potentially threatened. At least one social media company has refused to ban false political campaign ads from its platform, citing free-speech concerns.⁶ Changing the way that social networks do business and make money will be a huge task even without getting entangled with the Constitution, but altering the environmental factor, which has most contributed to this new epidemic of misinformation, may be the single best point of intervention.

While there is no simple solution to this complex problem, this epidemiological view does present a new way to view misinformation and may stimulate further discussion on the part of policymakers and the academic community. The existence of these false and insidious narratives is no longer benign but a true threat to our democracy at the highest levels. Misinformation is, in fact, present in the discussion of many of the issues considered to be critical in our country and the world. Political corruption, economic inequality, climate change, health care, and a host of other issues have been infected with misinformation, which is preventing much needed factual civil discourse and forward progress.

⁶ “As Zuckerberg Defends False Trump Ads, Critics Say Facebook’s Assault on Democracy Must Be Stopped,” Salon, October 21, 2019, https://www.salon.com/2019/10/21/as-zuckerberg-defends-false-trump-ads-critics-say-facebooks-assault-on-democracy-must-be-stopped_partner/.

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I. INTRODUCTION

Misinformation and disinformation have increasingly been a focus of public and media scrutiny in recent years. Although the terms are sometimes conflated, the main distinction is that *disinformation* refers to the deliberate attempt to influence public opinion or obscure the truth, such as the Russian disinformation campaigns prior to the 2016 U.S. presidential election.¹ Without such overt intent to deceive, misinformation is simply defined as false information that is spread, regardless of whether there was any particular intention behind it. Misinformation has quickly become such a part of the public discourse that it was named the 2018 word of the year by Dictionary.com, with an accompanying video stating, “Misinformation isn’t just the word of the year. It’s a call to action.”²

A. FACT OR FICTION?

The distortion of facts has been around for many years—more often than not designed to serve the needs of those in power, either politically or ideologically. Whether it has taken the form of withheld information or outright falsehoods, truth-bending autocrats have used disinformation campaigns to influence individual perceptions and sometimes incite entire societies to rise against their own members. The United States has been at the epicenter of some of these historical tragedies, which germinate from a seed of false claims or beliefs about a group of fellow humans. When fears of Japanese spying ran rampant during World War II, 117,000 people of Japanese descent were rounded up and sent to internment camps based on President Franklin D. Roosevelt’s Executive Order 9066.³ The premises upon which these actions were taken were later proven to be false and

¹ *Merriam-Webster*, s.v. “disinformation,” accessed August 26, 2019, <https://www.merriam-webster.com/dictionary/disinformation>.

² “Dictionary.com’s 2018 Word of the Year Is ...,” *Everything after Z* (blog), November 26, 2018, <https://www.dictionary.com/e/word-of-the-year/>.

³ Exec. Order No. 9066, 14 Fed. Reg. 1407 (February 25, 1942), <https://www.ourdocuments.gov/doc.php?flash=false&doc=74>.

based on a combination of racist views and overstated threats of Japanese-Americans performing as operatives of the Japanese military complex.⁴

What differentiates past campaigns from present-day attacks are the new tools of information warfare—primarily the internet and specifically social media platforms—which have effectively weaponized intentional false narratives directed at populations most vulnerable to manipulation. Where there is a lack of diverse populations willing to think critically about important issues, the mass nudging of social and political opinion via misinformation and disinformation both widens societal divides and stimulates action (or sometimes inaction) based on a false narrative.

Efforts to stem this tide through traditional means have so far been largely unsuccessful. Despite fact-based reporting by many experienced, legitimate, and objective journalists, it has become de rigueur to simply cry “fake news” when confronted with information counter to the desired narrative of an individual, party, or organization. This introduction of doubt into every discourse has effectively diluted the value of truth in our society, leading to widespread use of the term “post-truth,” named word of the year in 2016 by Oxford Dictionaries.⁵ So in a post-truth world, how do we examine where we lost sight of facts and evidence as the standard for rational discourse and decision making? One of the academic methods available is to apply the lens of a different discipline.

With so much of the lexicon of misinformation and disinformation revolving around “prevention,” “viral,” “spread,” and “counter-measures,” epidemiological models are a logical, yet largely unexplored parallel space to study the problem via solutions that have worked to curb or eliminate threats in the public health arena. Many of the facets of epidemiology—the study of the incidence, distribution, and control of disease within a population—lend themselves to potential interventions in the spread of infectious misinformation. As with any viral phenomenon, scholars must seek to understand the life

⁴ T. A. Frail, “The Injustice of Japanese-American Internment Camps Resonates Strongly to This Day,” *Smithsonian*, January 2017, <https://www.smithsonianmag.com/history/injustice-japanese-americans-internment-camps-resonates-strongly-180961422/>.

⁵ Katy Steinmetz, “Why Post-Truth Is Oxford’s Apt Word of the Year for 2016,” *Time*, November 16, 2016, <https://time.com/4572592/oxford-word-of-the-year-2016-post-truth/>.

cycle and the conditions that create the optimal host environment for misinformation, with an eye to effectively disrupting replication beyond the source. Within this framework, we can evaluate what has and has not worked historically and how our future efforts can be more effective at inoculating at-risk populations, eliminating potential vectors of misinformation spread, and directly applying treatment modalities as appropriate.

The study of misinformation as a disease reveals that the occurrence of disease itself can spur intentional and unintentional misinformation about who is causing it, how it spreads, and whether the treatments work or have side effects. For example, the United Nations Secretary General recognized the threat in this specific area: “The spread of false information poses a threat to people’s lives, health security and to public health systems across the world.”⁶ Efforts to combat the Ebola virus outbreak in the Democratic Republic of Congo have been hampered by conspiracy theories that claim the virus has been brought to them by foreign health workers. While there is no evidence to support this claim, and no motivation on workers’ part to spread disease rather than stop it, the misinformation has resulted in threats and actual violence against those working against the spread of Ebola.⁷

B. RESEARCH QUESTION

How can we better understand and address the proliferation of misinformation by viewing it through an epidemiological lens?

C. LITERATURE REVIEW

Public and academic discourse regarding the sources and consequences of misinformation typically fall into one or more of the following categories:

- Literature that examines historical disinformation campaigns and seeks to understand how they were successful in their deception. This includes

⁶ Antonio Guterres, “Inaccurate Information Makes Effective Responses to Complex Health Crises More Difficult, Secretary-General Tells Event on Countering ‘Fake News,’” United Nations, May 10, 2019, <https://www.un.org/press/en/2019/sgsm19574.doc.htm>.

⁷ Lisa Schnirring, “Threats to Health Workers Roil Ebola Response amid New Cases,” Center for Infectious Disease Research and Policy, May 24, 2019, <http://www.cidrap.umn.edu/news-perspective/2019/05/threats-health-workers-roil-ebola-response-amid-new-cases>.

articles that examine the targeting of certain audiences chosen for their susceptibility to manipulation, and any socioeconomic or demographic factors involved.

- Discussions of how certain cognitive processes help ease the delivery, retention, and spread of false narratives and how these newly acquired beliefs are difficult to extract once an individual's views have been altered.
- Proposed solutions to the problem, from media literacy education to search engine and social media interventions and numerous other approaches.

In a high-profile use of a disinformation campaign, Russian operatives systematically used social media advertising to influence voter attitudes in the 2016 U.S. elections and in other countries as well. The Senate Intelligence Committee released two reports in December 2018 detailing extensive Russian disinformation campaign efforts. The two reports came from cybersecurity firm New Knowledge and the Propaganda Research Project. The former focused on the Information Research Agency (IRA) and its tactics to suppress voter turnout and sow and widen political and racial divides. According to the report, the IRA campaigns reached “126 million people on Facebook, at least 20 million users on Instagram, 1.4 million users on Twitter, and uploaded over 1,000 videos to YouTube.”⁸

Regarding the study of cognition related to the misinformation phenomenon, Stephan Lewandowsky has written several articles discussing the pitfalls of a society in which decisions are made in an “opinion market” rather than by appropriate subject-matter experts. One such treatise, “Beyond Misinformation: Understanding and Coping with the Post-Truth Era,” proposes technological solutions to cognitive problems via an approach

⁸ Renee DiResta et al., “The Tactics & Tropes of the Internet Research Agency” (New Knowledge, December 17, 2018), 6.

coined “technocognition.”⁹ In their discussion, Lewandowsky et al. discuss a number of their findings, including what they call the “continued-influence effect,” the idea that misinformation, once introduced to an individual, is resistant to correction.¹⁰ Even when test subjects are told beforehand that they are being provided false information and afterward the false information is corrected, there is still a lasting impression of the original false narrative. Correcting this effect requires careful messaging, Lewandowsky argues. Simple corrective statements, research has found, are inadequate to dislodge false memories. An effective correction, first, must not challenge a person’s worldview but provide a credible alternative explanation to the original false information.¹¹

The perceived trustworthiness of the source is also important for correction effectiveness, according to a study by Guillory and Geraci.¹² In their experiment, they found that subjects were willing to “reduce reliance on original information” only with sources they perceived as trustworthy. They differentiate *trustworthy* from *credible* or *expert* sources, which showed no statistical influence on people’s willingness to accept a correction to originally incorrect information.¹³ Bode and Varaga expand on the issue of trustworthiness, looking at people’s trust in institutions such as media, government, and the scientific community. They found that, while trust has fallen for these organizations writ large, trust has increased for local news sources.¹⁴

Aaron McCright takes a slightly different view on the topic, arguing that the overall landscape is the biggest contributor to the spread of misinformation: “In our mind, the foremost barrier to combatting misinformation in the US is the intense political polarization

⁹ Stephan Lewandowsky, John Cook, and Ullrich K. Ecker, “Beyond Misinformation: Understanding and Coping with the ‘Post-Truth’ Era,” *Journal of Applied Research in Memory and Cognition* 6, no. 4 (July 2017): 353–69, <https://doi.org/10.1016/j.jarmac.2017.07.008>.

¹⁰ Lewandowsky, Cook, and Ecker, 355.

¹¹ Lewandowsky, Cook, and Ecker, 355.

¹² Jimmeka J. Guillory and Lisa Geraci, “Correcting Erroneous Inferences in Memory: The Role of Source Credibility,” *Journal of Applied Research in Memory and Cognition* 2, no. 4 (December 2013): 201–9.

¹³ Guillory and Geraci, 206–7.

¹⁴ Amy Mitchell et al., “The Modern News Consumer,” Pew Research Center, July 7, 2016, <https://www.journalism.org/2016/07/07/the-modern-news-consumer/>.

that, of course, is related intimately to decreasing social capital, rising inequality, declining trust in science, and an increasingly fractionated media landscape.”¹⁵ McCright argues that combatting misinformation requires an understanding of its sources and where they lie on the continuums of realism vs. constructivism and formal vs. informal presentation style, as shown in Figure 1. The four quadrants show different types of misinformation, with the upper two evoking a strong personal connection with their audience, supported primarily by emotional arguments. Truthiness and bullshit are more susceptible to debunking efforts because their informal messages are less believable to begin with. However, the audience for this type of misinformation does not often care as long as it aligns with its beliefs (more on this in Chapter II). The lower two quadrants are more insidious as they resemble the truth or contain elements of veracity, helping them gain a cognitive foothold in the brains of recipients.

¹⁵ Aaron McCright and Riley Dunlap, “Combatting Misinformation Requires Recognizing Its Types and the Factors That Facilitate Its Spread and Resonance,” *Journal of Applied Research in Memory and Cognition* 6 (2017): 389–96, <https://doi.org/10.1016/j.jarmac.2017.09.005>.

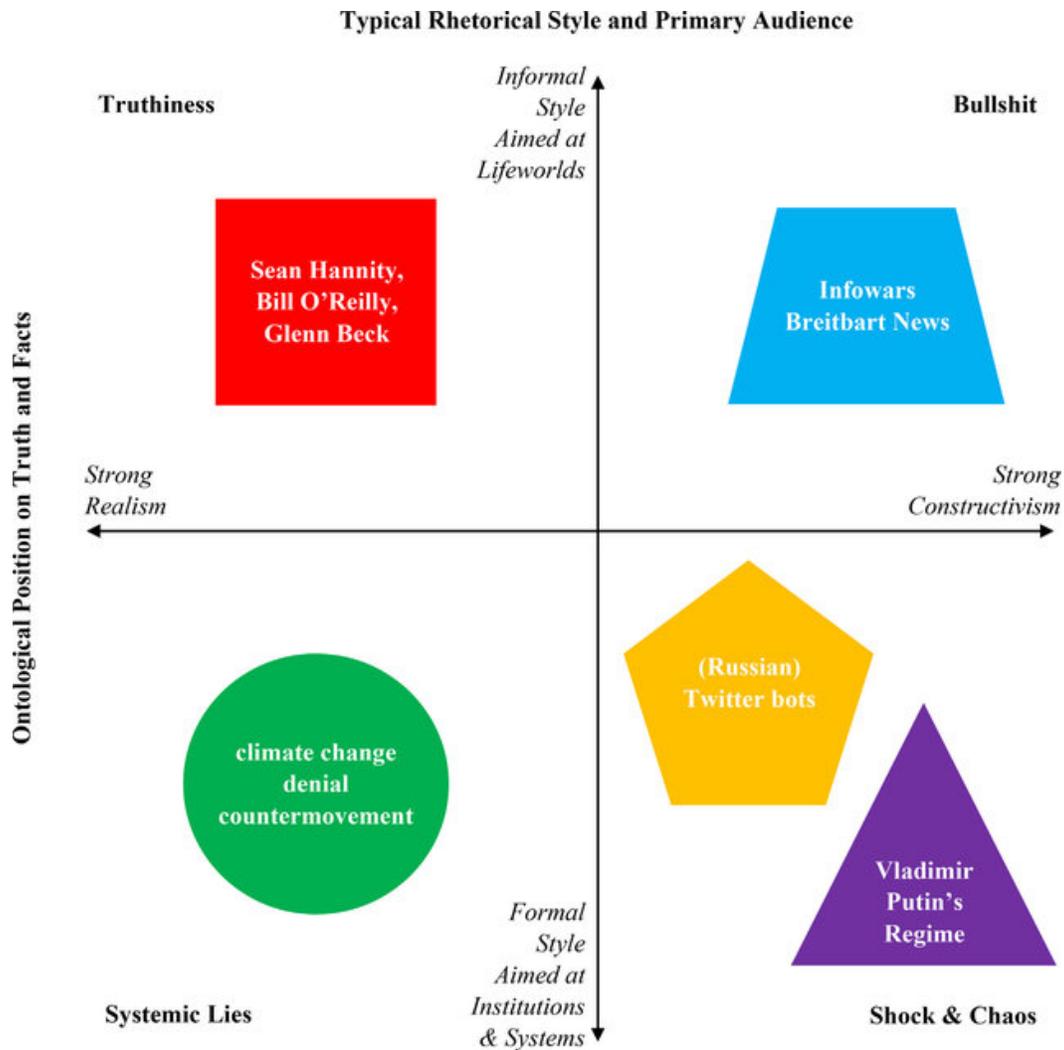


Figure 1. Types of Misinformation¹⁶

S. Mo Jang and Joon K. Kim delve into social and group dynamics as influencers on susceptibility to misinformation. Their study involves third-person perception (TPP) theory, which indicates that individuals tend to underestimate the impact of media influence on themselves relative to others.¹⁷ Supporting this notion, Jang and Kim found that participants in their study who showed a higher degree of TPP tended to support media literacy education as a countermeasure for “fake news” but did not support the regulation

¹⁶ Source: McCright and Dunlap, “Combatting Misinformation Requires Recognizing Its Types.”

¹⁷ W. Phillips Davison, “Third-Person Effect in Communication,” *Public Opinion Quarterly*, January 1983, 1–15.

of media—evidence that high TPP individuals believe they are able to discern fake news better than others.¹⁸

Also, in the realm of group behavior, the false consensus effect states that individuals who take on a belief they think is widely held in society are much more resistant to changing that belief. Lewandowsky et al. note, “In light of the fractionation of the media landscape into echo chambers, we can expect that many people will believe that their opinions, however exotic or unsupported by evidence, are widely shared, thereby rendering them resistant to change or correction.”¹⁹

While psychological studies seek primarily to understand human behavior in the brain, *sociology* expands to examine human behavior within larger social structures. The lines of sociology and epidemiology intersect in a relatively new discipline called social epidemiology. Specifically, this science is “concerned with the way that social structures, institutions, and relationships influence health.”²⁰ In one study, Moore and Kawachi discuss the forces of cohesion and social networks on individual social capital.²¹ “Cohesion” addresses the tendency toward a herd mentality and aversion to change within a group whereas the network approach takes a more detailed look at how qualities like trustworthiness can influence one’s positioning within a group.²² This concept ties back to previously mentioned studies on correcting misinformation.

Viewing misinformation through the epidemiological lens requires a basic understanding of the concepts of epidemiology. The Centers for Disease Control and Prevention (CDC) provides a good working definition: “Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations,

¹⁸ S. Mo Jang and Joon K. Kim, “Third Person Effects of Fake News: Fake News Regulation and Media Literacy Interventions,” *Computers in Human Behavior* 80 (2018): 295–302.

¹⁹ Lewandowsky, Cook, and Ecker, “Beyond Misinformation,” 361–362.

²⁰ Lisa F. Berkman, Ichiro Kawachi, and M. Maria Glymour, eds., *Social Epidemiology*, 2nd ed. (Oxford: Oxford University Press, 2014), 2.

²¹ S. Moore and I. Kawachi, “Twenty Years of Social Capital and Health Research: A Glossary,” *Journal of Epidemiology and Community Health* 71, no. 5 (2017): 513, <https://doi.org/10.1136/jech-2016-208313>.

²² Ichiro Kawachi and S. V. Subramanian, “Social Epidemiology for the 21st Century,” *Social Science & Medicine* 196 (2018): 243, <https://doi.org/10.1016/j.socscimed.2017.10.034>.

and the application of this study to the control of health problems.”²³ These epidemiological analogues become important when they are applied to the misinformation space, with the idea that false narratives have unique determinants and distribution, and certain populations may be more or less susceptible to infection.

Another basic concept is the epidemiological triangle, which consists of the host, the agent, and the environment. The host of misinformation is the person whose rational and fact-based thought process has been compromised; the agent is the one infecting false information; and the environment is the setting in which the infection occurs, which leads to the analysis of group dynamics and how they can work for or against immunity.

D. RESEARCH DESIGN

First, I researched, understood, and distilled the theoretical frameworks of epidemiology. This involved a review of educational media in the form of textbooks and academic literature as appropriate to address the research question. I analyzed and mapped the elements of epidemiological theories and models, looking for the main dynamics, principles, and explanations of disease contraction, transmission, containment, treatment, and prevention. This presented the framework upon which I could hang the analogous approaches to fighting viral misinformation.

Second, I conducted a systematic review of the processes and dynamics of cognitive and social psychology, using secondary sources to understand and then map the processes and principles whereby we form opinions and decide the veracity or validity of information. Further, I explored the cognitive biases and functions that contribute to individual and group vulnerability to misinformation.

Finally, I applied these psychological and epidemiological lenses and models to the misinformation space to utilize known, effective, and proven processes for a problem that has been difficult to understand and ultimately to solve.

²³ Department of Health and Human Services, *Principles of Epidemiology in Public Health Practice*, 3rd ed. (Atlanta: Department of Health and Human Services, 2012), 1–2.

The constant comparison methodology from Glaser and Strauss' grounded theory is one standard for this type of qualitative research, from which we can begin to establish data patterns to support theoretical conclusions.²⁴ One group of students described constant comparison as a "kaleidoscope of data" in which each piece of colored glass represents a data point.²⁵ Even though the glass and the mirrors in the tube create seemingly infinite visual images, they do follow certain patterns—which is the premise behind constant comparison.

Supporting this type of qualitative research are Edward O. Wilson's writings on the unity of knowledge. In his book *Consilience*, Wilson explores the same repetition we may find in constant comparison and suggests that similar conclusions reached from different bodies of knowledge support a stronger research conclusion: "Given that human action comprises events of physical causation, why should the social sciences and humanities be impervious to consilience with the natural sciences? And how can they fail to benefit from that alliance?"²⁶ The research path for this thesis explores this cross-pollination between the lenses and frameworks of the natural science of epidemiology and the social sciences involving human behavior.

The intent of this research was to draw comparisons from the epidemiological world, which suggests novel and compelling ways to understand and engage the challenge of misinformation and disinformation at the policy level. Exploring this problem metaphorically may trigger new thinking and discussion about an issue that has not been easily corralled, metaphorically speaking. George Lakoff has investigated the power of metaphor beyond the realm of linguistics: "The locus of metaphor is not in language at all, but in the way we conceptualize one mental domain in terms of another."²⁷ Lakoff's writing

²⁴ Barney G. Glaser and Anselm L. Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (Chicago: Aldine Publishing Company, 1967).

²⁵ J. F. Dye, I. M. Schatz, and S. T. Coleman, "Constant Comparison Method: A Kaleidoscope of Data," *Qualitative Report* 4, no. 1 (January 2000): 1–10.

²⁶ Edward O. Wilson, *Consilience* (New York: Vintage Books, 1998), 11.

²⁷ George Lakoff, "The Contemporary Theory of Metaphor," in *Metaphor and Thought*, ed. Andrew Ortony, 2nd ed. (Cambridge: Cambridge University Press, 1993), <https://doi.org/10.1017/CBO9781139173865.013>.

discusses the power of metaphor as a means to grasp complex problems by re-framing them in more universally understood terms. Moreover, while the deeper waters of epidemiology may be murky for many, the basic concepts of prevention and treatment will ring familiar to those interested in engaging with this thesis.

E. CHAPTER OUTLINE

Following this introductory chapter covering the basics of the misinformation problem and the proposed epidemiological re-framing, the thesis moves into tying together these two worlds. Any disease process begins in a particular body part, and efforts to combat disease must seek to understand exactly how that body part is being compromised. Chapter II works to explain the connection between the agent of misinformation and the vulnerabilities of the host brain. How does the mind receive, process, retain, and retrieve information, and what are the inherent cognitive biases and effects that influence these actions? Why are some pieces of information “stickier” than others, and are there identifiable steps to correct and extract bad information from memory?

This will set up Chapter III’s discussion of epidemiological principles, why they are a suitable lens for the study of misinformation, and how epidemiological intervention points must work hand in hand with the cognitive concepts outlined in Chapter II in order to succeed. A brief history of the science of epidemiology examines its successes and failures while outlining basic definitions. The logical flow of disease recognition, analysis, and intervention via prevention (stopping the spread within a population) and treatment (stopping the spread within a host) is also covered.

Chapter IV looks at some of the societal and governmental concerns regarding misinformation. Constitutional free speech can be a barrier to controlling misinformation, and there has been a number of interesting developments in this area, particularly in the world of social media. Many countries already regulate some exceptions to free speech while the United States continues to offer little room for deviating from strict constitutional interpretations. While politicians guard the Constitution, average citizens worry more about solving issues that may affect their lives directly, such as climate change, health care,

and whether their politicians are acting on their behalf. This chapter explores each of these sets of concerns and where misinformation comes into play.

Chapter V seeks to pull together the previous concepts of how we receive misinformation in our brain and how cognitive bias serves as an epidemiological intervention point to combat the spread of misinformation. Policy recommendations center mostly around developing better immunity to the disease of misinformation through critical thinking, media literacy, and heightened awareness of the problem and its political and societal repercussions.

II. THIS IS YOUR BRAIN ON MISINFORMATION

The brain is designed to learn information through experience: hot stoves burn, crying draws attention, falling down hurts. As we learn, we amass our collective experiences in memory and can leverage this gigantic database into making well-informed decisions based on those experiences, or what we perceive as facts. Consequently, we may fill our brains with all the information we *want* to be true, or *believe* to be true, but without careful and critical thinking, we may be acting on false information. Part of the challenge is that defining anything to be true with 100 percent certainty is impossible, so it is up to us at an individual level, and collectively within our society, to evaluate information and determine whether it is factual or fallacious. Accurate information is essential to the process of effectively analyzing daily decisions as citizens, from simple choices about picking the right clothes to wear for the weather to much more complex and interdependent judgements about where our democracy is heading and who will lead us there. And at the policy-making level, the consequences of legislators acting on incorrect information are amplified as they could become law, developed on false premises and given a foothold to future uninformed government action (e.g., Executive Order 9066).

To avoid these undesirable outcomes, the first step in understanding susceptibility to the disease of misinformation is to learn about where it originates: in the brain. This chapter discusses the means by which humans receive and retain information and how non-factual information, received in low or high doses, clouds human judgment. Cognitive psychology has made substantial contributions to understanding these processes, and as with any disease, understanding the natural human processes and their weaknesses is the first step in prevention and treatment.

As members of a democracy, U.S. citizens are responsible for the work of carefully examining information and maintaining an awareness of what issues are vital to the security of that democracy. Thomas Jefferson offered, “Wherever the people are well informed they can be trusted with their own government; that whenever things get so far wrong as to

attract their notice, they may be relied on to set them to rights.”²⁸ Conversely, could it then be said that if the people are not well-informed, they *should not* be trusted with their own government? Often government is thought of as a collection of politicians and bureaucrats sent to represent and carry out the direction of the voting public, yet Jefferson’s statement implies a connection between voters and *their* government—an ownership and interest in the successful operations of the government. It follows, then, that individual citizens have a responsibility to be consciously well-informed about their government and the various alternatives their government considers before ultimately implementing policy on behalf of their constituents. The reason people sometimes shirk this responsibility to be informed can be traced back to key cognitive processes in the brain known as heuristics.

A. HEURISTICS: THE SHORTEST PATH BETWEEN SYNAPSES

All decision making ultimately starts in an individual’s brain, and depending on whether information is new or familiar, the brain employs shortcuts, known as heuristics, to decision making. Daniel Kahneman summarizes this phenomenon using terms originally developed by psychologists Keith Stanovich and Richard West; the mind is essentially run by two systems: “System 1 operates automatically and quickly, with little or no effort and no voluntary sense of control. System 2 allocates attention to the effortful mental activities that demand it, including complex computations.”²⁹ Kahneman goes on to describe what sometimes happens when System 1 is unable to find a quick answer to a difficult question: it creates a simpler heuristic *alternative* question in a process known as “attribute substitution.” Usually, this happens when the question involves a prediction or extrapolation rather than a straight factual response. For example, if a person were asked, “Will this political candidate be successful?,” he might instead ask himself whether that person interviews well or comes across as confident in a debate.

The other critical ingredient to successful heuristic-based decision making is the concept of *availability bias*, which states that we use the most available information in our

²⁸ Thomas Jefferson to Richard Price, January 8, 1789, Library of Congress Exhibitions, <https://www.loc.gov/exhibits/jefferson/60.html>.

²⁹ Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 20–21.

minds to formulate decisions—whatever information we can retrieve readily will be weighted more heavily when we evaluate options. What drives availability is the vividness of these stored memories. Thus, if the safety of flying versus driving were being evaluated, one might conjure up images of a horrific plane crash more readily than envisioning one’s car wrapped around a tree. The events and images of 9/11 are etched deeply into our brains, and the more recent events of faulty control systems in Boeing Max planes further contribute to second thoughts in the minds of air travelers. Plane crashes receive widespread media attention and are usually accompanied by horrifying images, which make these incidents more salient and more available in memory. Yet, with over 40,000 deaths attributed to automobile accidents in the United States in 2018 and 556 fatalities caused by commercial aviation, the fear of flying versus driving is statistically unsupported; it has simply been exacerbated by the availability heuristic.³⁰

While often helpful in the process of efficient thought and analysis, these heuristics can cause systematic errors in our thinking, a phenomenon known as *cognitive bias*. Many of these biases have been identified and supported by reproducible research studies, but there are certain ones of greater relevance to this thesis—specifically, those biases and psychological effects capable of facilitating the acceptance and spread of misinformation. Why do we fail to recognize false information when we see it, or how do we rationalize and legitimize it in our brains? One theory points to a desire to avoid discomfort, or cognitive dissonance.

In his book, *The Social Animal*, social psychologist Elliot Aronson explores the idea of cognitive dissonance, a theory first introduced by Leon Festinger. According to Aronson, “Cognitive dissonance is a state of tension that occurs whenever an individual simultaneously holds two cognitions (ideas, attitudes, beliefs, opinions) that are psychologically inconsistent.”³¹ Aronson asserts that the human tendency is to reduce this

³⁰ Laura Smith-Spark, “Plane Crash Deaths Rise in 2018 but Accidents Are Still Rare,” CNN, January 3, 2019, <https://www.cnn.com/2019/01/02/health/plane-crash-deaths-intl/index.html>; “Fatality Estimates,” National Safety Council, accessed September 18, 2019, <https://www.nsc.org/road-safety/safety-topics/fatality-estimates>.

³¹ Elliot Aronson, *The Social Animal* (San Francisco: W. H. Freeman, 1972), 92–93.

tension, similar to the way we eat to relieve hunger or drink to quench thirst. In this case, though, the tension is psychological, and the brain works to relieve that dissonance.

The premise of cognitive comfort versus discomfort is a common theme when looking at the world of misinformation. Successful misinformation and disinformation campaigns rely on leveraging our discomfort or dangling the promise of comfort to achieve their desired goal. As this thesis progresses, cognitive biases will be exposed as one of the primary routes of exposure and mechanisms of spread of viral misinformation. Although not a universal solution, self-recognition of these biases may be one of the keys to prevention as we can either recognize when someone is trying to change our beliefs or realize when our beliefs need to change. In some cases, however, recognition may not be enough to overcome a strong affinity to core beliefs of a person or group.

B. INDIVIDUAL BIASES

The mechanisms of cognitive bias exist in an individual's brain, sometimes entirely self-influenced and at other times under social group-influenced pressures, or even the suggestive powers of computer algorithms. An article in *Scientific American* posits three categories: bias in the brain, bias in society, and bias in the machine.³²

Confirmation bias is at the heart of many discussions of the problem of misinformation, as it explains the strong tendency to accept information that confirms a person's existing worldview. While this idea is not a new one, the intensity of its effect has been greatly enhanced with the advent of the internet and, more specifically, social media. Many experts, as well as political pundits, point to private-sector social-media companies as creating and nurturing these digital echo chambers, which have a polarizing effect on their users.³³ Given that 72 percent of all U.S. adults have at least one social media account

³² Giovanni Luca Ciampaglia and Filippo Menczer, "Biases Make People Vulnerable to Misinformation Spread by Social Media," *Scientific American*, June 21, 2018, <https://www.scientificamerican.com/article/biases-make-people-vulnerable-to-misinformation-spread-by-social-media/>.

³³ Laura Jakli and Paul Gill, "Follow the Echo Chamber: Measuring Political Attitude Change and Media Effects on Twitter," *VOX Pol* (blog), October 10, 2018, <https://www.voxpol.eu/follow-the-echo-chamber-measuring-political-attitude-change-and-media-effects-on-twitter/>.

and 90 percent of those are 18–29 years old, these environments must be of concern as we look to identify the reservoirs in which the disease of misinformation thrives.³⁴

Up until the 1980s or so, information about current events, politics, sports, and weather came to us basically once a day. The newspaper arrived on the door step once a day in the morning and the evening newscast on a low-definition television every night. The content was not entirely without editorial lean, but generally, with half an hour to cover all that was happening in the world, the three main networks had time only to present the facts as they appeared. American citizens could take these facts and see how they aligned with their personal and political beliefs. Before the internet took hold, the emergence of hundreds of cable television channels—many of them news-related—began to serve up a round-the-clock diet of information to viewers who now could choose their favorite source. In a rush for one network to scoop another, the old approach of fact-checking for tomorrow’s headline story or confirming sources for the nightly news’ leading story began to fade. The result was misinformation spread due to time pressures, a dynamic now amplified by the internet and social media, which give instant gratification to those providing and consuming the news. Meme-length content prevents nuance, depth, context, or any other element required to evaluate and understand the information. This oversimplified news and information can be generated or spread by nearly anyone with a computer and an internet connection—gone are the days of media exclusively pushed out from the top down and with fact-checking and source verification.

With social media now outpacing newspapers as a news source, the online news cycle is continuous, instantaneous, and loaded with self-imposed and machine-learned confirmation bias.³⁵ Users choose the news content they want to see, which is often based on their biases, and social media platforms assist them in building and reinforcing that bias by showing them more of that same kind of content—the “bias in the machine.” As described by Ciampaglia and Menczer in the aforementioned *Scientific American* article,

³⁴ “Social Media Fact Sheet,” Pew Research Center, accessed August 17, 2019, <https://www.pewinternet.org/fact-sheet/social-media/>.

³⁵ Elisa Shearer, “Social Media Outpaces Print Newspapers in the U.S. as a News Source,” *Fact Tank* (blog), December 10, 2018, <https://www.pewresearch.org/fact-tank/2018/12/10/social-media-outpaces-print-newspapers-in-the-u-s-as-a-news-source/>.

“If a user often clicks on Facebook links from a particular news source, Facebook will tend to show that person more of that site’s content. This so-called ‘filter bubble’ effect may isolate people from diverse perspectives, strengthening confirmation bias.”³⁶

To use an architectural analogy, the echo chamber is built on a foundation of human bias leading to self-affirming information streams. The filter bubble created through the algorithms of social media platforms strengthens the walls of the echo chamber, locks the doors, and pulls the blinds on views outside this protected space. While these content filters may have originally been developed to provide users with information in line with their preferences, or “likes,” they have at a minimum carried the unintended consequence of deepening political and social divides. Online democracy advocate Eli Pariser, who coined the term filter bubble in his 2011 TED Talk, expressed his concern for “a world in which the internet is showing us what it thinks we want to see, but not necessarily what we need to see.”³⁷ Pariser calls out search engines, social media, and entertainment platforms for presenting personalized content that does not show us what we are missing, even if the omissions deviate from our machine-perceived preferences. Long before Facebook CEO Mark Zuckerberg testified before Congress about echo chambers and their supporting filter bubbles, Pariser had identified these as the developing fortresses of confirmation bias.

Given the power of cognitive dissonance, another way in which individual decisions can be swayed is through the *ambiguity effect*, which shows that people tend to be averse to choices containing ambiguity, or unknown outcomes.³⁸ In the misinformation discussion, this becomes relevant when doubt is introduced into a decision-maker’s mind. Misinformation and disinformation soften the focus of a clear and unambiguous choice. Is climate change real, and can we prove it? Are vaccines really safe? These are recent examples of the direct correlation between introducing doubt and fear into a discussion and increasing the level of perceived ambiguity in the process of deciding a course of action.

³⁶ Ciampaglia and Menczer, “Biases Make People Vulnerable to Misinformation.”

³⁷ Eli Pariser, “Beware Online ‘Filter Bubbles,’” March 2011, TED, video, 8:50, https://www.ted.com/talks/eli_pariser_beware_online_filter_bubbles.

³⁸ “Why We Prefer Options That Are Known to Us,” Decision Lab, accessed September 15, 2019, <https://thedecisionlab.com/biases/ambiguity-effect>.

In some cases, this tends to lead people to a non-rational choice, but in others, it can lead them to complete *indecision* (e.g., not voting). This tendency to choose inaction over action is known as *omission bias*, which is a preference to choose a harmful *inaction* or omission—in this case, not voting—over a harmful *action*.³⁹ In an ideal and perfect democracy, everyone who *could* vote *would* vote, and the inaction of not voting would make the democracy less perfect. Even though one could vote for something or someone theoretically harmful, at least one participated in the exercise of democracy. In this way, misinformation that leads to omission bias interferes with our democracy.

Related to the inaction effects of ambiguity and omission is the *status quo bias*, perhaps self-explanatory as a tendency to make decisions based on avoidance of changing from a current, familiar paradigm to a new, unfamiliar one. As Tversky and Kahneman observe, the intensity of this bias can be influenced by what choices are available, the perceived value of those options, and how they are framed.⁴⁰ Positive framing around information (or misinformation) is perceived as better than negative: a 95 percent chance that something good will happen is more favorable than a 5 percent chance of a negative outcome. People perceive bad things as more impactful and work to avoid them.

The politics of fear play into both the ambiguity effect and the status quo bias, primarily by injecting additional uncertainty into what is already an uncertain world. In this case, misinformation comes most often in the form of denialism: the act of disavowing the veracity of fact-based, scientifically proven concepts.⁴¹ The most prevalent example in recent times is climate change. With 97 percent or more of actively publishing scientists agreeing on the reality of human-caused climate change, it should be an uphill battle to deny this consensus.⁴² However, even the *suggestion* that the 3 percent view might be

³⁹ Jonathan Baron and Ilana Ritov, "Omission Bias, Individual Differences, and Normality," *Organizational Behavior and Human Decision Processes* 94, no. 2 (2004): 74–85, <https://doi.org/10.1016/j.obhdp.2004.03.003>.

⁴⁰ Daniel Kahneman and Amos Tversky, "Choices, Values, and Frames," *American Psychologist* 39, no. 4 (April 1984), <http://web.missouri.edu/~segeri/capstone/choicesvalues.pdf>.

⁴¹ Pascal Diethelm and Martin McKee, "Denialism: What Is It and How Should Scientists Respond?," *European Journal of Public Health* 19, no. 1 (January 2009): 2–4, <https://doi.org/10.1093/eurpub/ckn139>.

⁴² "Scientific Consensus: Earth's Climate Is Warming," National Aeronautics and Space Administration, accessed August 20, 2019, <https://climate.nasa.gov/scientific-consensus>.

accurate introduces enough uncertainty to sway the opinion of those already averse to change or ambiguity; they look for reasons other than the obvious to explain the change, such as simple historical cyclical weather patterns or natural global warming over time not due to human influence. Denial in the face of scientific consensus allows individuals to maintain harmful beliefs and habits without feeling they are harmful—thereby alleviating any cognitive dissonance they might otherwise have to endure.

So why can't the 3 percent who dispute climate change be right? The ethical concept of *moral relativism* explores the idea that all opinions (moral stances) are equal and legitimate, and the validity of these opinions is all a matter of perspective. The danger with discussions involving denial or rejection of agreed-upon scientific facts, however, is that we venture into the territory of *factual* relativism. Famously, White House advisor Kellyanne Conway justified false statements by then–Press Secretary Sean Spicer by calling them “alternative facts”—a response that seems to accept the result of a heuristic as legitimate and viable information.⁴³

So why not just correct misinformation where it is found? One contraindication to this seemingly simple solution is the *backfire effect*, which occurs when people react to disconfirming evidence by strengthening their (incorrect) position.⁴⁴ While previous psychological studies have demonstrated the backfire effect—driven by either familiarity with a piece of information or worldview—more recent evidence suggests that this effect may be less prevalent than originally thought.⁴⁵

Another impediment to effective correction of false information is that it can be “sticky” in nature, meaning that even after correction, it is difficult to remove from memory, which leads to what is known as the *continued influence effect* (CIE)—alluded to

⁴³ NBC News, “Kellyanne Conway: Press Secretary Sean Spicer Gave ‘Alternative Facts,’” January 22, 2017, YouTube, video, 3:53, <https://www.youtube.com/watch?v=VSrEEDQgFc8>.

⁴⁴ Brendan Nyhan and Jason Reifler, “When Corrections Fail: The Persistence of Political Misperceptions,” *Political Behavior* 32, no. 2 (2010): 303–30.

⁴⁵ Ullrich K. H. Ecker et al., “The Effectiveness of Short-Format Refutational Fact-Checks,” *British Journal of Psychology* (2019), <https://doi.org/10.1111/bjop.12383>.

previously in the literature review.⁴⁶ Continued influence has been studied extensively as it relates to the misinformation problem, and it serves as both an explanation and an alarm for the difficulties of combatting false narratives by simply attempting to correct them. The existence of this effect suggests that misinformation intervention efforts will potentially be more effective in the pre-exposure prevention stage rather than after treatment, epidemiologically speaking.

The continued influence effect is related to the *misinformation effect*, which creates false memories after an event.⁴⁷ When subjects were presented with bad information after witnessing an event, a high number (47 percent) accepted the misinformation as part of the original story. That tendency increased further as time passed and memories of the original event faded. With both effects, the problem is mis-remembering facts, but with CIE, even facts that are corrected after the event are mis-remembered.⁴⁸ In a study of mock jurors conducted in 1997, prejudicial pre-trial information was retained by test subjects despite their having been instructed to disregard this information as evidence. The only way to dislodge these memories was to introduce suspicion as to the motives underlying the introduction of this evidence.⁴⁹ In other words, it is not enough to ask people to forget something—they need a good reason to forget it, and refuting false information is more effective than retracting it.⁵⁰

Cook and Lewandowsky have studied CIE with similar findings: correcting information alone is not enough. In fact, simply repeating the information to debunk it can

⁴⁶ Stephan Lewandowsky et al., “Misinformation and Its Correction: Continued Influence and Successful Debiasing,” *Psychological Science in the Public Interest* 13, no. 3 (2012): 106–31, <https://doi.org/10.1177/1529100612451018>.

⁴⁷ Elizabeth Loftus, “Searching for the Neurobiology of the Misinformation Effect,” *Learning & Memory* 12 (2005): 1–2, <https://doi.org/10.1101/lm.90805>.

⁴⁸ Ullrich K. H. Ecker et al., “He Did It! She Did It! No, She Did Not! Multiple Causal Explanations and the Continued Influence of Misinformation,” *Journal of Memory and Language* 85 (2015): 101–15, <https://doi.org/10.1016/j.jml.2015.09.002>.

⁴⁹ Steven Fein, Allison L. McCloskey, and Thomas M. Tomlinson, “Can the Jury Disregard That Information? The Use of Suspicion to Reduce the Prejudicial Effects of Pretrial Publicity and Inadmissible Testimony,” *Personality and Social Psychology Bulletin* 23, no. 11 (1997): 1215–26, <https://doi.org/10.1177/01461672972311008>.

⁵⁰ Ecker et al., “The Effectiveness of Short-Format Refutational Fact-Checks.”

reinforce the false message. So, for instance, if one says, “Lynne is a psychiatrist . . . wait, no . . . she’s a surgeon,” both messages are encoded in the brain. In order to effectively remove the false memory, Cook and Lewandowsky propose a few key actions: (1) understand the worldview of your subject to avoid the backfire effect, (2) provide an alternative explanation, (3) give an explicit warning before mentioning incorrect information, and (4) keep the retraction and explanation simple and brief.⁵¹ Thus, the correction might be “I mentioned earlier that Lynne is a surgeon, which is correct. I falsely stated that she is a psychiatrist. She is a surgeon.”

While repeating corrective information can be effective in changing what we remember, unfortunately, so can repeated misinformation. With over 12,000 false or misleading statements made within the first 928 days in office, the Trump administration is an ongoing demonstration of how repetition of false information starts to create alternate truths—a phenomenon known as the illusory truth effect (ITE). Among the most repeated claims, for instance, is the statement that “We’re building the wall faster and better than ever,” which Trump repeated 190 times in those 928 days.⁵² Similar superlative statements have been made about the economy, global trade, tax cuts, and a number of other topics. While these claims are demonstrably false or misleading, studies on ITE have shown that repetition does increase the *subjective* truth of a statement.⁵³

C. GROUP BIASES

Collectively, the dominant views of a society influence popular opinion and consensus on any number of social or political topics and, eventually, might affect policy decisions at the highest levels of government. If people act on bad information, decision-making errors that start at an individual level can spread to the group dynamic, where their influence can be even more pronounced. As previously discussed, humans generally are

⁵¹ John Cook and Stephan Lewandowsky, *The Debunking Handbook* (Brisbane, Queensland: Global Change Institute, 2012), http://www.skepticalscience.com/docs/Debunking_Handbook.pdf.

⁵² “Tracking All of President Trump’s False or Misleading Claims,” *Washington Post*, last modified October 9, 2019, <https://www.washingtonpost.com/graphics/politics/trump-claims-database/>.

⁵³ Christian Unkelbach et al., “Truth by Repetition: Explanations and Implications,” *Current Directions in Psychological Science* 28, no. 3 (2019): 247–53, <https://doi.org/10.1177/0963721419827854>.

averse to conflict, which results in a tendency to congregate with like-minded people, or *ingroups*. Social identity theory teaches that ingroup bias exists when members of a group tend to assign preference to the members of their own group, or more importance to their opinions and positions.⁵⁴ Supporting this theory, a survey of 2,200 adults conducted in March 2019 found that people believe that the most trustworthy sources of information are family, friends, and “people like me.”⁵⁵ This circle of trust, a person’s ingroup, develops defensive biases against all others who now become the outgroup, whose views are marginalized by the relative ingroup.

The ingroup dynamic encourages proliferation of homogeneous narratives, whether true or false. It discourages exploring new ideas and rewards conformity by replacing feelings of self-uncertainty with the warmth of cohesion. In this homophilic world, one need not work hard to feel accepted and valued, and live in a world of relative cognitive harmony. Challenging or rejecting the narrative of this world amounts to a group honor challenge and rocks the individual’s cognitive boat.

The ingroup is also the breeding ground for numerous cognitive biases, including the closely related concepts of *groupthink* and the *bandwagon effect*. The former states that people tend to avoid the friction of holding beliefs or expressions incongruous with those of the ingroup and default to whatever the majority position is on a given topic. This phenomenon falls under the broader umbrella of cognitive dissonance discussed earlier, and this desired harmony with the group might lead to decisions that are harmful for the group and the individual. This desire to align with a group of like-minded people, coupled with the platform of social media, has given rise to the echo chambers discussed earlier. A subset of groupthink, the bandwagon effect explains a tendency to jump on the wave of popular opinion rather than critically arrive at an independent analysis of facts related to a given problem. To avoid the pitfalls of groupthink in the misinformation space, independent analysis must be taught and encouraged.

⁵⁴ David Brannan, Anders Strindberg, and Kristen Darken, *A Practitioner’s Way Forward: Terrorism Analysis* (Salinas, CA: Agile Press, 2014), 55–56.

⁵⁵ Institute for Public Relations, *Disinformation in Society Report* (Gainesville, FL: Institute for Public Relations, 2019), https://instituteforpr.org/wp-content/uploads/Disinformation_Study_IPR-6-18.pdf.

How individuals are influenced by the group and how charismatic individuals can exert influence on it are important to the misinformation discussion in that trust and perceived authority enhance the spread. Authority bias comes into play when people assign a greater degree of acceptance to a message received from an authority figure, regardless of whether his authority is related to the actual message. The infamous Milgram experiments, started in 1961, observed the extremes of authority bias when humans claimed their actions were the result of following orders from a powerful leader. Milgram theorized after the Nuremberg trials that Nazi soldiers had felt compelled out of obedience to carry out the orders of their superiors, regardless of the severity of the punishment they were delivering.⁵⁶ Thus, if bad information is passed from an authority to subordinates, or those who identify as such, authority bias tends to enhance the acceptance and spread of information, whether true or false.

Even without authority, ingroups can perceive unproven or unsupported positive or negative attributes in a person via the *halo* or *horn effect*. This phenomenon leads people to form a general impression of a person—positive or negative—based on only one specific character trait. So, if a person is seen as attractive or intelligent, we might assume she is also honest and trustworthy. If a candidate is perceived as successful in the world of business, we might expect that he would also run the business of his political jurisdiction effectively. While these associations may prove true in some circumstances, the pitfalls of the halo effect become evident when disinformation or misinformation is spread by virtue of the halo-bearing source.

The *false consensus effect* shows that individuals tend to overestimate the extent to which others would agree with their positions or actions.⁵⁷ This is yet another cognitive dissonance salve that people apply, consciously or unconsciously, to justify their actions. An individual may be so convinced that one's worldview on a particular issue is the dominant and correct view that the process of making decisions to support that hermeneutic

⁵⁶ Stanley Milgram, "Behavioral Study of Obedience," *Journal of Abnormal and Social Psychology* 67, no. 4 (1963): 371–78, <https://doi.org/10.1037/h0040525>.

⁵⁷ Lee Ross, David Greene, and Pamela House, "The 'False Consensus Effect': An Egocentric Bias in Social Perception and Attribution Processes," *Journal of Experimental Social Psychology* 13, no. 3 (1977): 279–301, [https://doi.org/10.1016/0022-1031\(77\)90049-X](https://doi.org/10.1016/0022-1031(77)90049-X).

is made even easier by this effect. People who pass along bad information on social media, for example, may be doing so in support of their worldview and their need for people to agree with them.

Countering the idea of perceived similarity between individual and group thought is the third-person effect, which finds that individuals believe that persuasive communications designed to change or solidify their opinions have a greater impact on others. This effect points out another egotistical characteristic of humans: we believe that we are smarter and more aware than everyone else, especially those in the outgroup. This hubris is yet another cognitive roadblock to the misinformation battle, working against changing minds on critical issues.

A question central to this thesis is whether the impacts of these cognitive phenomena are more prevalent than they used to be in the world, and if so, why? One explanation might be that the ease with which information comes to us via the internet has begun to alter the balance between our System 1 and System 2 thinking. Are we increasingly relying on System 1 thinking because most answers are no further away than a “Hey Siri” or a Google search? System 2 thinking is becoming a lost art, and just like we rely on search engines to answer tough questions, perhaps we have begun to lean more on heuristics in answering important questions or gathering pertinent information. Or, perhaps, it is not the nature or prevalence of cognitive bias itself but rather the frequency with which these heuristics are engaged by rampant distribution of information and memes, which challenge deeply held beliefs and evoke strong, emotional reactions among a bitterly divided society.

Whatever the cause, as the disease of misinformation is examined, this layering and reinforcing of the various cognitive biases discussed in this chapter mean that the spread of alternative facts is increasing, and the methods of prevention and treatment are becoming less effective. Understanding cognition could be the key to prevention and cure, so the next chapter discusses the key concepts of epidemiology.

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III. THE EPIDEMIOLOGICAL LENS

The fear of epidemics and pandemics is woven through the fabric of science fiction and real historical accounts of human existence. From Michael Crichton's *Andromeda Strain* to Stephen King's *The Stand*, to movies like *Contagion* and the ever-popular zombie apocalypse genre, the thought of an uncontrollable disease ending our world as we know it engages our fears at the deepest level. More likely than these scenarios, though, is an outbreak of a disease we have learned to control, such as a strain of influenza or an intestinal virus. Guarding the gate against such invasions is the science of epidemiology: the study of diseases in populations of people and animals. More specifically, epidemiology is defined as “the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.”⁵⁸ Under this broad umbrella, epidemiology can be applied to everything from non-communicable diseases like cancer, communicable diseases such as measles and influenza, and behavioral health concerns such as smoking, motor vehicle accidents, and gun violence. This chapter introduces the basic frameworks of epidemiology and how they might apply to the “disease” of misinformation.

A. HISTORY

The historical roots of epidemiology date back to Hippocrates, who theorized that factors such as environment and host could impact the disease process.⁵⁹ Hippocrates observed, among other variables, differences between male and female, young and old, and differing climates (e.g., wet and dry or hot and cold), in disease processes. Over 2,000 years later, in 1662, Englishman John Graunt published an analysis tracking births, deaths, and disease occurrences in London in the first-known demographical examination of health-related data.⁶⁰ London would remain the epicenter of epidemiological developments, as the

⁵⁸ J. M. Last, ed., *Dictionary of Epidemiology*, 4th ed. (New York: Oxford University Press, 2001), 61.

⁵⁹ Hippocrates, “On Airs, Waters, and Places,” trans. Francis Adams, Internet Classics Archive, accessed December 9, 2019, <http://classics.mit.edu/Hippocrates/airwatpl.mb.txt>.

⁶⁰ Department of Health and Human Services, *Principles of Epidemiology*, 1–7.

hypotheses of three scientists converged in the cholera epidemics of the mid-1800s. William Farr, who was examining a major outbreak of cholera in London in 1849, subscribed to the idea that disease existed in the air itself, specifically “bad air,” or miasma.⁶¹ The miasmatic theory is an example of the difficulty in changing scientific consensus, and Farr, whose contributions earned him the unofficial title of “father of modern vital statistics,” was only convinced of the invalidity of miasma theory by the findings of two other key figures in the cholera eradication effort.

Up until the mid-1800s, epidemiological practices had been passive—collecting statistics on raw numbers of births, deaths, and illnesses. But, in 1856, an anesthesiologist named John Snow took this practice into the field and moved epidemiology to the next level. Snow had observed a cholera outbreak in a London neighborhood, and upon mapping the incidence (distribution) of known infections, he found a significant concentration around a particular water-pumping station. Snow questioned households with cholera patients and those with no incidence of cholera, and from these interviews, two trends emerged: (1) the pumping station suspected of causing infections was known anecdotally to be dirty, and (2) uninfected workers in the area had sourced their water from a brewery with its own deep well.⁶² Based on Snow’s findings, the handle of the Broad Street pump was removed, and the epidemic was stopped at the source.

⁶¹ Stephen Halliday, “Death and Miasma in Victorian London: An Obstinate Belief,” *British Medical Journal* 323, no. 7327 (2001): 1469–71, <https://doi.org/10.1136/bmj.323.7327.1469>.

⁶² Department of Health and Human Services, *Principles of Epidemiology*, 1-8–9.

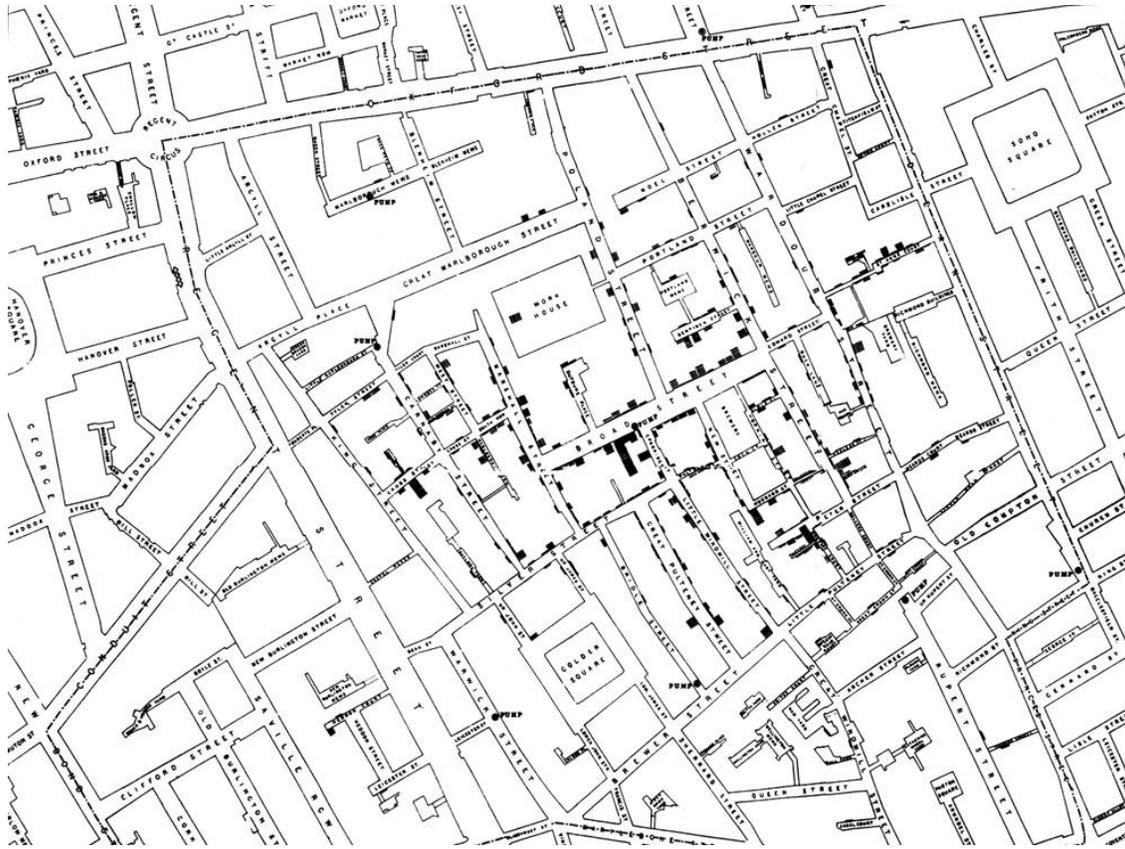


Figure 2. John Snow's Map of the 1854 Broad Street Epidemic⁶³

Snow's findings, although sound in hindsight, were not widely accepted at a time when most people thought that foul air and smells, not water, were the carriers of disease. However, an idea to remove these smells from homes inadvertently became the confirming evidence in the discussion of waterborne versus airborne disease vectors. The chief engineer of London's Metropolitan Board of Works, Joseph Bazalgette, constructed a series of sewer drainages that effectively separated waste water from drinking water. Having removed the stench from the areas surrounding homes, Londoners were pleased to find the cholera outbreaks stopped and attributed it to the removal of the deadly odors known at the time as "the Great Stink."⁶⁴

⁶³ Source: "Mapping a London Epidemic," National Geographic Society, July 21, 2014, <http://www.nationalgeographic.org/activity/mapping-london-epidemic/>.

⁶⁴ Paul Simons, "The Big Stench That Saved London," *The Times* (London), June 17, 2008, <https://www.thetimes.co.uk/article/the-big-stench-that-saved-london-lt6zmhswkbg>.

Farr continued to defend his airborne hypothesis, but Bazalgette and Snow's waterborne theory finally gained acceptance in 1892, when a deadly cholera outbreak occurred in Germany and had been expected to spread via the air, according to the principles of miasmatic theory. When the outbreak never materialized, opinion started to shift, and Farr and others began to jump on the waterborne bandwagon in a seismic shift of scientific consensus.

While Snow's studies in the 19th century focused mainly on the transmission of a pathogen within a population, notable epidemiology studies in the 1900s began to look more at causal effects of human hosts' choices on the incidence of illness and mortality. In 1948, amidst an unexplained rise in cancer deaths, British researchers Doll and Hill conducted a study that helped establish the first links between smoking and cancer.⁶⁵ In the same year, the Framingham Heart Study found similar correlations between smoking and cardiovascular disease, controlling for other environmental factors by isolating its 5,209 participants to a single town in Massachusetts.⁶⁶ Later in the 20th century, other public health threats such as the Ebola virus and acquired immunodeficiency syndrome (AIDS) were also studied and contained via epidemiological methods.

B. MODERN EPIDEMIOLOGY

Today, epidemiologists arm themselves with microscopes, computers, and a much better understanding of infectious agents. These agents are one of the three sides of the epidemiological triangle (see Figure 3). As defined by the Centers for Disease Control and Prevention (CDC): "The triad consists of an external *agent*, a susceptible *host*, and an *environment* that brings the host and agent together. In this model, disease results from the interaction between the agent and the susceptible host in an environment that supports transmission of the agent from a source to that host" (emphasis in original).⁶⁷ In John

⁶⁵ R. Doll and A. B. Hill, "Smoking and Carcinoma of the Lung: Preliminary Report," *British Medical Journal* 2, no. 4682 (1950): 739–48, <https://doi.org/10.1136/bmj.2.4682.739>.

⁶⁶ "Home Page," Framingham Heart Study, accessed October 11, 2019, <https://www.framinghamheartstudy.org/>.

⁶⁷ Kenrad E. Nelson, Carolyn Masters Williams, and Neil M. H. Graham, *Infectious Disease Epidemiology: Theory and Practice* (Gaithersburg, MD: Aspen Publishers, 2001).

Snow's study, the *agent* of cholera found its way into *hosts* via the *environmental* factors (water sources). As he further studied infectious sources, Snow found that the Broad Street pump had sourced its water from the River Thames, downstream of London and its sewage, which at the time was dumped directly into the river. After examining cholera data from other sources upstream of the city, Snow's conclusions showed that cholera found a suitable environment in water and was transmissible in that medium, and that moving the well source served to contain the problem.

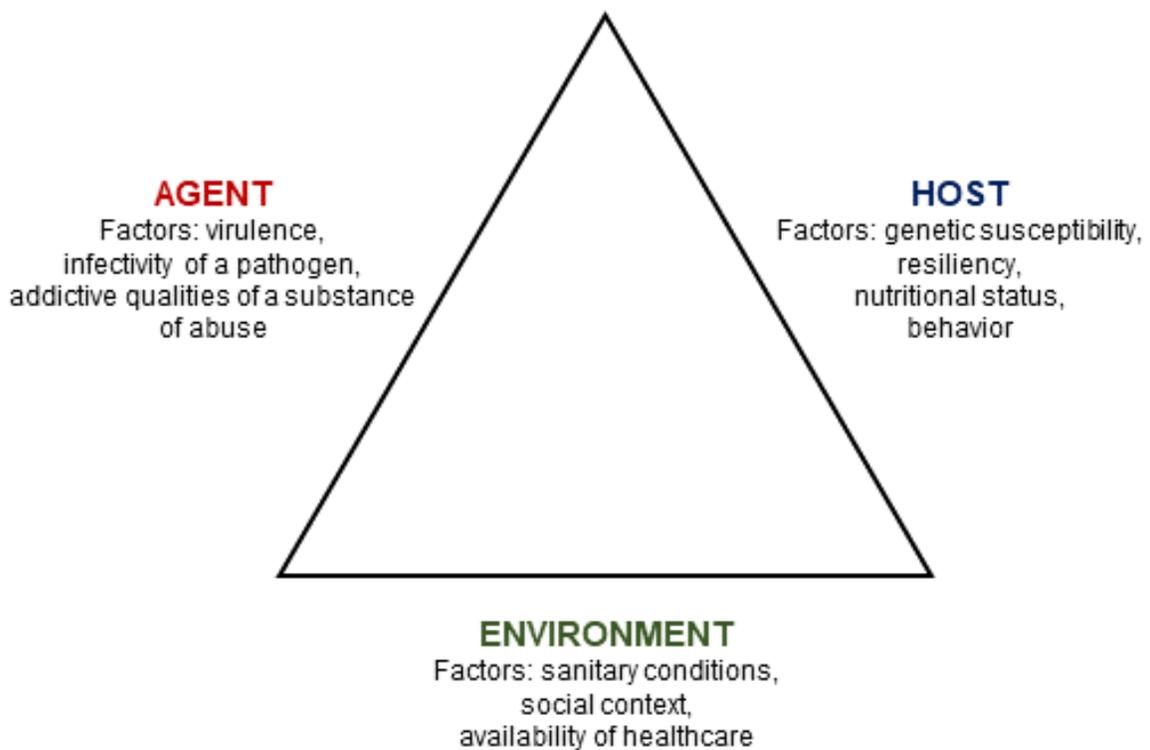


Figure 3. The Epidemiological Triad (or Triangle) of Causal Factors⁶⁸

Similar to the fire triangle (heat, fuel, oxygen) taught to firefighters, this epidemiological or triad requires all three components to create an infection. And, as with the fire triangle, some models add a fourth side, making a tetrahedron. With epidemiology,

⁶⁸ Adapted from Department of Health and Human Services, *Principles of Epidemiology*, 1-52.

this fourth side is a *vector*, such as a flea, mosquito, or other organism, that carries the pathogen, which eventually infects the animal.

Epidemiology can be used to study concepts other than disease. For example, the National Highway Safety Traffic Administration (NHSTA) uses epidemiological methods to study public health threats such as traumatic deaths from car accidents and the effect of seat belts on those numbers. In 2017 alone, NHSTA found that an estimated 14,955 lives were saved by wearing seatbelts, and public information campaigns have touted the importance of these findings.⁶⁹ This agency also collects data on numerous other preventable causes of automobile deaths—alcohol and drug use, distractions, drowsiness, and speeding are all tracked on a state and national basis to identify concerns of public interest and maintain awareness of concerning trends.

In another use of epidemiological data tracking and analysis, the Center for Homeland Defense and Security hosts a database specifically designed to track school shootings. According to its website, “The K-12 School Shooting Database research project is a widely inclusive database that documents each and every instance a gun is brandished, is fired, or a bullet hits school property for any reason, regardless of the number of victims, time, day of the week (e.g., planned attack, accidental, domestic violence, gang-related).”⁷⁰ Given the school gun violence constantly in the news and the political implications of gun laws, an unbiased, factual repository of all data related to these events allows epidemiological trends to be identified and addressed.

These examples are presented to demonstrate the effectiveness of epidemiology in studying topics not traditionally considered health related. Regardless of the environment, the defining epidemiological principles of *where* something is occurring and *what* might be causing it can be examined across a wide range of problem spaces. Within this broad scope of epidemiology, as a science that could be applicable to the misinformation problem, there are key concepts to consider: immunity and susceptibility, cause and

⁶⁹ “Seat Belts,” National Highway Traffic Safety Administration, accessed December 9, 2019, <https://www.nhtsa.gov/risky-driving/seat-belts>.

⁷⁰ “About the Project,” K-12 School Shooting Database, accessed November 23, 2019, <https://www.chds.us/ssdb/about/>.

contraction, spread, and ultimately treatment. Each one has its analog in the discussion of misinformation and how we can reduce or eliminate its negative effects.

C. PREVENTION: IMMUNITY AND SUSCEPTIBILITY

Immunity is generally thought of as a host's first line of defense against a disease agent. At birth, immune systems contain only the defenses they are given in utero, but over time, they grow stronger and smarter with exposure to the many infectious agents in the environment.⁷¹ In fact, there is evidence that the cleaner the environment in which we are raised, the weaker our immune systems will be. According to the U.S. Food and Drug Administration, "The problem with extremely clean environments is that they fail to provide the necessary exposure to germs required to 'educate' the immune system so it can learn to launch its defense responses to infectious organisms."⁷² This theory is known as the "hygiene hypothesis," and it was first introduced by epidemiologist David P. Strachan in the late 1980s. Strachan and others have studied the inverse relationship between instances of allergies and asthma with the cleanliness of environments. In other words, the less we are exposed to a variety of influences, the more at risk we are for infection. It is here where one of the most important comparisons to the world of misinformation can be drawn: Exposure to only a few sources of information is not healthy for any individual.

At an individual level, though, is this important? Does it matter if some people get infected with a virus or with misinformation, as long as they don't infect the rest of us? If we look at this from a broader, societal perspective, are there risks to the general population, and can we prevent them? Counter to the hygiene hypothesis, prevention in the epidemiological realm has relied upon good hygiene in the sense that potentially risky behaviors are identified and eliminated. Rather than expose ourselves to infectious agents, we avoid them or attempt to quell the inconvenience of illness with antibiotics, which have led to antibiotic-resistant bacteria. As hosts try to outsmart the agents, the agents are ever-

⁷¹ A. Katharina Simon, Georg A. Hollander, and Andrew McMichael, "Evolution of the Immune System in Humans from Infancy to Old Age," *Proceedings of the Royal Society B* 282, no. 1821 (2015), <https://doi.org/10.1098/rspb.2014.3085>.

⁷² "Asthma: The Hygiene Hypothesis," U.S. Food and Drug Administration, March 23, 2018, <http://www.fda.gov/vaccines-blood-biologics/consumers-biologics/asthma-hygiene-hypothesis>.

evolving in their quest to survive. If we work to raise awareness of media consumers as a possible solution to misinformation spread, those who are distributing it will likely adjust their tactics in kind to produce a less obvious, more viral product.

Sometimes preventing or reducing susceptibility to disease is as simple as changing minds as to what is and is not a “risky behavior” and how to lower that risk. Influenza is a constant and serious seasonal threat to public health, yet the simplest way to avoid it—frequent handwashing—is not always put into practice. Sexually transmitted diseases, as another example, are largely preventable through safe-sex practices, yet instances have risen 31 percent between 2014 and 2017.⁷³ Awareness campaigns are the usual tactic in changing public perceptions or behaviors, and they have been effective in the case of seatbelts, tobacco, drunk driving, and other risky behaviors identified through epidemiological studies. By extension, the risky behavior of poor “cognitive hygiene” could also see positive results from an awareness campaign designed to help people recognize when their brains may be using heuristics to shortcut critical thinking.⁷⁴

In the mid-1800s, Ignaz Semmelweis and Oliver Wendell Holmes established the first links between handwashing and infant mortality after childbirth.⁷⁵ Their studies paved the way for later advancements in germ spread prevention by the likes of Pasteur and Lister, and now handwashing is considered routine practice in operating rooms and restaurants and around our homes and businesses. If we are now aware that washing our hands can prevent disease, we can be made aware that our own cognitive bias can lead us into risky behaviors such as believing disinformation or misinformation. Establishing this awareness will necessarily require the population to understand and believe that false or misleading information leads to negative consequences that will impact their lives. As with smoking

⁷³ “2018 Sexually Transmitted Disease Surveillance,” Centers for Disease Control and Prevention, August 27, 2019, <https://www.cdc.gov/std/stats18/default.htm>.

⁷⁴ The term *cognitive hygiene* has previously been used in different circles to define different concepts, but broadly it has been related to awareness of negative thoughts and attempts to correct that type of thinking. In the context of this thesis, the term refers to maintaining an awareness of true and false narratives and keeping those from clouding judgment. Thank you, Dr. Lauren Wollman, for coining this phrase.

⁷⁵ World Health Organization, “Historical Perspective on Hand Hygiene in Health Care,” in *Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care* (Geneva: World Health Organization, 2009), <https://www.ncbi.nlm.nih.gov/books/NBK144018/>.

and seatbelts, the measure of success is behavior change, which will be a challenging and likely slow-moving endeavor given the intractability of previously discussed ingroup biases.

Another component approach of disease prevention that has achieved widespread success has been vaccination. A vaccine is designed to trigger an immune response for a given pathogen by introducing antigens into the body. An antigen can be any foreign substance that provokes an immune response, from allergens to bacteria and viruses. When the body recognizes an antigen, specialized white blood cells (B lymphocytes) leave the bone marrow where they are produced and tag the antigen for eventual destruction by T lymphocytes. This immune response produces antibodies programmed to react and destroy the pathogen when it next appears. Building on the hygiene hypothesis, in order to have a defense for a disease or virus, we must be exposed to it in some way. In order to defend against misinformation, then, our brains need to develop misinformation antibodies that react to future misinformation. If the first step in preventing the misinformation virus is simply to be aware that it is out there, then the next step is to recognize it and react when presented—much like the immune system does with its B and T cells.

Individual vaccinations, though, are only as effective as our ability to protect *everyone* in a population, and a recent resurgence in the disease of measles has shown that the anti-vaccination movement has compromised our ability to protect everyone.⁷⁶ In a sense, we are looking at an epidemiological tragedy of the commons, where people have put their own self-interests or fears ahead of the common good. The common good here is known as herd immunity, and its success relies on a large percentage (typically 96–99 percent) of the population receiving the vaccine so that those who are unable to receive it for legitimate health reasons can be protected as well.⁷⁷ Getting back to the epidemiological triangle, herd immunity creates an unfavorable environment in hopes that the pathogen will

⁷⁶ John Bacon, “Measles Cases Hit Second-Highest Level since Elimination in 2000,” *USA Today*, April 1, 2019, <https://www.usatoday.com/story/news/nation/2019/04/01/measles-surge-expands-15-states-closes-record/3331673002/>.

⁷⁷ Pedro Plans-Rubió, “Evaluation of the Establishment of Herd Immunity in the Population by Means of Serological Surveys and Vaccination Coverage,” *Human Vaccines & Immunotherapeutics* 8, no. 2 (2012): 184–88, <https://doi.org/10.4161/hv.18444>.

eventually die out and can no longer affect human hosts. This is how we were able to declare the smallpox virus, a disease that killed 300 million people in the 20th century alone, eradicated in 1980.⁷⁸

Herd immunity can serve as a template for defense against false or misleading news from social media and other sources. Individually, we are under cognitive attack from pathogenic misinformation. By helping individuals recognize these pathogens, we effectively introduce the antigen into their systems, and future exposures will trigger the misinformation antibodies needed to fight off the pathogen. These antibodies will then trigger an immune response, which causes us to think critically and seek out factual information. Then, on a herd level, we begin to build a resistance to the disinformation campaigns and careless spread of misinformation.

D. CAUSE AND CONTRACTION

If prevention efforts are unsuccessful at protecting vulnerable hosts, we could identify an infectious agent and associated outbreak. In the world of healthcare, this means relying on a network of care providers reporting unusual clusters of illness to their local health department and surveilling for further developments. At the national level, the CDC has extensive historical data for comparison and can begin evaluating patients for known and novel diseases. One such instance was the 2009 H1N1 swine flu outbreak. Previously known as Spanish flu, the H1N1 virus was first identified in 1918 and resulted in a pandemic causing the deaths of 50–100 million people—3 to 5 percent of the population at the time.⁷⁹ Thanks in part to early identification and vaccination efforts, the 2009 strain caused only 1,799 fatalities worldwide and was found to have originated in Mexico. While the damage of these two outbreaks differs significantly, it is the efficiency of transmission from person to person that provides the common characteristic of pandemic-level spread. While H1N1 originates in swine, misinformation pandemics have their origins in an initial

⁷⁸ Colette Flight, “Eradicating the Scourge,” British Broadcasting Company, last modified February 17, 2011, http://www.bbc.co.uk/history/british/empire_seapower/smallpox_01.shtml.

⁷⁹ Talha N. Jilani, Radia T. Jamil, and Abdul H. Siddiqui, “H1N1 Influenza (Swine Flu),” in *StatPearls* (Treasure Island, FL: StatPearls Publishing, 2019), <http://www.ncbi.nlm.nih.gov/books/NBK513241/>.

piece of disinformation. Human-to-human transmission is then facilitated by many of the biases discussed in the previous chapter.

The determinants that result in an infection and eventual outbreak vary, but one scientific model often used to understand them in the field of epidemiology is known as causal pies.⁸⁰ Developed as a way of better understanding non-infectious diseases, each piece of a causal pie represents a *component* cause for infection, but all pieces must be present for *sufficient* cause to exist. Once sufficient cause is established (a complete pie), a disease can be defined as having been contracted. As there may be more than one way to contract a disease (e.g., lung cancer from smoking or from working with asbestos), individual patient pies may comprise different pieces, or component causes (see Figure 4). If, however, a single component cause is found to exist in all pies, it is deemed to be a *necessary* cause, without which the disease cannot occur. To draw the parallel as to how humans might initially contract the disease of misinformation from a given piece of disinformation, the pie would be made up of wedges of misinformation, cognitive biases, highly viral content, and compromised immunity. With all of these components in place, the spread of false or misleading content is highly likely.

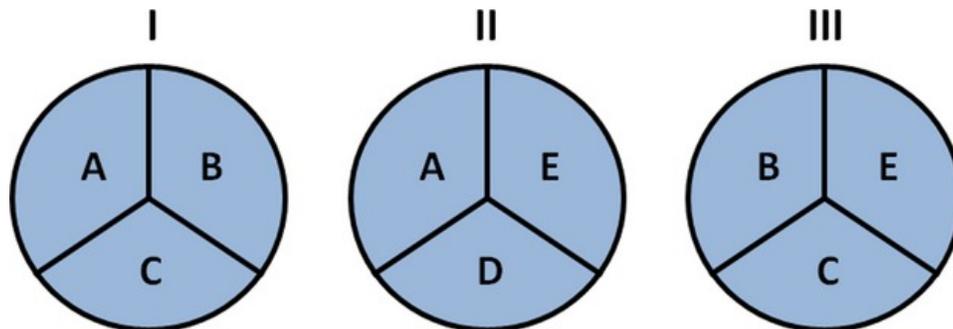


Figure 4. Causal Pies⁸¹

⁸⁰ Kenneth J. Rothman and Sander Greenland, "Causation and Causal Inference in Epidemiology," *American Journal of Public Health* 95, no. S1 (July 2005): S144–50, <https://doi.org/10.2105/AJPH.2004.059204>.

⁸¹ Source: Maarten Wensink, Rudi G. J. Westendorp, and Annette Baudisch, "The Causal Pie Model: An Epidemiological Method Applied to Evolutionary Biology and Ecology," *Ecology and Evolution* 4, no. 10 (May 2014): 1925, <https://doi.org/10.1002/ece3.1074>.

Whether the epidemiological triangle or the causal pie model is used, misinformation is not a problem in and of itself but rather an *agent* waiting for a host and a favorable environment in which to reproduce, or a *component cause* awaiting other contributors to complete the infection. False narratives, both intentional and unintentional, have existed in their inert form throughout history. However, when introduced into a suitable environment, they can become a catalyst for more destructive processes, facilitated by the incredible abilities and sometimes catastrophic shortfalls of the human brain.

E. SPREAD

Having established an understanding of how and when a disease comes to life, the next relevant variables of this epidemiological view are the factors that contribute to disease spread. Returning to the epidemiological triangle, the two sides at play in this case are the agent and the environment—the virulence of a given agent significantly affecting both the probability of initial infection and the ease of spread, and the surrounding environment potentially enhancing the spread. In the communicable disease world, the Ebola virus, which is spread through direct and close contact with infected bodily fluids, is considered one of the most virulent and deadly agents in the world, with a death rate as high as 90 percent. Despite this, Ebola is not as transmissible as other diseases having an airborne component, such as influenza and measles.

With close contact being a common causal component of spread for many infectious processes, the idea of what close contact means in the misinformation space is worthy of examination. If air is the medium most conducive to human disease transmission, then the medium of the modern internet is arguably the most capable of facilitating the spread of dangerous viral misinformation. When disease spreads to humans from pigs, cows, chickens, cats, dogs, mice, mosquitoes, fleas, spores, and—of course—other humans, the epidemiological solution is often to find and break those close contacts. Efforts to disrupt the spread of misinformation should focus on similar actions by taking out a leg of the epidemiological triangle, or cutting out a slice of the causal pie before it is fully baked.

Another way of viewing disease spread is by looking at contagion models. While the deeper complexities of network science are beyond the scope of this thesis, a top-level understanding helps to explain how information, both true and false, can spread through networks of people. Often used in epidemiological studies, contagion models can be represented with mathematical formulas or graphically via a collection of nodes and edges or links, as shown in Figure 5. Essentially, the goal is to show the flow of disease or, in the case of misinformation, ideas or actions from a point of origin to all recipients. Ideological contagion moves in patterns similar to disease, with transmission enhanced by close contact of social groups, virality of information, and potentially, the influence of propaganda.

The notion that ideas need to “contaminate” a population to change beliefs, behaviors, or actions is discussed at length in the book *The Misinformation Age*, in which the authors explore the adaptation of beliefs by networks of scientists.⁸² As seen in the London cholera outbreak, scientific evolution involves an often long and difficult process of proving correlation and, eventually, causation before adaptation takes place. O’Connor and Weatherall use standard node and edge network drawings in this book to represent networks of scientists and their connections to other scientists exploring the same topic. The connections between scientists are valuable in so far as they share information of their findings. If this happens, a scientific community is likely to converge on the correct answer to a given problem. It may only take one contact to change an opinion or adapt a new idea, and this is known as simple contagion. If multiple exposures are necessary, this is known as complex contagion.

⁸² Cailin O’Connor and James Owen Weatherall, *The Misinformation Age: How False Beliefs Spread* (New Haven, CT: Yale University Press, 2019), Kindle.

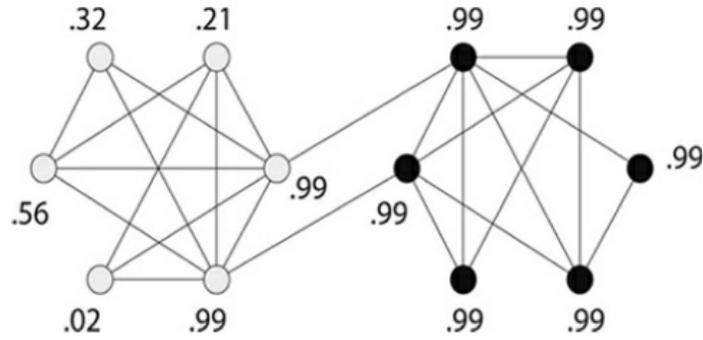


Figure 5. Contagion Network⁸³

Contagion models become increasingly complex as we limit the amount of information sharing or introduce doubt about the validity of the information being shared. Imagine replacing the aforementioned scientists with regular citizens—does limited or homogeneous information help facilitate proper and accurate consensus on important issues? If members of a citizen network are constantly being told the information they are receiving is of questionable accuracy, should we expect anything other than a healthy dose of status quo bias? Quantifying these influencing factors, like assigning a value to the virality of a disease, is a difficult exercise.

Though social networks revolving around work, school, and friends have always existed, the shift in recent years to online social networks has changed the epidemiological environment in which the agent of misinformation thrives. There is evidence that global climate change will affect the spread of disease by creating an environment more favorable to the growth of bacteria and other pathogens. There is also evidence that social media has changed the environment to aid the rapid dissemination of misinformation, which Russian operatives leveraged heavily in the 2016 election. If environment is a necessary and critical side of the basic epidemiological triangle, or an important slice of the causal pie, or an influencing factor in social networks, altering that environment may be one epidemiological key to the disease of misinformation. Influencing that environment, however, presents some challenges of its own.

⁸³ Source: O'Connor and Weatherall, *The Misinformation Age*, loc. 1332.

IV. NINETY-NINE PROBLEMS, BUT FREE SPEECH AIN'T ONE OF THEM

This chapter explores how this new uncertainty of truth plays out in a handful of issues that are polarizing the populace: gun violence, climate change, income inequality, and healthcare. While not the only issues of import to Americans, nor the only ones marked by cognitive bias and misinformation, they are readily available examples of the implications and consequences of both. The four examples also illuminate the complex and complicated relationship of citizen to policymaker in a democracy, and the importance of good information in informed decision making. Within this context, one of the ongoing challenges of policymakers has also been to uphold the integrity of our Constitution, particularly free speech, while effectively deterring the threat of harmful expression in the form of hate speech or attempts to intimidate individuals or groups or to incite violence against them. Where misinformation fits into this free-speech discussion is rapidly evolving and has far-reaching implications on how we address the real and perceived threats of the world. If we cannot rely on the factual accuracy of dialogue about these issues, it will be difficult if not impossible to make meaningful progress.

A. CYBER SECURITY AND FREE SPEECH

The Office of the Director of National Intelligence (DNI) views cyber influence campaigns as a significant threat:

Our adversaries and strategic competitors probably already are looking to the 2020 US elections as an opportunity to advance their interests. More broadly, U.S. adversaries and strategic competitors almost certainly will use online influence operations to try to weaken democratic institutions, undermine U.S. alliances and partnerships, and shape policy outcomes in the United States and elsewhere. We expect our adversaries and strategic competitors to refine their capabilities and add new tactics as they learn from each other's experiences, suggesting the threat landscape could look very different in 2020 and future elections.⁸⁴

⁸⁴ Daniel Coats, *Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Committee* (Washington, DC: Office of the Director of National Intelligence, January 29, 2019), <https://www.dni.gov/files/ODNI/documents/2019-ATA-SFR---SSCI.pdf>.

The DNI's *Threat Assessment* outlines the threat of cyber influence but does little to suggest remedies, leaving social media giants to make their own policy decisions about how, or if, they will combat misinformation in their pipelines. Despite the DNI's concern, Facebook CEO Mark Zuckerberg has refused to pull false or misleading campaign ads from any of the company's social media platforms, citing free-speech concerns.⁸⁵ Why is this a problem? According to the Federal Trade Commission (FTC), "When consumers see or hear an advertisement, whether it's on the Internet, radio or television, or anywhere else, federal law says that ad must be truthful, not misleading, and, when appropriate, backed by scientific evidence."⁸⁶ Zuckerberg's actions seemingly challenge FTC regulations by allowing false political ads on Facebook's platforms, but it turns out they are legal, as political ads are protected under First Amendment rulings. The result is that campaigns can say whatever they want, have the protection of the Supreme Court, and enjoy circulation among a social network topping one billion people. This environment presents itself as one either conducive to positive epidemiological influence or supportive of ever-increasing misinformation contagion.

While Facebook has seemingly green-lighted further spread of misinformation via its policies, the CEO of Twitter, Jack Dorsey, has taken a different stance, announcing on October 30, 2019, via tweet, "We've made the decision to stop all political advertising on Twitter globally. We believe political message reach should be earned, not bought." Is this shutting down free speech or making a corporate decision about whose money Twitter is willing to take? Somewhere in between the two poles of no political ads and no-facts-required would seem a reasonable goal for corporate and U.S. policy, but social media have not found that middle ground domestically.

The hardline free-speech position gets tricky, though, when examining the ways in which other countries' views of freedom of speech differ from ours. For instance, the European Union (EU)'s Court of Justice recently ruled that EU member nations could force

⁸⁵ Cecilia Kang and Mike Isaac, "Defiant Zuckerberg Says Facebook Won't Police Political Speech," *New York Times*, October 17, 2019, <https://www.nytimes.com/2019/10/17/business/zuckerberg-facebook-free-speech.html>.

⁸⁶ "Truth in Advertising," Federal Trade Commission, August 5, 2013, <https://www.ftc.gov/news-events/media-resources/truth-advertising>.

Facebook to remove offensive content worldwide. “The ruling essentially allows one country or region to decide what Internet users around the world can say and what information they can access,” according to Victoria de Posson, senior manager of the Computer and Communications Industry Association, a lobbying organization whose clients include Facebook, Google, and Amazon.⁸⁷ On one side of the coin, and from the perspective of the United States as a nation-state ingroup, this amounts to censorship of the free-speech content that Zuckerberg is trying to defend. “It undermines the long-standing principle that one country does not have the right to impose its laws on speech on another country. It also opens the door to obligations being imposed on internet companies to proactively monitor content and then interpret if it is ‘equivalent’ to content that has been found to be illegal,” according to a Facebook statement on the matter.⁸⁸

From the perspective of other sovereign nations, they are defending themselves from the threat of libel, slander, hate speech, and other misleading or false statements that we as a country have historically defended. Hate speech, for example, is illegal in many countries throughout the world—countries who follow similar democratic principles to the United States. Even in non-democratic Russia, the criminal code states, “Actions aimed at the incitement of hatred or enmity, as well as abasement of dignity of a person or a group of persons on the basis of sex, race, nationality, language, origin, attitude to religion, as well as affiliation to any social group, if these acts have been committed in public or with the use of mass media, shall be punishable.”⁸⁹ Despite these laws, Russia’s state-sponsored efforts in 2016 to exploit these same protected classes in the United States have been deliberate and ongoing—and ironically exploitive of the free-speech loopholes that exist nowhere in Russia. At their worst, this is where disinformation and misinformation efforts from foreign actors threaten to undermine our democracy. Political partisanship and First

⁸⁷ Zachary Evans, “EU Court Rules Member States Can Force Facebook to Remove Content Worldwide,” *National Review*, October 3, 2019, <https://www.nationalreview.com/news/eu-court-rules-member-states-can-force-facebook-to-remove-content-worldwide/>.

⁸⁸ Foo Yun Chee, “Facebook Can Be Forced to Remove Content Worldwide after Landmark EU Court Ruling,” Reuters, October 3, 2019, <https://www.reuters.com/article/us-eu-alphabet-content/facebook-can-be-forced-to-remove-content-worldwide-after-landmark-eu-court-ruling-idUSKBN1WI0QL>.

⁸⁹ “Article 282 Criminal Code,” Legislation Online, accessed October 30, 2019, <https://www.legislationline.org/documents/id/4028>.

Amendment concerns aside, countering these efforts should be of grave concern to all homeland security professionals.

Freedom of speech is a painstakingly forged, double-edged sword that has been wielded by individuals and groups in defending their right to speak their viewpoints and espouse their agendas. Increasingly, though, First Amendment rights have tested the boundaries of what is judicially conferred “free speech” as opposed to words that could incite violence, discrimination, or outright hatred. As misinformation’s presence in the world continues to drive controversial actions by self-promoting leaders, the lines of distinction between true and false have become blurred. Central questions driven by this new reality might be, do certain group narratives threaten free speech, or does free speech threaten certain groups? Perhaps, most importantly, if the speech is false or misleading, and influences or results in decisions that harm oneself or others, should it still be allowed to continue uncorrected, or should it be put into context at a minimum? These are no longer rhetorical questions—our government should mandate exploring the potentially uncomfortable answers.

B. CITIZEN PRIORITIES

The security concerns that drive government action and policy are one set of problems, but American citizens have their own worries, as an April 2019 Gallup poll showed.⁹⁰ At the top of the list are healthcare concerns, followed by federal spending, hunger and homelessness, drug use, guns and violence, and the environment. All of these problems share a common thread. *Facts* are required to address the concerns of public entities and private citizens alike. Facts, not beliefs, should be the bedrock for policy decisions in all matters.

As humans, we have evolved uniquely in our ability not only to reason and solve problems based on facts but also to lie. In the animal world, life is without nuance about fact or fiction—there is only the daily challenge of survival. When a disease hits a population or species, there are no epidemiologists (other than human ones) working on

⁹⁰ Jim Norman, “Healthcare Once Again Tops List of Americans’ Worries,” Gallup, April 1, 2019, <https://news.gallup.com/poll/248159/healthcare-once-again-tops-list-americans-worries.aspx>.

interventions to reduce the impact. If one chimpanzee communicates a threat to her group, there is no back-and-forth discussion about whether the threat is real. Yet we as humans have the cognitive ability to accept or question everything, including evidence-based (factual) information. The ability to create and share fictional information is unique to *homo sapiens*. As author Yuval Noah Harari states, “Fiction has enabled us not merely to imagine things, but to do so collectively. We can weave common myths such as the biblical creation story, the Dreamtime myths of the Aboriginal Australians, and the nationalist myths of modern states.”⁹¹

For the most part, these shared fictions have served us well throughout history, but *science* still needs its place in a functioning democratic society. Without a common belief in certain social constructs, we have no currency, no laws, no borders, no religion—the list goes on. Provided that these myths are understood as woven from the cloth of reality and a general desire for a harmonious existence, negative moral implications are minimal. Moral relativism also indicates that morals themselves involve judgment and can vary from person to person. Facts, however, should not be subject to relativist debates. Facts must be quarantined from opinions and beliefs if we are to understand and fight the battle of the disease of misinformation—a concept enshrined in our own Constitution: “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof.”⁹² This is the constitutional phrase usually associated with the separation of church and state, debated over the years but consistently reaffirmed in the courts. If religion is a system of beliefs, or shared fiction, it should be understood that lawmakers’ beliefs should not enter the debate; rather, they should base decisions on the facts at hand.

This is not to say that over time, facts cannot change nor scientific opinion shift, but we should always strive to operate on as accurate a version of the present body of knowledge as possible. Society used to effectively quarantine individuals with outlandish ideas, but the internet has weakened those defenses, and both legislative and executive

⁹¹ Noah Yuval Harari, *Sapiens* (New York: Harper Perennial, 2018).

⁹² U.S. Const. amend. I.

branch members have been complicit in the spread of these harmful and false narratives.⁹³ The delicate balance, however, between public concerns and the boundaries and expectations placed on legislators in a sociopolitical environment has changed significantly with the last generation. Information and, more specifically, *truth* are now crowdsourced from platforms such as Facebook, Twitter, Instagram, Wikipedia, and other social media. An unintended consequence of Web 2.0, where audience feedback is encouraged, is that nearly all online media have become a two-way discussion with non-experts disputing experts with little to no factual counterarguments.⁹⁴

1. The Gun Debate

Individual citizens might reasonably be expected to act on facts as well, but public susceptibility to misinformation would indicate otherwise. To cite one example, when President Barrack Obama took office, there were concerns shared by many gun owners that he was “coming to take their guns.” These worries were only heightened as the 44th president’s public concern for gun violence increased in the wake of some of the worst mass shootings in history. In an almost stock-market-like phenomenon, gun sales skyrocketed on a simple perception or fear of tighter gun laws, despite no statement ever by Obama that he intended to confiscate weapons. It was President Donald Trump, however, who actually threatened such action, which has yet to take place. “I like taking guns away early,” Trump said. “Take the guns first, go through due process second.”⁹⁵ During the eight years of the Obama administration, gun and ammunition sales topped the

⁹³ Brett Samuels, “Trump Praises Kennedy after Chuck Todd Links Senator’s Ukraine Remarks to Putin,” *The Hill*, December 2, 2019, <https://thehill.com/homenews/administration/472602-trump-praises-kennedy-after-chuck-todd-links-senators-ukraine-remarks>.

⁹⁴ Laura Sydell, “On the Internet, Is Everyone an Expert?,” National Public Radio, October 26, 2007, <https://www.npr.org/templates/story/story.php?storyId=15671312>.

⁹⁵ David Jackson, Dierdre Shesgreen, and Nicole Gaudiano, “Trump Says Take Guns First and Worry about ‘Due Process Second’ in White House Gun Meeting,” *USA Today*, February 28, 2018, <https://www.usatoday.com/story/news/politics/2018/02/28/trump-says-take-guns-first-and-worry-due-process-second-white-house-gun-meeting/381145002/>.

same combined revenues of the 16 years of the Clinton and Bush (Jr.) administrations, yet since Donald Trump's election, sales have been on a steady decline.⁹⁶

To say these trends are entirely based on fear and misinformation is speculative, but it is illustrative of how these factors can come into play when discussing guns and gun violence as an issue of concern to American citizens. Getting to the facts of gun violence will require compiling historical data of epidemiological trends and separating correlation from causation. Seemingly, this would be an important and reasonable use of funding from the CDC or the National Institutes of Health, but a law known as the Dickey Amendment, passed in 1996, made it illegal to fund research on guns; thus, the data needed to explore solutions do not exist. In 2018, Congress lifted this ban, but no research programs have been funded since, leading to carefully constructed narratives around the Second Amendment. Interpretations of what exactly a “well-regulated militia” is and whether certain individuals should or should not have their right to bear arms infringed have been debated in the courts and in public discourse for years. Some have overstated the role of “assault weapons,” which were involved in only 4 percent of gun homicides, according to 2017 statistics from the Federal Bureau of Investigation.⁹⁷ Others have falsely assigned a blanket correlation between mental illness and the likelihood of committing gun violence, despite the fact that individuals with mental illness are far less likely to commit violent crimes than the general population and far more likely to be the victims of said crimes.⁹⁸ Eliminating these types of false narratives, whether they are intentional or not, is a critical first step to researching fact-based solutions to gun violence.⁹⁹ Misinformation and selective data marred by confirmation bias exist on both sides of this debate, and the problem will continue if left unchecked.

⁹⁶ Christina Silva, “Gun Sales Down after Obama Boom Years,” *Newsweek*, March 23, 2017, <https://www.newsweek.com/gun-sales-down-after-obama-boom-years-573170>.

⁹⁷ “Expanded Homicide Data Table 11,” Federal Bureau of Investigation, accessed November 18, 2019, <https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/tables/expanded-homicide-data-table-11.xls>.

⁹⁸ Joel Miller, “Gun Violence and Mental Illness: Myths and Evidence-Based Facts,” American Mental Health Counselors Association, October 3, 2017, <https://www.amhca.org/blogs/joel-miller/2017/10/03/gun-violence-and-mental-illnessmyths-and-evidence-based-facts>.

⁹⁹ Matt Laslo, “The CDC Could Totally Study Gun Violence—It Just Needs Money,” *Wired*, August 7, 2019, <https://www.wired.com/story/cdc-gun-violence-research-money/>.

2. Climate Change

To examine another issue of concern from the Gallup poll, climate change discussion is heating up and often debated along political lines. With 97 percent of actively publishing climate scientists agreeing that climate-warming trends are anthropogenic, there is again no room for belief-based policy on this front.¹⁰⁰ Yet, in a Pew Research Center poll, only 59 percent of Americans see this as a major threat.¹⁰¹ So how or why do people take a denialist perspective on what is scientifically considered an existential threat to the entire planet? The political demographic splits are compelling in this case, showing that 72 percent of Republicans feel that policies to help the climate or environment either have no impact or do more harm than good, compared with only 32 percent of Democrats.

Adding an additional demographic layer to these same groups shows that knowledge can influence beliefs on the topic, with 93 percent of Democrats with a higher level of knowledge about science believing that climate change is mostly due to human activity, compared with 49 percent with low science knowledge. Evidence suggests, though, that those who identify as Republican are no more likely to believe in the science even if they have a higher level of knowledge, suggesting that party affiliation may matter more than scientific facts. This is a strong example of how the power of the ingroup can have a significant impact on decision making, outweighing the importance of acting on facts and leading to a poor and potentially harmful choice based on confirmation bias.¹⁰² The higher level of knowledge, in this case, equates to boosting host immunity in the agent of misinformation. Education on climate science can serve as a vaccine of sorts, provided people are willing to be inoculated.

The enormity of the climate change issue also makes it subject to status quo bias, with some people choosing the known and comfortable concept that our planet will still be here tomorrow rather than imagining the consequences of their actions or inactions a

¹⁰⁰ Silva, “Gun Sales Down after Obama Boom Years.”

¹⁰¹ Cary Funk and Brian Kennedy, “How Americans See Climate Change in 5 Charts,” *Fact Tank* (blog), April 19, 2019, <https://www.pewresearch.org/fact-tank/2019/04/19/how-americans-see-climate-change-in-5-charts/>.

¹⁰² Funk and Kennedy.

century from now. The cognitive dissonance that looms over such choices supports the denial of scientific consensus and the adaptation of beliefs based on misinformation.

3. Income Inequality

When politics and personal bias trump reason and truth, it becomes extremely difficult to enact positive, productive policy. Similar partisan splits have been accused of driving everything from healthcare to tax policy, with the impacts of increasing income inequality being stubbornly debated from both ends of the political spectrum. In a 2018 op-ed piece, economist Kaushik Basu states, “Powerful voices in both rich and developing countries—and, tragically, even among the misinformed poor—claim that current income disparities are fair because they are a result of free markets.”¹⁰³

Related to Basu’s piece, a poll conducted by the Harvard Kennedy School’s Institute of Politics found that more Democrats than Republicans believe that the income gap is the “result of factors outside one’s control.”¹⁰⁴ Meanwhile, Republicans are more likely to believe that greater economic success is driven by “certain people working hard and making smart choices,” according to the survey.¹⁰⁵ Both of these positions are vague and lacking in meaningful policy solutions. Rather than dealing in blame and self-supporting misinformation, as both statements do, the broader socioeconomic questions of income distribution and redistribution point to a need for discussion and education in society of exactly where taxes come from, where they go, and the extent to which the successes of billionaires fuel the economic fortunes of the average worker. Misinformation muddies these waters tremendously and distracts from the facts necessary to implement comprehensive economic policy solutions.

John Powell, a professor of law at UC Berkeley, suggests a number of actions based on data and sound economic policy. These recommendations include increasing the

¹⁰³ Kaushik Basu, “The Ethics of Reducing Inequality,” Brookings, March 30, 2018, <https://www.brookings.edu/opinions/the-ethics-of-reducing-inequality/>.

¹⁰⁴ “Political Issue: Wealth Gap,” Institute of Politics at Harvard University, accessed December 6, 2019, <https://iop.harvard.edu/political-issue-wealth-gap>.

¹⁰⁵ Institute of Politics.

minimum wage, expanding the earned income tax credit, making the tax code more progressive, investing in education, and helping to build assets for working families. According to Powell, “Higher levels of racial residential segregation within a metropolitan region are strongly correlated with significantly reduced levels of intergenerational upward mobility for all residents of that area.”¹⁰⁶ These are observations based on facts and data trends and, if properly communicated, present an opportunity to boost herd immunity to misinformation about people not working hard enough or free-market forces creating an ever-widening income gap. As citizens begin to understand the economic forces at work, they are likely to charge their political representatives with implementing some of the proposed solutions.

4. Healthcare

Healthcare, a perennial concern among Americans, is not immune from the effects of false and misleading information aimed to garner public support of pseudoscientific trends. Most visible of these has been ongoing efforts to raise unproven connections between vaccines and health problems such as autism. Misinformation on the measles, mumps, and rubella (MMR) vaccine started with a flawed study conducted by now-discredited British physician Andrew Wakefield, and the movement gained enough traction to cause a significant decrease in measles vaccinations, with a correlating rise in measles cases soon thereafter.¹⁰⁷

The exploding popularity of cannabidiol (CBD) oil has also been driven by manufacturers’ non-scientific claims of cures for a long list of ailments from insomnia to cancer. Currently, the only medically approved use is as an anti-seizure application for epilepsy patients.¹⁰⁸ Outside of that, CBD dosages are unregulated and inconsistent.

¹⁰⁶ John A. Powell, “Fed Up with Inequality? Six Policies for a Fair and Inclusive Society,” Huffington Post, September 9, 2014, https://www.huffpost.com/entry/fed-up-with-inequality-si_b_5790852.

¹⁰⁷ T. S. Sathyanarayana Rao and Chittaranjan Andrade, “The MMR Vaccine and Autism: Sensation, Refutation, Retraction, and Fraud,” *Indian Journal of Psychiatry* 53, no. 2 (April 2011): 95–96, <https://doi.org/10.4103/0019-5545.82529>.

¹⁰⁸ “What You Need to Know (and What We’re Working to Find Out) about Products Containing Cannabis or Cannabis-Derived Compounds, Including CBD,” U.S. Food and Drug Administration, November 25, 2019, <http://www.fda.gov/consumers/consumer-updates/what-you-need-know-and-what-were-working-find-out-about-products-containing-cannabis-or-cannabis>.

“Consumers are participating in one of the largest uncontrolled clinical trials in history, and no one really knows what it is they’re taking,” says Pal Pacher, an investigator at the National Institutes of Health and president of the International Cannabinoid Research Society.¹⁰⁹ Contrasting CBD and the MMR vaccine stories, we have seen a widespread adaptation of an unproven substance in the case of CBD and a widespread denial of the scientifically and historically proven benefits of a vaccine that eliminated a deadly disease almost 20 years ago. In both cases, misinformation has had a significant influence in the adaptation of false beliefs.

The broader discussion and debate of national health care are also likely being cognitively influenced by the ambiguity effect and general misinformation about whether the existing Affordable Care Act (ACA) should be revised or rejected. The ambiguity effect makes it difficult for citizens and legislators to get behind an idea with a relatively unknown outcome, as discussed in Chapter II. Meanwhile, political candidates even within the same party continue to argue over the best course of action for the country—and how to pay for it. As Reisman points out, “While numerous studies show that uninsured rates have decreased sharply across the country under the ACA, and while Americans’ favorable opinion of health care reform has been rising steadily, the law remains as politically divisive as ever.”¹¹⁰ With the ACA as the law of the land for nearly 10 years, data—in another word, *facts*—exist regarding where it has been effective and where it falls short. Over those years, attempts to repeal it have been nearly constant, yet a 2019 Kaiser Family Foundation poll indicates that most Americans are not interested in dismantling the ACA.¹¹¹

¹⁰⁹ David H. Freedman Freeman, “Pop Culture Says CBD Cures Everything—Here’s What Scientists Say,” *Newsweek*, August 29, 2019, <https://www.newsweek.com/2019/09/06/cbd-oil-miracle-drug-science-1456629.html>.

¹¹⁰ Miriam Reisman, “The Affordable Care Act, Five Years Later: Policies, Progress, and Politics,” *Pharmacy and Therapeutics* 40, no. 9 (September 2015): 575–600.

¹¹¹ Ashley Kirzinger, Bryan Wu, and Mollyann Brodie, “KFF Health Tracking Poll – April 2019: Surprise Medical Bills and Public’s View of the Supreme Court and Continuing Protections for People with Pre-existing Conditions,” Henry J. Kaiser Family Foundation, April 24, 2019, <https://www.kff.org/health-costs/poll-finding/kff-health-tracking-poll-april-2019/>.

The disconnect between legislators and their constituents is a common roadblock to policy reform in each of the examples discussed. The majority of American citizens have polled in support of new gun laws, action on climate change, ongoing universal healthcare, and tax laws to benefit the middle class.¹¹² Still, deep divisions exist among Americans as to which policy actions they support, and there is rising fear as to whether government officials are acting in the interest of citizens or under the influence of self-serving forces. A 2018 poll conducted by Chapman University found that 74 percent of a random sample of 1,190 American adults were either “afraid” or “very afraid” of corruption of government officials—the number one fear. By comparison, this study found that death of a loved one was only the sixth greatest concern, cited by 56 percent of respondents.

With people more afraid of our government than of losing loved ones, there should be cause for concern. Our collective fears—whether they are about loss of freedoms, loss of life, or loss of control—create an environment in which misinformation can thrive and leverage cognitive dissonance and bias to achieve ends not in our best interests. This type of heuristic thinking, conversely, is fed by misinformation and becomes self-sustaining. Democracies fail because citizens do not take their responsibilities seriously, and Americans are at a point where Jefferson’s words are particularly poignant. What are we doing to be well-informed? Can we be trusted with our government? The modern age hands us the ability to express our thoughts as online experts with no requirements for subject expertise or source checks. When everyone has become an expert, nobody is an expert, and free speech can easily become false speech packaged as truth. Armed with an awareness of these new realities, care must be taken by all to remain properly and accurately informed,

¹¹² Ashley Turner, “Most Americans Don’t Want Congress to Overhaul Health Care, Despite ‘Medicare for All’ Plans, GOP Push to Repeal Obamacare,” CNBC, April 25, 2019, <https://www.cnn.com/2019/04/24/most-americans-dont-want-congress-overhaul-health-care-system-obamacare.html>; Brady Dennis, Steven Mufson, and Scott Clement, “Americans Increasingly See Climate Change as a Crisis, Poll Shows,” *Washington Post*, September 13, 2019, https://www.washingtonpost.com/climate-environment/americans-increasingly-see-climate-change-as-a-crisis-poll-shows/2019/09/12/74234db0-cd2a-11e9-87fa-8501a456c003_story.html; Dana Blanton, “Fox News Poll: Voters Favor Gun Measures, Doubt Congress Will Act,” *Fox News*, March 25, 2018, <http://www.foxnews.com/politics/2018/03/25/fox-news-poll-voters-favor-gun-measures-doubt-congress-will-act.html>; Matthew Sheffield, “Poll: A Majority of Americans Support Raising the Top Tax Rate to 70 Percent,” *The Hill*, January 15, 2019, <https://thehill.com/hilltv/what-americans-thinking/425422-a-majority-of-americans-support-raising-the-top-tax-rate-to-70>.

for a misinformed citizenry cannot make the informed decision upon which democracy depends.

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V. FIGHTING THE EPIDEMIC

Those who can make you believe absurdities can make you commit atrocities.

—Voltaire

The previous chapters of this thesis have laid the foundation for understanding and addressing the problem of misinformation in our society, with a focus on democratic principles plagued by false, misleading, or incomplete information. Through the epidemiological lens, the evidence presented points to intervention via prevention efforts as opposed to treatment once the disease has taken hold. Like some chronic but treatable diseases, it is far preferable to avoid misinformation infections in the first place than to treat the resulting symptoms over the long term. These societal symptoms may include chronic confirmation bias from a lack of exposure to different ideas and viewpoints, worsening polarization of self-interested ingroups, and a rapidly diminishing ability to find common ground to further the shared interests of all members of society.

To complete the analogy, we return to the epidemiological triangle: agent, host, environment—all three must be present for disease to take hold and spread, and the removal or compromise of any of these elements will help *prevent* infection and spread. This final chapter shows the metaphorical sides of the triangle upon which these misinformation prevention efforts could be focused, and the interdependencies that can be exploited.

A. AGENT INTERVENTION

The cause of a disease begins with the agent, or the producer of original misinformation. Several years ago, this was primarily a foreign operator looking to deceive or manipulate people in our country. While these attacks continue, domestic sources of misinformation fueled by political goals are also on the rise. Agents will always control the message and can release it when and where they want. Therefore, until there is a willingness to enact legislation prohibiting false claims on all fronts—not just commercial products covered by FTC rules—the agents of misinformation may continue producing and

adapting their message to the most vulnerable hosts with the lowest immunity to this misinformation contagion.

Debunking false narratives is another way of attacking the host at the source. Cook and Lewandowsky have produced a set of guidelines called *The Debunking Handbook* in which they offer an anatomy of an effective debunking.¹¹³ Their process involves four basic components:

1. Present key facts to refute the myth in question
2. Provide explicit warnings prior to mentioning any misinformation
3. Fill the cognitive hole left by refutation of the myth with an alternative explanation to the myth
4. Provide graphics to illustrate the core facts¹¹⁴

A simple myth is more cognitively attractive than a complicated explanation, so care must be taken to stick to the basics and avoid the cognitive heuristic shortcuts that may perpetuate misinformation spread. Chan et al. performed a larger meta-analysis of debunking techniques, largely concurring with the findings of *The Debunking Handbook*. Their findings support the assertions of this thesis as they pertain to the threat of misinformation: “Because misinformation can lead to poor decisions about consequential matters and is persistent and difficult to correct, debunking it is an important scientific and public-policy goal.”¹¹⁵

As in the epidemiological world, the misinformation agent is codependent on its environment, so making the environment unconducive to the survival of the agent is an indirect method of severing the agent’s leg of the triangle.

¹¹³ Cook and Lewandowsky, *The Debunking Handbook*.

¹¹⁴ Cook and Lewandowsky.

¹¹⁵ Man-Pui Sally Chan et al., “Debunking: A Meta-Analysis of the Psychological Efficacy of Messages Countering Misinformation,” *Psychological Science* 28, no. 11 (2017), <https://doi.org/10.1177/0956797617714579>.

B. ENVIRONMENTAL INTERVENTION

Of the three epidemiological intervention arenas, the environment has become the critical force multiplier in recent years. Misinformation would have been much more difficult to propagate before the internet existed. Previously, foreign operatives might have tried to drop leaflets to sow division and discourage democracy in a country they were trying to influence, but now the “leaflets” are digital and spread worldwide in an instant. From a homeland security perspective, the internet has facilitated asymmetric warfare on a new battlefield of our own design. Our enemies no longer need to match our firepower in the air or on the ground. Instead of “a few good men,” they can cause considerable damage with a few good hackers who might cause catastrophic and immediate damage through something like a power grid attack or the more insidious, long-term infection of our collective cognition. As such, an unwillingness to regulate social media and protect vulnerable populations from misinformation is one of the biggest contributing factors to the spread of false narratives.

As discussed in Chapter IV, stepping on the political third rail of constitutional free speech requires a significant commitment to the idea that some forms of speech are more damaging to a society and democracy than are the consequences of prohibiting their distribution. The appropriate place to draw that line for misinformation is still unclear, but without meaningful non-partisan dialogue as to how we might regulate social media platforms, the epidemiological environment will remain highly conducive to misinformation spread. Policymakers must pressure social media platforms to continue to focus their efforts on the following actions:

- Provide clear indicators of stories with factual inaccuracies
- Examine algorithms designed to reinforce confirmation bias and counter them with alternative points of view
- Discuss free speech—and whether we are willing to accept or choose to fight weaponized false narratives

Tied in with concerns about social media is the integrity of traditional media in the digital realm. “Advertising revenue that used to go to quality journalism is now captured

by big tech intermediaries, and some of that money now goes to dishonest, low-quality, and fraudulent content,” remarks Matt Stoller, a fellow at the Open Markets Institute.¹¹⁶ If this content cannot or will not be stopped, one proposal is to tax the ad revenue it generates and create a an endowment to fund a resurgence of independent and local journalism.¹¹⁷ In their report *Beyond Fixing Facebook*, Karr and Aaron suggest that a 2 percent tax on these revenues could provide \$2 billion per year to support better quality journalism and fact-checking without having to regulate content by legislative means.¹¹⁸

C. HOST INTERVENTION

The cure starts with a realization of what the cause is. We learned that germs can be stopped by handwashing, so we started washing our hands. We learned that seatbelts saved lives. We understand now causal links between smoking and numerous health issues. If people understand that misinformation spreads because we do not question it, maybe they will pay more attention to it and increase their immunities. With these historical examples of public information campaigns as a guideline for changing societal attitudes toward unhealthy behavior, policymakers should consider this type of campaign to raise awareness and attempt to counter the power of confirmation bias. One such campaign was launched in Ireland in March 2019, encouraging people to “Be Media Smart.”¹¹⁹ The campaign provides a simple message—“Stop. Think. Check.”—and drives viewers to a website for more information. Understanding that certain groups of the population will be reluctant to put forth the effort to increase their media literacy, efforts to encourage those who *are* willing to stop, think, and check their information may yield positive results. The hope would be to create a tipping point where it is no longer socially acceptable to spread

¹¹⁶ Matt Stoller, “Tech Companies Are Destroying Democracy and the Free Press,” *New York Times*, October 17, 2019, <https://www.nytimes.com/2019/10/17/opinion/tech-monopoly-democracy-journalism.html>.

¹¹⁷ Timothy Carr, “Free Press Calls for Tax on Targeted Ads to Fund Civic-Minded Journalism,” Free Press, February 26, 2019, <https://www.freepress.net/news/press-releases/free-press-calls-tax-targeted-ads-fund-civic-minded-journalism>.

¹¹⁸ Timothy Karr and Craig Aaron, *Beyond Fixing Facebook* (Free Press, February 2019), 8, https://www.freepress.net/sites/default/files/2019-02/Beyond-Fixing-Facebook-Final_0.pdf.

¹¹⁹ “Be Media Smart: New Public Awareness Campaign Launched,” Web Wise, accessed November 27, 2019, <https://www.webwise.ie/trending/be-media-smart-new-public-awareness-campaign-launched/>.

false narratives, essentially creating a stigma for those who carelessly spread misinformation.

Host susceptibility and the interaction of this variable with the virulence of the agent presents the greatest opportunity for successfully using an epidemiological lens to better understand and potentially intervene with the problem. We cannot always control the agent who is releasing information pathogens or the environment that helps them thrive, but we can boost immunity in the host brain by understanding and leveraging the cognitive biases already discussed. Figure 6 is a quadrant chart graphing misinformation virality versus immunity.

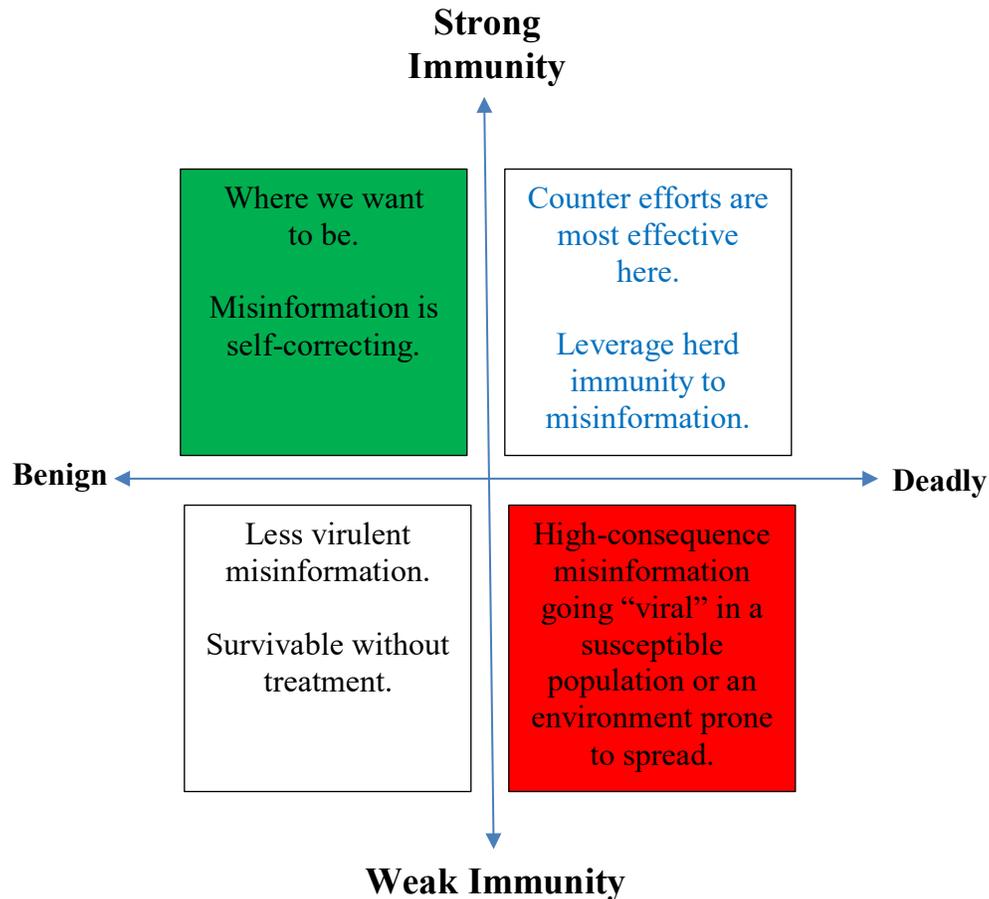


Figure 6. Misinformation and Consequence

Quadrant 1 (upper left) is our best possible scenario: a relatively benign misinformation pathogen is released into the environment, and the population has a strong immunity to it. This scenario is often because the information itself is implausible, but it could also be that the population is better-educated and armed with critical-thinking skills. Without these immunities, even a benign conspiracy theory, such as a claim that someone was born in another country, may gain traction in the population. This is the domain of Quadrant 3 (lower left), where misinformation may have a minor impact in the short-term but has the potential to wear down immunity via the continued influence effect and other cognitive biases. Quadrant 2 is where counter-measures to misinformation are most likely to have a meaningful effect. Imagine that a highly viral piece of information—usually one that has an element of truth or sounds very plausible—gets released into the world. For the portion of a population with high immunity and an inherent suspicion, critical-thinking skills may defeat any attempts to deceive, but without these immunities, the scenario moves to the most dangerous, Quadrant 4, where misinformation is actually successful at gaining belief and acceptance. Once this happens, we know that dislodging it from the brain is very difficult.

Classification or categorization of misinformation incidences into these quadrants can help prioritize more dangerous threats to the goal of clean and accurate public information. In terms of policy, this means we should boost individual and herd immunity through education and awareness campaigns. In a world where nothing is more than a shout out to Siri or Alexa away, we have likely become cognitively lazy, employing heuristics more often than we are aware and accepting digital representations of what is true or false, rather than exploring on our own and building out immunities through critical thinking and education.

Democracy, according to psychologist Fathali Moghaddam, includes “rule by leaders who are elected by a society’s full adult population and who are removable through regular popular elections, and with independent legislative and judicial checks, protection

for minority rights, and freedom of speech and movement.”¹²⁰ We exist at a time in history when every one of these tenets have been thrown into question by a lack of reliable and factual information. Legitimate elections are held, yet false accusations of voter fraud gain traction. Constitutionally established, independent legislative and judicial processes are followed yet are framed as illegitimate attacks on the party in power. Protection for minority rights is endangered when purposeful misinformation campaigns exploit differences in race, religion, and sexual orientation, among other issues. And freedom of speech is often used as a cudgel to spread false narratives that limit the freedom of movement of our fellow humans.

Notably, neither this definition of democracy nor any other speaks to a “majority rules” ethic where those elected and the citizens who voted for them get to impose their will on those who voted for the candidate who lost. Democracy and America as we know it are missing a key antidote to counter the attempts to polarize our people: the recognition of a common pathway to good for all, not just the party in power. With this goal in mind, we can begin to slow and eventually stop the viral threat of misinformation.

¹²⁰ Fathali M. Moghaddam, *The Psychology of Democracy* (Washington, DC: American Psychological Association, 2016).

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