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COVID-19 Vaccine Hesitancy and (Mis)perception of Risk

Joanna K. Sax, JD PhD[†]

This Article tackles the critical problem of COVID-19 vaccine hesitancy and provides a normative framework for legal policies to address such hesitancy in the ongoing pandemic. The foundation of this Article rests in decision-making theories that allow policymakers to understand individual misperception of risk as compared to evidence-based assessment of risk. Vaccine-hesitant individuals assign a high risk to the COVID-19 vaccine and a low risk to the disease—a perception that is disconnected from the science. The backbone of this Article is the timeline of the COVID-19 pandemic and the underlying science of the disease and vaccines. The timeline provides a factual background to demonstrate how vaccine hesitancy to the COVID-19 vaccine emerged. The instant pandemic also demonstrates changes in how individuals see themselves in society, receive information, and are persuaded by economic forces. This Article combines the individual's decision-making process with modern day variables to suggest interventions that can undo anti-vaccine damage. While the novelty of the normative framework provided herein is instructive for current COVID-19 vaccine hesitancy issues, this framework can be applied to other areas in which individual's perceptions of risk are disconnected from evidence-based assessment of risk.

I. INTRODUCTION

The variations in non-expert responses to the COVID-19 pandemic are startling examples of the problem between the public's perception of risk and evidence-based assessment of risk. Members of the public inappropriately assign risk measurements in numerous areas capable of being assessed by scientists. One example is vaccines—individuals are increasingly resisting vaccines and assigning a high-risk to the vaccines while the evidence-based assessment of risk is low. This is problematic. Although usually the short-term consequences of individuals inappropriately assigning risk is tolerable, this is not so with a pandemic; the short-term consequences of individuals inappropriately assigning a high risk to the COVID-19 vaccine is catastrophic.[1]

[†]Professor Joanna K. Sax is the E. Donald Shapiro Professor of Law at California Western School of Law in San Diego, CA. Professor Sax is grateful to Nicole Nazari for her helpful research assistance. In addition, Professor Sax thanks the peer reviewers for their insightful comments and the editorial team at the American Journal of Law & Medicine. The author can be contacted at jsax@cwsl.edu

[1]The long-term consequences of the inappropriate assignments of risk are also acute, such as with climate change. *See* Obama White House Archives, *A Historic Commitment to Protecting the Environment and Addressing the Impacts of Climate Change*, (last visited Feb. 2, 2022), https://obamawhitehouse.archives.gov/the-record/climate

Individual perceptions of risk are well-studied, although no single theory or doctrine easily explains the complicated decision-making process. This Article draws on four main decision-making theories to model the disconnect between individual misperceptions of risk and evidence-based assessment of risk as it applies to the COVID-19 vaccine. The four theories are: ambiguity, affect, cultural cognition, and heuristics/dual process. These theories explain how people make decisions and perceive risk. Importantly, none of these theories fully explain decision-making processes. Thus, by discussing multiple theories, a clearer picture emerges to help understand why some people—and some political leaders—inappropriately assign risk to COVID-19 and the COVID-19 vaccine, the result of which leads to dire consequences.

This inappropriate assignment of risk that leads some people—including political leaders—to underestimate the risk of COVID-19, is a long-time coming. Decades of anti-science sentiment, distrust of scientists, and a decrease in understanding science has wreaked havoc on the ability of scientists to effectively communicate the risk of COVID-19 and the related safety of the vaccines. Even when the facts are presented, including an evidence-based assessment of risk related to COVID-19 and the COVID-19 vaccine, the public's ability to align their perceptions of risk with evidence-based assessment of risk has been so undermined that it is extremely difficult to overcome decades of learned behavior leading to the exhibited inappropriate assignment of risk.

This Article tackles the important problem of re-aligning the public's perception of risk with evidence-based assessment of risk. This is not an easy task. To do this, Part II provides an overview of the timeline of the COVID-19 pandemic. This timeline will catalogue what leaders knew when and what interventions were or were not implemented. This not only sets the stage for the ensuing discussion of vaccine hesitancy, but it also provides a useful tool so that future autopsies of this pandemic can reference a timeline. Part III explains the science of COVID-19 vaccine development. The scientific component is critical to unpacking whether the facts even matter for the public's assessment/perception of risk. In addition, it provides context for the ability of scientists to assign evidence-based assessment(s) of risk. Part IV provides an overview of four main decision-making theories: ambiguity, affect, cultural cognition and heuristics/dual process theory. These decision-making theories are well-described in legal and social science literature. Importantly, these theories have not answered the question posed in this Article, thus there is value in utilizing them in this particular way. Part V analyzes why the decades long war against science successfully undermined the public's ability to appropriately assign risk. This part also incorporates the timeline from Part II to demonstrate how the messaging to the public is/was a driver of COVID-19 vaccine hesitancy. This Part includes a discussion of three important variables that contribute to individual misperception of risk: the rise of individualism, the role of misinformation on the internet, and economic incentives to promote misinformation. These variables contribute to an individual's inability to appropriately assign risk. In Part VI, this Article provides a normative framework for utilizing the decision-making theories and these three variables to propose ways to allow individuals to appropriately assign risk. Many in the public would rather hear that we will get back to business as usual, even as experts share the data that indicates we are nowhere near the end of this pandemic. The normative framework provides an important mechanism to unpack vaccine hesitancy and the larger problem of individual misperception of risk.

[https://perma.cc/LJY8-LNN8] ("President Obama believes that no challenge poses a greater threat to our children, our planet, and future generations than climate change[.]").

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Being able to close the divide between individual misperception of risk and evidence-based assessment of risk is a matter of life and death. This is true for other topics as well, such as climate change, smoking, and food systems, but the immediate impact of those problems is not as tangible. COVID-19 and its effects are tangible. While legal regulations consider risk assessment, this Article takes a different tactic that is important for implementation of legal policies; that is, understanding and re-aligning individual's perceptions of risk so when legal regulations are implemented they are more likely to be accepted by individuals. This pandemic presents an opportunity to re-align the public's perception of risk with an evidence-assessment of risk—this is important not only for the current pandemic, but for other critical problems, such as addressing climate change.

II. COVID-19 TIMELINE

This Part provides an overview of the COVID-19 pandemic timeline. While COVID-19 is a global pandemic, this Article largely focuses on the United States ("U.S.") and its response, especially as it relates to vaccine hesitancy. Thus, while the below describes some global events, as the timeline progresses, it narrows down to events in the U.S. This Part demonstrates that the messaging to the public set up the problem addressed in this Article: that some individuals inappropriately assign a high risk to the COVID-19 vaccine. In other words, the mishandling of the COVID-19 pandemic—from the very beginning—contributed to COVID-19 vaccine hesitancy. Unpacking these facts and demonstrating how they contribute to vaccine hesitancy will then be discussed in Parts V and VI.

The novel coronavirus likely started to infect humans and begin its spread in October or November 2019.[2] In mid-November 2019 or early December 2019, the first patient with COVID-19 was diagnosed.[3] In mid to late December 2019, the virus that led to hospitalizations in China was sequenced and found to be an unknown beta-CoV strain, with an indicator of bat-origin CoVs.[4] In late December 2019, Dr. Li, an ophthalmologist at Wuhan Central Hospital, started to warn other doctors about the novel coronavirus.[5] Dr. Li was severely punished by the Chinese government. He also later died of COVID-19. The Wuhan Municipal Health Commission issued a statement that there was no obvious human-to-human transmission and their communications with the World Health

[2]The term "novel coronavirus" is used to denote the virus that causes the disease COVID-19. The scientific term for this coronavirus is "SARS-Co-V-2." The term "COVID-19" denotes the disease caused by the coronavirus/SARS-Co-V-2. *See* Nat'l Inst. Of Allergy and Infectious Diseases, Coronaviruses, https://www.niaid.nih.gov/diseases-conditions/coronaviruses [https://perma.cc/MPR8-APHT] (last visited March 23, 2022).

[3]It is unclear if the early reports in November 2019 of a plague were actually the early infections of the novel coronavirus. Sui-Lee Wee, *Pneumonic Plague is Diagnosed in China,* N.Y. Times (Nov. 13, 2019), https://www.nytimes.com/2019/11/13/world/asia/plague-china-pneumonic.html [https://perma.cc/HN9D-ARV7]; Jamie Seidel, *Scientists Rush to Find 'Patient Zero' in a Bid to Stop the Coronavirus*, N.Z. Herald (Feb. 1, 2020, 12:23 AM), https://www.nzherald.co.nz/world/scientists-rush-to-find-patient-zero-in-a-bid-to-stop-the-coronavirus/DI6H6BARB45F2IEPLIOMYKIVRI/?c_id=2&objectid=12305211 [https://perma.cc/2KR9-6H7G]. Jon Cohen, *Wuhan Seafood Market may Not be the Source of Novel Virus Spreading Globally*, Science (Jan. 26, 2020, 11:25PM), https://www.science.org/content/article/wuhan-seafood-market-may-not-be-source-novel-virus-spreading-globally [https://perma.cc/DNU8-8C7W].

[4]Li-Li Ren, et al., *Identification of a Novel Coronavirus Causing Severe Pneumonia in Human: A Descriptive Study*, 133 Chinese Med. J. 1015, 1015-1024 (2020), https://journals.lww.com/cmj/fulltext/2020/05050/identification_of_a_novel_coronavirus_causing.3.aspx [https://perma.cc/5XF8-6QMY] ("A novel bat-borne CoV was identified that is associated with severe and fatal respiratory disease in humans.").

[5]Stephanie Hegarty, *The Chinese Doctor Who Tried to Warn Others about Coronavirus*, BBC (Feb. 6, 2020), https://www.bbc.com/news/world-asia-china-51364382 [https://perma.cc/2WZ2-M9F8].

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Organization ("WHO") did not set off any major public health measures.[6] The WHO denied that it had been alerted by Taiwan about cases of atypical pneumonia.[7]

By early January 2020, the U.S. received intelligence regarding the threat of the novel coronavirus and predicting its spread.[8] While the U.S. took some measures, they can be described as minimal at best, such as issuing a travel notice.[9] But, government and public health officials were aware of and capable of predicting that a pandemic might ensue. Human error—across international lines—let small outbreaks turn into a world-wide catastrophe with millions of deaths.[10] Even the timeline of events within the U.S., as more fully described below, demonstrates the total lack of a containment plan.

In January 2020, the U.S. government was well aware of the potential for COVID-19 to become a pandemic. In documents obtained by the *New York Times*, a large email chain, referred to as the 'Red Dawn' emails, included government officials' and experts' comments like the following: "… if we assume the case ascertainment rate is even worse than 2009 H1N1, this is really unbelievable (higher transmissibility than flu). Any way you cut it, this is going to be bad. You guys made fun of me screaming to close the schools. Now I'm screaming, close the colleges and universities."[11] And, "My argument is that we should treat this as the next pandemic for now, and we can always scale back if the outbreak dissipates, or is not as severe."[12] Discussion in late January 2020 and early February 2020 revolved around the need for testing priority and capacity.[13]

Some of what we know about the response comes from a whistleblower complaint. On or about January 10, 2020, Dr. Rick Bright filed a whistleblower complaint,

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[6]*COVID-19—China*, World Health Org. (Jan. 5, 2020), https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/ [https://perma.cc/SZ64-8BEN] ("Based on the preliminary information from the Chinese investigation team, no evidence of significant human-to-human transmission and no health care worker infections have been reported.").

[7]*The Facts Regarding Taiwan's email to Alert WHO to Possible Danger of COVID-19*, Taiwan Ctrs. for Disease Control (Apr. 11, 2020), https://www.cdc.gov.tw/En/Bulletin/Detail/PAD-lbwDHeN_bLa-viBOuw?typeid=158 [https://perma.cc/KSP8-R7JU] ("On December 31, 2019, Taiwan sent an email to the International Health Regulations (IHR) focal point under the World Health Organization (WHO), informing WHO of its understanding of the disease and also requesting further information from WHO.").

[8]Eric Lipton et al., *He Could Have Seen What Was Coming: Behind Trump's Failure on the Virus,* N.Y. Times (Apr. 26 2021), https://www.nytimes.com/2020/04/11/us/politics/coronavirus-trump-response.html [https://perma.cc/F4T5-AGMF] ("The National Security Council office responsible for tracking pandemics received intelligence reports in early January predicting the spread of the virus to the United States, and within weeks was raising options like keeping Americans home from work and shutting down cities the size of Chicago. Mr. Trump would avoid such steps until March.").

[9]*CDC Advises Travelers to Avoid All Nonessential Travel to China*, Ctrs. for Disease Control & Prevention (Jan. 28, 2020), https://www.cdc.gov/media/releases/2020/s0128-travelers-avoid-china.html [https://perma.cc/PJ2C-6KD8] ("In the United States, there have been 5 cases of 2019-nCoV detected in travelers returning from Wuhan. No person-to-person spread has been detected in the United States at this time and this virus is NOT spreading in the community.").

[10]On April 17, 2021, the global COVID-19 related deaths surpassed 3 million. *Coronavirus: Timeline*, U.S. Dep't Def. (Jan. 19, 2021) [hereinafter "DOD Timeline"], https://www.defense.gov/Explore/Spotlight/Coronavirus/DOD-Response-Timeline/ [https://perma.cc/WB65-WSFB] (citing Johns Hopkins University as the source).

[11]Emails from Carter Mecher to Matthew Hepburn, Duane Caneva, James V Lawler, Wargo Michael, Richard Hatchett, Melissa Harvey, Lisa Koonin, David Marcozzi, and Herbert Wolfe (Jan. 28, 2020) [hereinafter "Red Dawn Emails"], https://int.nyt.com/data/documenthelper/6879-2020-COVID-19-red-dawn-rising/66f590d5cd41e11bea0f/optimized/full.pdf#page=1 [https://perma.cc/47K8-V7XU].

[12]Red Dawn Emails, *supra* note 11, Email from Matthew Hepburn to Richard Hatchett and Carter Mecher (Jan. 28, 2020).

[13]*See, e.g.*, Red Dawn Emails, *supra* note 11, Email from Dr. Eva K. Lee to James V Lawler (Feb 9, 2020) ("In order to have true testing capacities/surge., we must select a collection of assays/reagents and make them into standards so that you can handoff to private sectors readily for (mass) production.").

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alleging a wholly inadequate federal response that never actually contained the novel virus, demonstrating the federal government knew or should have known about the seriousness of the risk of a pandemic.[14] The Center for Disease Control ("CDC") created a website dedicated to COVID-19, but as more fully described below, the messaging was confusing and did not reflect the potential gravity of the situation, which was known to some insiders at that time.[15] Yet, still in mid-January, Chinese officials continued to reiterate no clear evidence of person-to-person transmission and that the risk of community transmission was low.[16] By January 17, 2020, Dr. Nancy Messonnier, the director of the CDC's National Center for Immunization and Respiratory Diseases, stated that we were dealing with a serious situation, but that the risk to the general public was low.[17]

Finally, on January 20, 2020, China's National Health Commission stated there was evidence of human-to-human transmission of the virus.[18] On January 20, 2020, the U.S. confirmed its first case of COVID-19 in the state of Washington.[19] This patient had recently traveled to Wuhan, China.[20] Within days, the WHO announced they would hold an emergency meeting.[21] But, the U.S. continued to move slowly on implementing non-pharmaceutical interventions ("NPIs"), such as social distancing and masking.

By late January 2020, U.S. Senators were briefed on the novel coronavirus, led by Dr. Robert Redfield and Dr. Anthony Fauci, two individuals that would later become well-known to the U.S. population.[22] On January 27, Joe Biden penned an op-ed in USA Today,

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[14] *See* Norah O'Donnell, *The Government Whistleblower Who Says The Trump Administration's Coronavirus Response Has Cost Lives*, CBSNews (May 18, 2020), https://www.cbsnews.com/news/rick-bright-whistleblower-trump-administration-coronavirus-pandemic-response/ [https://perma.cc/C5UH-529T].

[15] *COVID-19*, Ctrs. for Disease Control & Prevention (last visited July 12, 2021), https://www.cdc.gov/coronavirus/2019-ncov/index.html [https://perma.cc/FD65-PDJY].

[16] *See, e.g.*, World Health Org. (@WHO), Twitter (Jan. 14, 2020, 6:18 A.M.), https://twitter.com/who/status/1217043229427761152?lang=en [https://perma.cc/KFQ7-ZCLX] ("Preliminary investigations conducted by the Chinese authorities have found no clear evidence of human-to-human transmission of the novel #coronavirus 2019-nCoV) identified in #Wuhan, #China.").

[17] *Transcript of 2019 Novel Coronavirus Response Telebriefing*, Ctrs. for Disease Control & Prevention (Jan. 17, 2020), https://www.cdc.gov/media/releases/2020/t0117-coronavirus-screening.html [https://perma.cc/RE7L-8U64] ("Based on the information that CDC has today, we believe the current risk from this virus to the general public is low. For a family sitting around the dinner table tonight this is not something that they generally need to worry about.").

[18] Malaka Gharib, *Coronavirus in China: Over 200 Cases, Human-to-Human Transmission*, NPR (Jan. 20, 2020, at 2:33 PM), https://www.npr.org/sections/goatsandsoda/2020/01/20/797926447/coronavirus-in-china-over-200-cases-human-to-human-transmission [https://perma.cc/H2HG-8LN6] ("On Monday, Zhong Nanshan, the epidemiologist who leads the committee on the outbreak for China's National Health Commission, gave a TV interview stating there was evidence of human-to-human transmission.").

[19] *First Travel-related Case of 2019 Novel Coronavirus Detected in United States*, Ctrs. for Disease Control & Prevention (Jan. 21, 2020), https://www.cdc.gov/media/releases/2020/p0121-novel-coronavirus-travel-case.html [https://perma.cc/H2HG-8LN6] ("The Centers for Disease Control and Prevention (CDC) today confirmed the first case of the 2019 Novel Coronavirus (2019-nCoV) in the United States in the state of Washington.").

[20] *Id.* ("The patient recently returned from Wuhan, China, where an outbreak of pneumonia caused by this novel coronavirus has been ongoing since December 2019.").

[21] *China Confirms Human-to-Human Transmission of Wuhan Virus as WHO Announces Emergency Meet*, Channel News Asia (Jan. 21, 2020, at 2:27AM), https://www.channelnewsasia.com/news/asia/wuhan-pneumonia-coronavirus-china-confirms-human-transmission-12293414 [https://perma.cc/MTS6-LWP9] ("[T]he World Health Organization announced that a key emergency committee would meet this week to discuss the infections.").

[22] Nathaniel Weixel & Peter Sullivan, *Top Health Officials Brief Senators on Coronavirus as Infections Spread*, Hill (Jan. 24, 2020 at 12:30 PM), https://thehill.com/policy/healthcare/479771-healthofficials-brief-senators-on-coronavirus-as-infections-spread [https://perma.cc/6D26-SLXU] ("Top U.S. public health officials on Friday briefed senators on the spread of coronavirus, which has infected hundreds of people in China and two in the United States.").

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in which he recognized the potential severity of the problem and criticized President Trump for his demonstrated failure of judgement in his response to the novel virus.[23] On the same day, multiple senators sent a letter to Secretary Alex Azar regarding their concerns about the novel coronavirus.[24] While this letter catalogued the number of confirmed cases world-wide, which seems quite small in hindsight, what stands out is the realization that the virus was spreading to multiple continents, which suggests high transmissibility.[25] On January 28, 2020, the Department of Health & Human Services ("HHS") gave a press briefing that acknowledged the potential for a serious public health threat, but also indicated that "Americans should not worry for their own safety."[26] On January 29, 2020, President Trump finally created a twelve person task force, led by Secretary Azar.[27]

On January 30, 2020, the WHO declared the coronavirus to be a public health emergency of international concern:

> The Committee believes that it is still possible to interrupt virus spread, provided that countries put in place strong measures to detect disease early, isolate and treat cases, trace contacts, and promote social distancing measures commensurate with the risk. It is important to note that as the situation continues to evolve, so will the strategic goals and measures to prevent and reduce spread of the infection. The Committee agreed that the outbreak now meets the criteria for a Public Health Emergency of International Concern and proposed the following advice to be issued as Temporary Recommendations.[28]

On this same day, the CDC issued a press briefing confirming person-to-person spread, but also provided conflicting guidance. On one hand the CDC said that we needed to work together to prevent the spread, on the other, the CDC did not recommend the use of face masks at this time, something that was a preventative measure and could

[23]Joe Biden, Opinion, *FLASHBACK by Joe Biden: Trump is worst possible leader to deal with coronavirus outbreak*, USA Today (Jan. 27, 2020, at 4:00 AM, updated Sep. 29, 2020 at 7:22 PM), https://www.usatoday.com/story/opinion/2020/01/27/coronavirus-donald-trump-made-us-less-prepared-joe-biden-column/4581710002/ [https://perma.cc/X9GM-993M] ("The possibility of a pandemic is a challenge Donald Trump is unqualified to handle as president.").

[24]Letter from Patty Murray, Senator, et al. to Alex Azar, Sec'y, U.S. Senate (Jan. 27, 2020), https://www.help.senate.gov/imo/media/doc/01272020%202019%20Novel%20Coronavirus%20Letter%20to%20Azar.pdf [https://perma.cc/6NSC-GWAN] ("We write to express concern about the rapidly evolving 2019 Novel Coronavirus (2019-nCoV_, to urge your continued robust and scientifically driven response to the situation, and to assess whether any additional resources or action by Congress are needed at this time.").

[25]*Id.* ("Cases have now been confirmed on four continents.").

[26]*Health and Human Services Secretary Azar Holds News Conference on Coronavirus*, Fin. Markets Reg. Wire. (Jan. 28, 2020) (transcript reprinted from CQ-Roll Call), LEXIS, News Database (Feb. 3, 2020).

[27]Press Release, White House, Statement from the Press Secretary Regarding the President's Coronavirus Task Force (Jan. 29, 2020), https://www.whitehouse.gov/briefings-statements/statement-press-secretary-regarding-presidents-coronavirus-task-force/ [https://perma.cc/9ES4-KPKK].

[28]Press Release, *Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV)*, World Health Org. (Jan. 30, 2020), https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov) [https://perma.cc/5T9B-6MZS].

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have reduced the spread of the novel coronavirus.[29] And, on this same day, President Trump held a rally in Iowa.[30]

On January 31, 2020, Dr. Fauci remarked that the "WHO has issued, as you know, a Public Health Emergency of International Concern declaration."[31] At the same time, Dr. Fauci noted a "low risk to the American public[.]"[32] The U.S. restricted incoming travel from China.[33] Multiple other countries, such as Italy and Singapore, similarly began to restrict travel to/from China.[34]

In early February 2020, individual states and private non-profit groups became involved. In New York, Governor Cuomo announced a new hotline to be staffed by public health experts.[35] The Bill and Melinda Gates Foundation stepped in to commit $100 million to support a global response to the coronavirus.[36] In addition, the CDC announced the development of a test that can detect the virus using polymerase chain reaction ("PCR").[37] During the first week of February, the President's Coronavirus Task Force held a briefing that included data that the U.S. had 12 confirmed cases, but continued to indicate that the risk in the U.S. remained low.[38]

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[29] *Transcript of CDC Telebriefing for the Update on 2019 Novel Coronavirus (2019-nCoV)*, Ctrs. for Disease Control & Prevention (Jan. 30, 2020), https://www.cdc.gov/media/releases/2020/t0130-novel-coronavirus-update-telebriefing.html [https://perma.cc/YLR3-H829] ("Given what we've seen in [C]hina, and other countries with this novel coronavirus, CDC experts have expected to identify some person-to-person spread in the [U]nited [S]tates. We understand that this may be concerning, but based on what we know now, our assessment remains that the immediate risk to the American public is low.").

[30] *President Trump Rally in Des Moines, Iowa*, C-SPAN (Jan. 30, 2020), https://www.c-span.org/video/?468452-1/president-trump-rally-des-moines-iowa [https://perma.cc/5WH3-9PA6].

[31] *White House Briefing on Coronavirus Response*, C-SPAN (Jan. 31, 2020), https://www.c-span.org/video/?468862-1/white-house-declares-coronnavirus-presents-public-health-emergency-us [https://perma.cc/F8HJ-53VV].

[32] *Id.*

[33] *Suspension of Entry as Immigrants and Nonimmigrants of Persons Who Pose a Risk of Transmitting 2019 Novel Coronavirus and Other Appropriate Measures to Address This Risk*, Proclamation No. 9984, 85 Fed. Reg. 6709, 6710, (Jan. 31, 2020).

[34] Reuters Staff, *Italy government agrees state of emergency after confirmed coronavirus cases: government* source, REUTERS (Jan. 31, 2020, 3:00 AM), https://www.reuters.com/article/us-china-health-italy-cabinet/italy-government-agrees-state-of-emergency-after-confirmed-coronavirus-cases-government-source-idUSKBN1ZU1CM [https://perma.cc/KE66-FVQ8]; *Extension of Precautionary Measures to Minimise Risk of Community Spread in Singapore*, Sing. Ministry Health (Jan. 31, 2020), https://www.moh.gov.sg/news-highlights/details/extension-of-precautionary-measures-to-minimise-risk-of-community-spread-in-singapore [https://perma.cc/P2A6-H4RN].

[35] *Governor Cuomo Issues Update on Novel Coronavirus and Announces New Hotline Staffed by State Health Department Experts*, N.Y. State Off. Governor (Feb. 2, 2020), https://www.governor.ny.gov/news/governor-cuomo-issues-update-novel-coronavirus-and-announces-new-hotline-staffed-state-health [https://perma.cc/2WY6-2L5R] ("New Yorkers can call 1-888-364-3065 with Question or Concerns about Travel and Symptoms.").

[36] *Bill & Melina Gates Foundation Dedicates Additional Funding to the Novel Coronavirus Response*, Gates Foundation (Feb. 5, 2020), https://www.gatesfoundation.org/Media-Center/Press-Releases/2020/02/Bill-and-Melinda-Gates-Foundation-Dedicates-Additional-Funding-to-the-Novel-Coronavirus-Response [https://perma.cc/D7KT-KAW5].

[37] *Transcript for CDC Telebriefing: CDC Update on Novel Coronavirus*, Ctrs. for Disease Control & Prevention (Feb. 3, 2020), https://www.cdc.gov/media/releases/2020/t0203-coronavirus-update.html [https://perma.cc/7RUR-5VN2] ("As we have reported earlier, CDC has developed a real-time Reverse Transcription Polymerase Chain Reaction or RRT-PCR test that can detect 2019 Novel Coronavirus and respiratory and serum specimens from clinical specimens. On January 24, CDC publicly posted the assay protocol for this test.").

[38] CNBC Television, *White House's Coronavirus Task Force Holds a News Conference—2/7/2020*, YouTube (Feb., 7, 2020), https://www.youtube.com/watch?v=pdt2krYW4Fk [https://perma.cc/P8H2-P85W] (confirming 12 confirmed cases in the U.S. at 1:45; noting the risk to the American public remains low at 2:19-2:36).

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By February 13, 2020, U.S. officials knew that COVID-19 was spreading via human-to-human interaction:

> It is also odd—why would officials in the U.S. keep saying that they cannot confirm the extent of human-to-human transmission? I think the public is confused by all of these experts saying conflicting things. If human-to-human transmission is still in question, how was the transmission in China? It's one thing that I predicted based on the social situation, how animals and humans interact. I got that people don't have to believe. But now it is very clear—based on published results—that confirms over 90% them are not animal-to-human.[39]

The Red Dawn email thread (from the documents obtained by the *New York Times*) starts to turn towards mitigation (which was never really adopted in the US) and demonstrates that U.S. officials watched Japan institute mitigation strategies, such as encouraging people with cold-like symptoms to stay home.[40]

On February 24, 2020, the Trump Administration asked Congress for $1.25 billion for a coronavirus response.[41] On February 25 and 26, 2020, U.S. officials testified before the Senate Appropriation Committee and conducted media telebriefings.[42] At this time, Dr. Nancy Messonnier acknowledged that NPIs need to be implemented, including social distancing, cleaning measures, and possible school closures.[43] At the end of February 2020, things started heating up at both the federal and state levels, even though President Trump continued to misstate and/or mislead the public regarding the U.S. preparedness.[44] On February 28, 2020, President Trump hosted a rally in South Carolina.[45]

The Red Dawn email chain also shows that the individuals on the email chain understood that the U.S. lagged behind other mitigation efforts:

> At the moment, we indeed have not yet gone forward with any of these. The 'unknown origin' case in California shows ttat [sic] we missed a whole week before she was tested. And she may very well not be patient

[39]Red Dawn Emails, *supra* note 11, email from Dr. Eva K. Lee dated Feb 13, 2020.

[40]Red Dawn Emails, *supra* note 11, email from Carter Mecher dated Feb. 18, 2020.

[41]Noah Weiland et al., *White House Asks Congress for Billions to Fight Coronavirus*, N.Y. Times (Feb. 26, 2020), https://www.nytimes.com/2020/02/24/us/politics/trump-coronavirus-response.html [https://perma.cc/D4TV-45FD].

[42]*Health and Human Services Fiscal Year 2021 Budget Request*, C-SPAN (Feb. 25, 2020), https://www.c-span.org/video/?469633-1/lawmakers-question-hhs-secretary-azar-coronavirus-preparedness-2021-budget&start=1225 [https://perma.cc/YV6M-EE5E]; *Transcript for the CDC Telebriefing Update on COVID-19*, Ctrs. for Disease Control & Prevention (Feb. 26, 2020), https://www.cdc.gov/media/releases/2020/t0225-cdc-telebriefing-COVID-19.html [https://perma.cc/U2ZZ-W7SR].

[43]*Id.* ("At this time, there's no vaccine to protect against this new virus and no medications approved to treat it. Non-pharmaceutical interventions or NPIs will be the most important tools in our response to this virus.").

[44]President Donald Trump, *Remarks by President Trump, Vice President Pence, and Members of the Coronavirus Task Force in Press Conference* (Feb. 26, 2020, at 6:37 PM) ("We're rated number one for being prepared."); President Donald Trump, *Remarks by President Trump in Meeting with African American Leaders* (Feb. 27, 2020, at 5:22 PM) ("But we have done an incredible job. We're going to continue. It's going to disappear. One day – it's like a miracle – it will disappear."). While Trump was saying everything was fine, New York was actually responding to the pandemic. *See Governor Cuomo Announces $40 Million Emergency Appropriation to Support DOH Staffing and Equipment to Respond to Potential Novel Coronavirus Pandemic*, N.Y. State Off. Governor (Feb. 26, 2020), https://www.governor.ny.gov/news/governor-cuomo-announces-40-million-emergency-appropriation-support-doh-staffing-and-equipment [https://perma.cc/ZV9U-9SW3].

[45]*Campaign 2020 President Trump Campaign Event in North Carolina, South Carolina*, C-SPAN (Feb. 28, 2020), https://www.c-span.org/video/?469663-1/president-trump-campaign-event-north-charleston-south-carolina [https://perma.cc/93V7-QEYP].

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> zero because she could have gotten it from someone with no symptoms at all.[46]

In discussing Italy, Carter Mecher observed: "The lesson is that although things might have looked under control on Feb 20 (3 cases/0 deaths), things obviously weren't fine. They couldn't see how large the iceberg was below the water line. They were blind to the extent of disease and the extent of ongoing transmission. We have also been flying blind."[47]

The Red Dawn email chain really heats up in early March, as the experts realize that the window for NPIs to contain COVID-19 no longer exists: "6 deaths in Seattle[.] Seattle missed the window … It is too late for NPIs." [48] In other words, the U.S. never contained. Frankly, even the subsequent attempts to mitigate were not consistently employed, thus, some deaths were likely preventable.

In early March 2020, President Trump continued to hold rallies. On March 2, 2020, at a rally in North Carolina, President Trump exclaimed: "My administration has also taken the most aggressive action in modern history to protect Americans from the coronavirus."[49] At the same time, the states continue to discuss measures to attempt to control the spread of the virus.[50] The federal and state responses do not appear coordinated. This bifurcation continued to grow through spring 2020.[51] On March 12, 2020, both California and New York announced NPI regulations, such as social distancing and limiting gatherings.[52]

On or about March 13, 2020, the CDC issued school closure guidance.[53] The same day, President Trump proclaimed the novel coronavirus to be a national emergency.[54] This was the beginning of the shut-downs[55]—several months too late from a public health perspective. Containment never happened. Mitigation efforts occurred but the pandemic

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[46]Red Dawn Emails, *supra* note 11, email from Eva Lee dated Feb. 28, 2020.

[47]Red Dawn Emails, *supra* note 11, email from Carter Mecher dated Feb 20, 2020.

[48]Red Dawn Emails, *supra* note 11, email from Carter Mecher dated March 2, 2020.

[49]*Campaign 2020 President Trump Rally in Charlotte, North Carolina*, C-SPAN (March 2, 2020), https://www.c-span.org/video/?469845-1/president-trump-campaigns-charlotte-north-carolina [https://perma.cc/YM6S-VBRS].

[50]Andrew Cuomo, *Video, Audio, Photos & Rush Transcript: At Novel Coronavirus Briefing, Governor Cuomo Declares State of Emergency to Contain Spread of Virus*, N.Y. State Off. Governor (Mar. 7, 2020), https://www.governor.ny.gov/news/video-audio-photos-rush-transcript-novel-coronavirus-briefing-governor-cuomo-declares-state [https://perma.cc/BMM6-7LP2].

[51]*See, e.g.*, Andrew Cuomo, *Video, Audio, Photos & Rush Transcript: During Coronavirus Briefing, Governor Cuomo Issues Executive Order Allowing State to Increase Hospital Capacity*, N.Y. State Off. Governor (Mar. 16, 2020) https://www.governor.ny.gov/news/video-audio-photos-rush-transcript-during-coronavirus-briefing-governor-cuomo-issues-executive [https://perma.cc/K73R-MGUT].

[52]Governor Gavin Newsom, Cal. Exec. Order No. N-25-20, (Mar. 12, 2020), https://www.gov.ca.gov/wp-content/uploads/2020/03/3.12.20-EO-N-25-20-COVID-19.pdf [https://perma.cc/WP39-BHWM]; Andrew Cuomo, *Video, Audio, Photos & Rush Transcript: During Novel Coronavirus Briefing, Governor Cuomo Announces New Mass Gatherings Regulations*, N.Y. State Off. Governor (Mar. 12, 2020), https://www.governor.ny.gov/news/video-audio-photos-rush-transcript-during-novel-coronavirus-briefing-governor-cuomo-announces-0 [https://perma.cc/748B-6L8X].

[53]Red Dawn Emails, *supra* note 11, Gerald Parker email from Gerald Parker dated March 14, 2020.

[54]President Donald Trump, *Proclamation on Declaring a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak*, Trump White House Archives (Mar. 13, 2020), https://trumpwhitehouse.archives.gov/presidential-actions/proclamation-declaring-national-emergency-concerning-novel-coronavirus-disease-covid-19-outbreak [https://perma.cc/4WNR-RMLQ].

[55]*See, e.g.*, Andrew Cuomo, *Amid COVID-19 Pandemic, Governor Cuomo, Governor Murphy, Governor Lamont and Governor Wolf Direct Temporary Closure of Barber Shops, Nail and Hair Salons and Related Personal Care Services Effective by 8pm Saturday*, N.Y. State Off. Governor (Mar. 20, 2020), https://www.governor.ny.gov/news/amid-COVID-19-pandemic-governor-cuomo-governor-murphy-governor-lamont-and-governor-wolf-direct [https://perma.cc/ZHE9-J82Q].

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remained uncontained, and even during mitigation times thousands of people died every single day.

After March 2020, the problems in the response continued. Testing capability lagged far behind what was needed for early detection of community spread.[56] An entire article can be written about masking, from delayed implementation to politicization to enforcement and beyond.[57] School closures, particularly in K-12, lasted too long due to the other public health impacts on children and data to support safe re-opening; in some cases, over a year.[58] Lack of PPE and other supplies contributed to the ongoing problems. Between March 2020 to present day, the number of problems in the response mounted.

In April 2020, the situation became bleak. Vice President Pence blamed the CDC and China for the delay in the response to the novel coronavirus.[59] Throughout the world, countries initiated lockdowns and curfews.[60] On April 3, 2020, the CDC recommended the use of facemasks in public. The Trump White House promoted a different story on facemasks.[61] The public received mix messages and facemasks became a political statement—people likely died as a result.[62] On April 8, the news reported that U.S. intelligence warned of the novel coronavirus as early as November 2019.[63] In mid-April, President

[56]*See, e.g.*, Michael D. Shear et al., *The Lost Month: How a Failure to Test Blinded the U.S. to COVID-19*, N.Y. Times (Apr. 1, 2020), https://www.nytimes.com/2020/03/28/us/testing-coronavirus-pandemic.html [https://perma.cc/F6NF-NG4Y]

[57]See, e.g., Lindsay F. Wiley, *Democratizing the Law of Social Distancing*, 19 YALE J. HEALTH POL'Y L. & ETHICS 50, 75 (2020); Richard W. Parker, *Why America's Response to the COVID-19 Pandemic Failed: Lessons From New Zealand's Success*, 73 Admin. L. Rev. 77, 101 (2021) ("Yet even in November, weeks after South Dakota had become a national hotspot of covid disease and death, the governor of the state refused to adopt a mask mandate, its residents remained free to travel about the country, and the state continued to serve (along with numerous other recalcitrant states) as an incubator of contagion regionally and nationwide."); Josh Blackman, *The "Essential" Free Exercise Clause*, 44 Harv. J of L. & Pub. Pol'y 637, 679-80 (2021).

[58]San Diego Unified School District, for example, closed its in-person classrooms for over a year. *See, e.g.*, Kristen Taketa, *San Diego Unified will stay closed indefinitely while vaccinations, testing scale up*, San Diego Union-Tribune (Jan. 14, 2021, 6:00 AM), https://www.sandiegouniontribune.com/news/education/story/2021-01-14/san-diego-unified-will-stay-closed-indefinitely-while-vaccinations-testing-scale-up-slowly [https://perma.cc/7A9Z-U2CQ].

[59]Betsy Klein et al., *Pence Seeks to Blame CDC and China for Any Delay in US Coronavirus Response—Not Trump's Initial Failure to Face Reality*, CNN (Apr. 1, 2020, 4:12 PM), https://www.cnn.com/2020/04/01/politics/mike-pence-coronavirus/index.html [https://perma.cc/J4TK-VQ7V] ("I will be very candid with you and say that in mid-January the CDC was still assessing that the risk of the coronavirus to the American people was low … The reality is that we could've been better off if China had been more forthcoming.").

[60]Reuters Staff, *Italy's coronavirus lockdown measures to be extended to April 13: minister*, REUTERS (Apr. 1, 2020, at 1:27 AM), https://www.reuters.com/article/us-health-coronavirus-italy-lockdown/italys-coronavirus-lockdown-measures-to-be-extended-to-april-13-minister-idUSKBN21J4RU [https://perma.cc/AHJ5-4ZQD]; Reuters Staff, *Mecca, Medina get 24-hour curfew; Gulf migrant worker districts locked down*, REUTERS (Apr. 2, 2020, at 5:24 AM), https://www.reuters.com/article/us-health-coronavirus-saudi/mecca-medina-get-24-hour-curfew-gulf-migrant-worker-districts-locked-down-idUSKBN21K1TV [https://perma.cc/XS8J-H2QP].

[61]Lena H. Sun & Josh Dawsey, *New face mask guidance comes after battle between White House and CDC*, Washington Post (Apr. 3, 2020) https://www.washingtonpost.com/health/2020/04/03/white-house-cdc-turf-battle-over-guidance-broad-use-face-masks-fight-coronavirus/ [https://perma.cc/9VBU-5U7C] ("President Trump announced new guidance Friday that people in the U.S. wear coverings in public to slow the spread of the coronavirus, a reversal of the administration's earlier recommendations. But Trump immediately said he himself would not choose to do it, even though 'it may be good' advice, reflecting the sharp debate in recent days between the White House and the Centers for Disease Control and Prevention.").

[62]*See id.*; Inst. for Health Metrics COVID-19 Forecasting Team, *Modeling COVID-19 Scenarios for the United States*, 27 Nature Med. 94, 94 (2020) (discussing that universal mask use could save lives).

[63]Josh Margolin & James Gordon Meek, *Intelligence report warned of coronavirus crisis as early as November: Sources,* ABC News (Apr. 8, 2020, at 6:55 PM), https://abcnews.go.com/Politics/intelligence-report-warned-coronavirus-crisis-early-november-sources/story?id=70031273 [https://perma.cc/8SUBUPSP] ("As far back as late November [2019], U.S. intelligence officials were warning that a contagion was sweeping

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Trump announced that the U.S. would halt funding to the WHO.[64] On April 23, 2020, President Trump made a ridiculed suggestion that injecting a disinfectant into a human could be a therapeutic approach.[65] On April 27, 2020, *The Washington Post* reported that President Trump received more than a dozen classified briefings on the novel coronavirus in January and February 2020.[66] This revelation is particularly important given that President Trump held rallies during January and February and played down the seriousness of the virus during that time frame.

In May 2020, President Trump continued a campaign that blinded the public from the real threat of the pandemic. On May 6, 2020, President Trump remarked that the reason that the U.S. had so many cases was because the U.S. did more testing.[67] President Trump indicated that if we stopped testing, we would have very few cases.[68] At a hearing before the Senate, U.S. Senators made remarks to the Coronavirus Task Force Members that President Trump was hiding the truth from the American people.[69] Senator Patty Murray stated:

> Families across the country are **counting on us for the truth especially since it's clear they will not get it from President Trump**. **The truth is essential**. **So, people have the facts**, so they make decisions for themselves, their families and their communities. Lives are at stake.

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through China's Wuhan region, changing the patterns of life and business and posing a threat to the population, according to four sources briefed on the secret reporting.").

[64]Donald Trump, *Remarks by President Trump, Vice President Pence, and Members of the Coronavirus Task Force in Press Briefing*, Trump White House Archives (Apr. 15, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-vice-president-pence-members-coronavirus-task-force-press-briefing-26/ [https://perma.cc/AYJ2-4659]. ("In order to advance the health and security of our nation and all nations, as we announced yesterday, the U.S. government has put a hold on funding to the WHO – World Health Organization – pending a review of the organization's cover-up and mismanagement of the coronavirus outbreak.").

[65]Donald Trump, *Remarks by President Trump, Vice President Pence, and Members of the Coronavirus Task Force in Press Briefing* Trump White House Archives (Apr. 23, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-vice-president-pence-members-coronavirus-task-force-press-briefing-31/ [https://perma.cc/Y55Y-3CDR] ("Right. And then I see the disinfectant, where it knocks it out in a minute. One minute. And is there a way we can do something like that, by injection inside or almost a cleaning. Because you see it gets in the lungs and it does a tremendous number on the lungs. So it would be interesting to check that. So, that, you're going to have to use medical doctors with. But it sounds—it sounds interesting to me. So we'll see. But the whole concept of the light, the way it kills it in one minute, that's—that's pretty powerful.").

[66]Greg Miller & Ellen Nakashima, *President's intelligence briefing book repeatedly cited virus threat,* Washington Post (Apr. 27, 2020), https://www.washingtonpost.com/national-security/presidents-intelligence-briefing-book-repeatedly-cited-virus-threat/2020/04/27/ca66949a-8885-11ea-ac8a-fe9b8088e101_story.html [https://perma.cc/N5KM-XA9V] ("U.S. intelligence agencies issued warnings about the novel coronavirus in more than a dozen classified briefings prepared for President Trump in January and February, months during which he continued to play down the threat, according to current and former U.S. officials.").

[67]Donald Trump, *Remarks by President Trump and Vice President Pence at a Meeting with Governor Reynolds of Iowa*, (May 6, 2020), https://www.govinfo.gov/content/pkg/DCPD-202000335/pdf/DCPD-202000335.pdf [https://perma.cc/YH43-4QZS] ("But by doing all of the testing—I'd love to get that chart from yesterday. It's such an incredible chart. We do many times—we've done more testing than every other country combined, wouldn't you think? So we're going to have more cases because we do more testing. Otherwise, you don't know if you have a case. I think that's a correct statement.").

[68]*Id.* ("So if do did tests down here, we're going to have very few cases. If we do tests up here, we're going to have many more cases. So they keep saying, "They have a million cases." Well, that's because we're doing a lot of testing. Otherwise, Deborah—in fact, I'm doing it because of Deborah. She keeps saying, "Keep going." We're going to break—pretty soon, we're going to need a longer piece of paper.").

[69]*White House Coronavirus Task Force Members Testify on Coronavirus Response and Reopening Phases*, C-SPAN (May 12, 2020), https://www.c-span.org/video/?471837-1/white-house-coronavirus-task-force-members-testify-coronavirus-response-reopening-phases&live [https://perma.cc/M6BQ-ULE6].

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> **The president is not telling the truth.** We must … **because the Trump administration's response to this public health emergency so far has been a disaster on its own**. **Delays, missteps**, have put us way behind where we need to be on diagnostic testing and allowed inaccurate antibody tests to flood the market…[**and] corruption and political interference have impeded efforts** to secure desperately needed personal protective equipment … and promoted dangerous, unproven treatments … this is far from the first time that **Trump has tried to silence experts … the fact of the matter is President Trump has been more focused on fighting against the truth than fighting this virus** … .[70]

Senator Mitt Romney remarked: "I find our testing record is nothing to celebrate."[71] In May 2020, the United States still did not have a handle on testing, let alone mitigation.

In June 2020, the mixed response continued. The White House spoke out about the jobs report and promoted an end to the lock downs for the states.[72] President Trump held rallies and required the attendees to sign a waiver with the following language:

> By clicking register below, you are acknowledging that an inherent risk of exposure to COVID-19 exists in any public place where people are present," the disclaimer notes. "By attending the Rally, you and any guests voluntarily assume all risks related to exposure to COVID-19 and agree not to hold Donald J. Trump for President, Inc.; BOK Center; ASM Global; or any of their affiliates, directors, officers, employees, agents, contractors, or volunteers liable for any illness or injury.[73]

During this time, Dr. Fauci explained that the reason the public was told not to wear masks earlier was because of the limited supply of N95 and surgical masks, which were needed for the healthcare professionals.[74] The White House appeared to order the cancellation of federal funding to a researcher who studied the coronavirus, with the underlying reason stated that "the grantee was not in compliance with NIH's grant policy[]," although some believe that the White House was attempting to interfere with

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[70] *Id.* at 14:13-16:03 (emphasis added).

[71] Max Roth, *Mitt Romney to Trump Admin: COVID-19 testing record is 'nothing to celebrate,'* FOX13NOW (May 12, 2020 at 5:48 PM), https://www.fox13now.com/news/local-news/mitt-romney-to-trump-admin-COVID-19-testing-record-is-nothing-to-celebrate [https://web.archive.org/web/20220222194533/; https://www.fox13now.com/news/local-news/mitt-romney-to-trump-admin-covid-19-testing-record-is-nothing-to-celebrate].

[72] Donald Trump, *Remarks by President Donald Trump on the Jobs Numbers Report*, TRUMP WHITE HOUSE ARCHIVES (June 8, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-jobs-numbers-rep]ort/ [https://perma.cc/S9LR-NRRX] ("And I hope that the lockdown — governors, I don't know why they continue to lock down, because if you look at Georgia, if you look at Florida, if you look at South Carolina, if you look at so many different places that have opened up — I don't want to name all of them, but the ones that are most energetic about opening, they are doing tremendous business. And that — this is what these numbers are all about").

[73] *See, e.g.*, Oliver Milman, *Trump campaign asks supporters to sign coronavirus waiver ahead of rally*, GUARDIAN (Jun 12, 2020, 12:35 PM), https://www.theguardian.com/us-news/2020/jun/12/trump-rally-supporters-sign-coronavirus-waiver [https://perma.cc/Y5ZA-NUAG] (actual waiver document on file with author).

[74] Katherine Ross, *Why Weren't We Wearing Masks From the Beginning? Dr. Fauci Explains*, STREET (Jun 12, 2020, 3:07 PM), https://www.thestreet.com/video/dr-fauci-masks-changing-directive-coronavirus [https://perma.cc/A9UQ-JDBD] ("Well, the reason for that is that we were concerned the public health community, and many people were saying this, were concerned that it was at a time when personal protective equipment, including the N95 masks and the surgical masks, were in very short supply. And we wanted to make sure that the people namely, the health care workers, who were brave enough to put themselves in a harm way, to take care of people who you know were infected with the coronavirus and the danger of them getting infected.").

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scientific research into the novel coronavirus.[75] Toward the end of June 2020, the Trump Administration took steps to close federally funded COVID-19 testing sites.[76]

In July 2020, Senator Mitch McConnell publicly pressed people to wear face coverings, describing it as the single most important thing people can do to protect themselves and others.[77] The issue of facemasks became increasingly politicized, much to the detriment of the public. On July 25, 2020, a Texas hospital was overwhelmed by novel coronavirus cases and announced that it may need to send some patients home to die.[78] On July 27, 2020, data showed that Louisiana had the most cases per population.[79] Despite the immense death and disease, President Trump publicly stated: "Young people are almost immune to this disease."[80] President Trump and his administration continued to press a false narrative that the U.S. had the best testing in the world.[81] At the end of July 2020, the reported number of COVID-19 deaths in the U.S. was close to 150,000, although

[75]Beth Mole, *White House ordered NIH to cancel coronavirus research funding, Fauci says*, Arstechnica (June 24, 2020, 7:16 PM), https://arstechnica.com/science/2020/06/white-house-ordered-nih-to-cancel-coronavirus-research-funding-fauci-says/ [https://perma.cc/2PWF-2GDY]; David Lim & Brianna Ehley, *Fauci says White House told NIH to cancel funding for bat virus study*, POLITICO (June 23, 2020 at 5:41 PM), https://www.politico.com/news/2020/06/23/fauci-nih-white-house-bat-study-336452 [https://perma.cc/9A7Z-64X7].

[76]Vanessa Romo, *Trump Administration Moving to Close Federally Funded COVID Testing Sites*, NPR (June 24, 2020, 8:45 PM), https://www.npr.org/sections/coronavirus-live-updates/2020/06/24/883154244/trump-administration-moving-to-close-federally-funded-COVID-testing-sites [https://perma.cc/36HV-M8EM] ("Federal officials say the sites have been closing or transferring to state or local control because it's more efficient to run testing that way. In other instances they argue there are readily available testing sites nearby.").

[77]Reuters, *Wearing a mask is 'not complicated' says Mitch McConnel,* YouTube (July 6, 2020), https://www.youtube.com/watch?v=eJSi2rJ60Ck [https://perma.cc/6KFF-ZNQ9].

[78]Nicole Chavez & Kay Jones, *A Texas hospital overwhelmed by the coronavirus may send some patients home to die*, CNN (July 25, 2020, 12:02 AM), https://www.cnn.com/2020/07/24/us/texas-starr-county-hospital-coronavirus/index.html [https://perma.cc/C2ML-SK7J]. The Starr County's Facebook page stated the following:

> We are seeing the results of socialization during the 4th of July, vacations, and other social opportunities. Unfortunately, Starr County Memorial Hospital has limited resources and our doctors are going to have to decide who receives treatment, and who is sent home to die by their loved ones. This is what we did not want our community to experience. I am working on a Shelter-in-Place Order, but it is only as good as we make it. We must be responsible for ourselves and our loved ones. I have faith that Starr County will do what is good for one another. We can turn this around in two weeks. WE CAN DO IT. STAY HOME as much as possible. God bless you. – Your Judge Eloy Vera.

Li Cohen, *A Texas county's only hospital forced to choose "who is sent home to die as ICU beds near capacity [sic]*, CBS News (July 23, 2020, 8:49 PM), https://www.cbsnews.com/news/starr-county-only-hospital-forced-to-choose-who-is-sent-home-to-die-as-icu-beds-reach-capacity/ [https://perma.cc/BP5F-KKHM].

[79]*United States Coronavirus Cases*, worldometers (July 27, 2020, 11:21 PM), https://www.worldometers.info/coronavirus/usa/louisiana/ [https://web.archive.org/web/20200727232309/https://www.worldometers.info/coronavirus/country/us/].

[80]Donald Trump, *Remarks by President Trump in Press Briefing*, Trump White House Archives (July 30, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-press-briefing-july-30-2020/ [https://perma.cc/9Q3Q-KAP2] ("So, can you assure anybody of anything? I do say, again: Young people are almost immune to this disease. The younger, the better, I guess. They're stronger. They're stronger. They have a stronger immune system. It's an incredible thing. Nobody has ever seen this before. Various types of flu will hurt young people more than older people. But young people are almost immune. If you look at the percentage, it's a tiny percent of 1 percent. It's a tiny percent of 1 percent. So we have to have our percent of 1 percent. It's a tiny percent of 1 percent. So we have to have our schools open. We have to protect our teachers. We have to protect our elderly. But we do have to have our schools open.").

[81]Donald Trump, *President Donald J. Trump and His Administration Have Created The Best COVID-19 Testing System in the World,* Trump White House Archives (July 31, 2020), https://trumpwhitehouse.archives.gov/briefings-statements/president-donald-j-trump-administration-created-best-covid-19-testing-system-world/ [https://perma.cc/GQA4-HLVF].

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we know from later research that this number likely severely undercounted the actual number of deaths at this time.[82]

By August 2020, some hindsight was possible, although it will likely be years before a full forensic autopsy will detail the devastation. Health Professionals, in an open letter, pled for an effective and coordinated response, stating that ninety-nine percent of COVID-19 deaths in the U.S. could have been prevented.[83] A *Time Magazine* article articulates why the U.S. was failing in its response:

> The U.S. is surely losing the war on COVID-19, but it did not have to be this way. Of the G-7 countries—the U.S., the U.K., Canada, France, Japan, Germany and Italy—only we have an outbreak that continues to spin out of control … Desperate for supplies as the pandemic worsened in early April, some hospital executives, doctors and other caregivers turned to shady dealers to arrange for shipments of overpriced gear from China… [Trump] wasted weeks early on downplaying the virus; he has stubbornly clung to a fantastical belief that the virus will simply "disappear"; he banned many travelers from China but squandered the time the move bought him by failing to set up an adequate testing and tracing program; he encouraged states to reopen ahead of his own Administration's guidelines; and he has repeatedly cherry-picked statistics that make the situation in the U.S. look far better than it is in reality … Then there were the masks … Masks aside, the most glaring failure of the federal government has been, and continues to be, a lack of adequate testing infrastructure, which is a key element of pandemic response, as testing shows how bad an outbreak is getting and reveals key hot spots … No single person better represents the bitter politicization of science than Dr. Anthony Fauci, longtime head of the National Institute of Allergy and Infectious Diseases.[84]

In mid-August 2020 the number of recorded deaths placed COVID-19 as the third leading cause of death in the US, behind heart disease and cancer.[85] The CDC reinstated its COVID-19 data collection system after the reporting system to HHS led to delays and data problems.[86] By late August, cases were increasing once again, both in

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[82]Logan Lutton, *Coronavirus case numbers in the United States: JULY 31 update,* MED. ECON. (July 31, 2020), https://www.medicaleconomics.com/view/coronavirus-case-numbers-in-the-united-states-july-31-update [https://perma.cc/7APF-C45Q] ("Patient deaths: 144,139").

[83]Matthew Wellington et al., *Shut Down, Start Over, Do It Right*, US PIRG (Nov. 17, 2020), https://uspirg.org/resources/usp/shut-down-start-over-do-it-right [https://perma.cc/WEW7-HB6X].

[84]Alex Fitzpatrick, *Why the U.S. is Losing the War on COVID-19*, TIME (Aug. 13, 2020, 11:19 AM), https://time.com/5879086/us-COVID-19/?utm_source=reddit.com [https://perma.cc/C955-HPUW] (emphasis added).

[85]Justine Coleman, *COVID-19 now No. 3 cause of death in US*, HILL (Aug. 17, 2020, 7:43 PM), https://thehill.com/policy/healthcare/512427-COVID-19-now-no-3-cause-of-death-in-us [https://perma.cc/NX7B-SGKB].

[86]Robbie Whelan, *COVID-19 Data Will Once Again Be Collected by CDC, in Policy Reversal*, WALL ST. J. (Aug. 20, 2020, 2:04 PM), https://www.wsj.com/articles/troubled-COVID-19-data-system-returning-to-cdc-11597945770?mod=e2tw&AID=11557093&PID=9101088&SID=0FOF37732195255840930&subid=FlexOffers.com%2C+LLC&cjevent=17e30e8ee36111ea80bd00510a1c0e11&tier_1=affiliate&tier_2=moa&tier_3=FlexOffers.com%2C+LLC&tier_4=1607582&tier_5=https%3A%2F%2Fwww.wsj.com%2Farticles%2Ftroubled-COVID-19-data-system-returning-to-cdc-11597945770%3Fmod%3De2tw [https://perma.cc/JD6M-7FPQ] ("The U.S. Department of Health and Human Services is reversing course on a change to the way hospitals report critical information on the coronavirus pandemic to the government, returning the responsibility for data collection to the Centers for Disease Control and Prevention.").

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the U.S. and abroad.[87] While scientists and clinicians learned a lot about the novel coronavirus over the previous months, effective vaccines were months away and widespread efficacy of therapeutics remained elusive.[88]

In September 2020, New York, once the major hotspot for infections, had some control over the spread of the virus.[89] This was short-lived as travel over Thanksgiving and Christmas put the U.S. back into another wave. Testing in the U.S. remained plagued with problems.[90] In North Dakota and South Dakota, the novel coronavirus spread on college campuses and disproportionately in the Native American population.[91]

Throughout the fall of 2020, facemasks and other non-therapeutic interventions remained politicized. Presidential candidate Joe Biden campaigned from his basement. President Trump campaigned at public events and held rallies. At the end of October 2020, the U.S. set a new high in daily COVID-19 infections.[92] Governors warned against holiday travel over Thanksgiving. Despite warnings, Americans travelled, cases spiked, and lock downs were reinstated. In December 2020 and January 2021, hospitals became overwhelmed. In California, for example, the Governor issued new lockdown rules in early December 2020.[93] Not only were cases spiking, but data showed that hospitals were soon to be overwhelmed. Public health officials needed to slow the Christmas travel. This latest lockdown faced opposition. Thousands of people died. Vaccines, the main pharmaceutical intervention to attempt to control the spread, death, and serious disease, were just being introduced.[94]

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[87] *See* Matthre Impelli, *Nearly 9,000 Florida Children Diagnosed with Coronavirus in Two Weeks as Schools Reopen*, NEWSWEEK (Aug. 25, 2020, 4:07 PM), https://www.newsweek.com/nearly-9000-florida-children-diagnosed-coronavirus-two-weeks-schools-reopen-1527587 [https://perma.cc/236M-93EG]; *COVID-19: South Korea closes Seoul schools amid rise in cases*, BBC (Aug. 25, 2020), https://www.bbc.com/news/world-asia-53901707 [https://perma.cc/6NS7-66BB].

[88] Richard Harris, *FDA's Hahn Apologizes for Overselling Plasma's Benefits As A COVID-19 Treatment*, NPR (Aug. 25, 2020, 1:44 PM), https://www.npr.org/sections/health-shots/2020/08/25/905792261/fdas-hahn-apologizes-for-overselling-plasmas-benefits-as-a-COVID-19-treatment [https://perma.cc/TLJ7-9NYW].

[89] Kenneth Chang et al., *In Signs of Progress, Fewer Than 1% of New York's Virus Tests Are Positive*, N.Y. TIMES (Sept. 16, 2020, https://www.nytimes.com/2020/09/06/world/covid-coronavirus.html [https://perma.cc/VS4L-WL9K].

[90] Alexis C. Madrigal & Robinson Meyer, *The Fog of the Pandemic is Returning*, ATLANTIC (Sept. 10, 2020), https://www.theatlantic.com/health/archive/2020/09/how-many-people-america-testing-coronavirus/616249/?scrolla=5eb6d68b7fedc32c19ef33b4 [https://perma.cc/T2FG-KPWD] ("But some evidence suggests that these tests are being used on a much wider scale than is understood: Thousands, if not tens of thousands, of antigen tests may already be happening every day without their results appearing in any public data. Just as dark matter can't be observed directly, even though it makes up much of the universe, this "dark testing" does not show up in the data but may already account for a substantial chunk of the coronavirus testing done in the U.S.").

[91] Associated Press, *Dakotas lead U.S. in growth of coronavirus cases as both states reject mask rules*, LA TIMES (Sept. 12, 2020, 1:01 PM), https://www.latimes.com/world-nation/story/2020-09-12/dakotas-lead-us-in-virus-growth-as-both-reject-mask-rules [https://perma.cc/DL59-EB62] ("Coronavirus infections in the Dakotas are growing faster than anywhere else in the nation, fueling impassioned debates over masks and personal freedom after months in which the two states avoided the worst of the pandemic.").

[92] Jessie Yeung et al., *The latest on the coronavirus pandemic*, CNN (Oct. 31, 2020, 1:41 AM), https://www.cnn.com/world/live-news/coronavirus-pandemic-10-30-20-intl/index.html [https://perma.cc/ZU23-3EE7].

[93] Associated Press, *California Under New COVID-19 Rules For Next Three Weeks*, KPBS (Dec. 7, 2020), https://www.kpbs.org/news/2020/dec/07/california-imposes-new-COVID-19-rules-hospitals-st/ [https://perma.cc/6T2Q-UMNC].

[94] A major highlight was vaccine development. The development of COVID-19 vaccines is nothing short of tremendous. The ability to develop COVID vaccines rested on decades of research. The ultimate strategy against COVID lays in vaccines. We are lucky in this sense because scientists cannot create vaccines against every virus. As noted by HIV researcher at UW-Madison, we've been studying HIV for 40 years and we still not have a vaccine. Wisconsin Alumni Association, *COVID-19 Vaccines and Side Effects*, YOUTUBE

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In December 2020, COVID-19 vaccines became available in the U.S., although in limited supply. The U.S. Food & Drug Administration ("FDA") authorized two vaccines, Pfizer and Moderna, for Emergency Use Authorization ("EUA"). Shortly thereafter, the Johnson and Johnson ("J&J") vaccine also received authorization. Initial interest in the vaccines far exceeded availability. But, public health experts understood that at some point everyone who wanted a vaccine would have access and a new public health challenge would arise—vaccine hesitancy. This challenge became exacerbated by the arrival of the Delta variant, which disproportionately caused serious death and disease in non-vaccinated individuals.

This Article tackles this issue of vaccine hesitancy, which is an important component in the timeline of efforts to contain and mitigate the coronavirus. Although vaccine hesitancy is a nuanced topic, two main forms of vaccine hesitancy exist: (1) long standing mistrust of the government by minority populations and (2) individual misperception of risk. The first form is critically important, but is the focus of the work of other scholars, such as Ruqaiijah Yearby and Seema Mohapatra. It is this second form of vaccine hesitancy that is addressed in this Article. This concept of vaccine hesitancy is not new; it was predictable that hesitancy toward the COVID-19 vaccine would exist. But the missteps described above, such as holding rallies, telling the public that young people are immune, delaying widespread testing, and not implementing NPIs earlier all contributed to the public's inability to appropriately assign risk to the COVID-19 vaccine and the risk of the vaccine-preventable disease. This Article contributes to the important work on vaccine hesitancy and decision-making.

III. THE SCIENCE OF COVID-19

Understanding the science is a critical component of assigning evidence-based risk. Understandably, however, the non-scientific community may not always comprehend the technical science of medical interventions, so they end up believing information provided to them—whether it is correct or not. Without understanding the applicable science, the public has no way to know how to sift through information, understand policy, and appropriately assign risk.

For the sake of terminology, the term COVID-19 refers to the disease. The virus that causes the COVID-19 disease is called SARS-CoV-2. This is similar to HIV/AIDS: HIV is the virus that causes the disease AIDS. Here, similarly, SARS-CoV-2 is the virus that causes the disease COVID-19. This Article will seek to use the term SARS-CoV-2 (or novel coronavirus) when discussing the virus and the term COVID-19 when referring to the disease.

What do we know about SARS-CoV-2/COVID-19? Scientists know some, but not all, of how this virus works.[95] SARS-CoV-2 is an RNA virus, which means that it encodes strands of nucleotides that are translated into proteins. The sequencing of the virus tells us not only how the virus works, but also how it spilled over into humans, how it spreads, and how it adapts.[96] Without explaining the basics of how RNA encodes the amino acids that form the proteins, let us just focus on the proteins created by

(Mar. 30, 2021), https://www.youtube.com/watch?v=iEDXfzl21Yo [https://perma.cc/WBU9-BD95] (remarks by David O'Connor).

[95]The complete SARS-CoV2 genome was published on January 7, 2020. *Severe acute respiratory coronavirus 2 isolate Wuhan-Hu-1, complete genome*, NCBI (Mar. 18, 2020), https://www.ncbi.nlm.nih.gov/nuccore/MN908947 [https://perma.cc/7AH8-UQ9U].

[96]Michael A. Martin et al., *Insights from SARS-CoV-2 sequences*, 371 Science 466, 466-67 (2021), https://science.sciencemag.org/content/371/6528/466 [https://perma.cc/RS2S-UR3M].

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SARS-CoV-2. SARS-CoV-2 appears to encode twenty-four proteins.[97] At least four of these proteins have uncertain roles or their potential roles are highly speculative.[98] Several of the proteins function to assemble the virus. One protein, called Spike, allows the virus to attach to and infect human cells.[99] In other words, Spike is important to infection, and thus became the target for vaccine development.

The Spike protein is the target for the three main vaccines available in the U.S.: Pfizer, Moderna, and J&J; the Spike protein is also the target for other vaccines developed around the world. The three U.S. vaccines function in practically identical ways, although they utilize different molecular techniques. Notably, the molecular techniques in the Pfizer and Moderna mRNA vaccines are novel, which may explain some of the vaccine hesitancy, discussed herein.

Broadly, the vaccines contain a portion of the molecular code of the Spike protein—but not any other part of the SARS-CoV-2 virus. This snippet of the code for the Spike protein is injected into a person and the person's immune system recognizes a foreign object and prepares antibodies to fight the offensive intruding object. In so doing, the body's immune system creates a response to the Spike protein. However, since the vaccine does not contain the full virus, no actual infection occurs. Upon mounting the defense to the injected snippet, the human immune system places this defense into its memory so that it can quickly recall how to defend the body should the body see this Spike protein again. Thus, vaccines do not prevent subsequent infections, but allow the body to fight off any infection quickly. This is why the COVID-19 vaccines are highly effective against severe symptoms of COVID-19, but not necessarily effective against initial infection. Further, to date, the Moderna, Pfizer, and J&J vaccines appear effective against the emerging variants (*e.g.*, alpha, beta, gamma, delta, etc.).[100]

From a public health perspective, the introduction of effective vaccines was a milestone, but it also created a race to inoculate as quickly as possible. In the currently known variants, the virus appears not to be able to mutate the coding sequence for portions of the Spike protein (the target for the vaccines) too much because then the virus will not be able to infect its host.[101] Thus, variants will continue to arise and potentially be more virulent (or infectious), but to date, the variants are still targeted by the vaccines.[102]

The discovery of effective vaccines (and therapeutics) is critical to resolving the pandemic.[103] If, for example, a new variant emerges that is outside of the scope of the

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[97]Yang Zhang, *Genome-wide Structure and Function Modeling of SARS-CoV-2 Virus*, U. Mich., [hereinafter "Zhang Lab"] https://zhanglab.ccmb.med.umich.edu/C-I-TASSER/2019-nCov/ [https://perma.cc/GH58-HJK8].

[98]*Id.*; Chengxin Zhang et al., *Protein Structure and Sequence Reanalysis of 2019-nCoV Genome Refutes Snakes as Its Intermediate Host and the Unique Similarity between Its Spike Protein Insertions and HIV-1*, 19 J. Proteome Res. 1351, 1355 (2020).

[99]Zhang Lab, *supra* note 97; Zhang et al., *supra* note 98.

[100]*See Do COVID-19 vaccines protect against the variants?*, Mayo Clinic, (May 5, 2022), https://www.mayoclinic.org/coronavirus-covid-19/covid-variant-vaccine [https://perma.cc/7FHR-DRXB]; *Tracking SARS-CoV-2 variants*, World Health Org. (July 6, 2021), https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/ [https://perma.cc/TNY8-AMBW].

[101]*Id.*

[102]*Vaccine efficacy, effectiveness and protection*, World Health Org. (July 14, 2021), https://www.who.int/news-room/feature-stories/detail/vaccine-efficacy-effectiveness-and-protection [https://perma.cc/S3H5-ZZGA] ("Based on what we know so far, vaccines are proving effective against existing variants, especially at preventing severe disease, hospitalization and death. However, some variants are having a slight impact on the ability of vaccines to guard against mild disease and infection.").

[103]See Tanya Albert Henry, *COVID-19 therapeutics: What the evidence shows*, Am. Med. Ass'n (Mar. 29, 2021), https://www.ama-assn.org/delivering-care/public-health/COVID-19-therapeutics-what-evidence-shows [https://perma.cc/TU7N-53KH] ("Effective vaccines mean that the COVID-19 pandemic may be more controlled in the coming months, but the SARS-CoV-2 virus will likely remain a part of our everyday

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vaccine, then effective therapy will be even more critical. In addition, vaccines are highly effective, but not completely effective, thus some vaccinated individuals may require treatment upon infection.[104] The unequal access to vaccines worldwide also dictates the need for therapeutics.[105] Also, some individuals will refuse to be vaccinated or may have a medical condition that does not allow vaccination, which is yet another reason to need therapeutics.[106] The list can continue, but in sum, a combination of vaccines and therapeutics are needed. Understanding the science of the virus is critical to solving the current pandemic—at least from the scientific side. The individual perception of risk of vaccines and therapeutics is critical to solving the current pandemic. Vaccine-hesitancy is its own legal policy challenge, discussed herein.[107]

From an evidence-based risk assessment analysis, the vaccines are safe and effective and the risk of the disease of COVID-19 is high—the benefits of the vaccines greatly outweigh the risks.[108] COVID-19 presents an interesting case study for vaccine hesitancy because sometimes vaccine hesitancy can be attributed to the fact that people do not have the personal experience to understand the risk of the vaccine-preventable disease, but with COVID-19, many do.[109] Thus, at first blush, the experience of a pandemic might allow people to appropriately assign the risk of disease. But, for some vaccine-hesitant individuals, the COVID-19 daily death toll was not convincing. As discussed above and below, this may partially be attributed to the mishandling of the pandemic from the beginning. The public received mixed messages across the board—concerning whether NPIs were important, whether young people were immune to the virus, and whether they needed to stay at home. This likely contributed to individual's misperception of risk of COVID-19 and the importance of the vaccine as a public health measure.

This Article posits that understanding why individuals inappropriately assign risk to the COVID-19 vaccine will provide important information to create interventions to allow individuals to appropriately assign risk. The decisionmaking process is complex, as

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lives. That makes it important for physicians to have therapeutics in their toolbox to treat patients at all stages of disease progression—today, as well as in the future.").

[104]*COVID-19 Vaccine Effectiveness*, Ctrs. for Disease Control & Prevention (Dec. 17, 2021), https://covid.cdc.gov/covid-data-tracker/#vaccine-effectiveness [https://perma.cc/SH6A-J48W] ("Getting vaccinated against COVID-19 helps protect people from getting sick or severely ill with COVID-19 and can also help protect the people around them. CDC continues to monitor how well the vaccines are working.")

[105]See Atthar Mirza & Emily Ruahala, *Here's just how unequal the global coronavirus vaccine rollout has been*, Wash. Post (Apr. 22, 2021), https://www.washingtonpost.com/world/interactive/2021/coronavirus-vaccine-inequality-global/ [https://perma.cc/43PQ-4HGH].

[106]Shingai Machingaidze & Charles Shey Wiysonge, *Understanding COVID-19 vaccine hesitancy*, 27 Nat. Med. 1338, 1338 (2021) ("Promoting the uptake of vaccines (particularly those against COVID-19) will require understanding whether people are willing to be vaccinated, the reasons why they are willing or unwilling to do so, and the most trusted sources of information in their decision-making."); *COVID-19 Vaccines for People with Allergies*, Ctrs. for Disease Control & Prevention (Mar. 25, 2021), https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/specific-groups/allergies.html [https://perma.cc/67ZX-RASV].

[107]Lindsay Kalter & Ralph Ellis, *CDC: COVID-19 Is A 'Pandemic of the Unvaccinated'*, Web MD (July 16, 2021), https://www.webmd.com/lung/news/20210716/delta-variant-rising-COVID-case-counts-every-state [https://perma.cc/8EVN-CFS5] ("COVID-19 cases are continuing to spike in communities where vaccination rates are low, leading to what CDC Director Rochelle P. Walensky, MD, called 'a pandemic of the unvaccinated.'").

[108]*Learn More about COVID-19 Vaccines From the FDA*, U.S. Food & Drug Admin. (July 12, 2021), https://www.fda.gov/consumers/consumer-updates/learn-more-about-COVID-19-vaccines-fda [https://perma.cc/VGR3-F3M6] (" … the FDA determined that the available data for each vaccine provides clear evidence that the known and potential benefits outweigh the known and potential risks of each vaccine.").

[109]COVID-19 daily death counts were in the thousands at times. *See COVID-19 Projections*, Inst. for Health Metrics & Eval., (July 19, 2021), https://COVID19.healthdata.org/united-states-of-america?view=infections-testing&tab=trend&test=infections [https://perma.cc/KLB3-Z7FL].

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described below, and is the focus of this Article, especially as it relates to COVID-19 vaccine hesitancy.

IV. DECISION-MAKING THEORIES AND PERCEPTIONS OF RISK

How members of the public perceive risk is critical to understanding the range of reactions to this public health crisis and the attendant interventions and policies that need to be developed. Decades of research on decision-making illuminates how people perceive risk, including how individuals inappropriately assign risk even in the face of evidence-based risk assessment. Four decision-making theories –affect, ambiguity, cultural cognition, and heuristics/dual process—are empirically tested theories, which are recognized in legal and scientific literature. An overview of each theory is provided below. Importantly, the scholars in each of these areas often collaborate and recognize that multiple decision-making theories can co-exist and that one process may dominate at one time or another time.[110] This overview is important as Parts V and VI will utilize these decision-making theories to explain the public's (mis)perception of risk and provide a normative framework that can guide legal policymakers in the area of COVID-19 vaccine hesitancy.

A. Affect

The Affect Heuristic, a term coined by Paul Slovic and colleagues, explains how emotion underscores risk perception.[111] In this theory, a "faint whisper of emotion," known as affect, impacts decision-making.[112] Work by Slovic and others demonstrates that people want to experience and replicate positive emotions and, conversely, people do not want to experience and replicate negative feelings.[113] If a person experiences a faint whisper of a negative emotion, they are more likely to assign a high risk and low benefit to the decision, such that they, in essence, reject the proposition.[114]

Unsurprisingly, emotion impacts how people perceive situations. This can arise in many situations. For example, some people fear flying, even though the car drive to the airport is statistically more dangerous.[115] This can be attributed, in part, to the dread of a

[110]Daniel Kahneman, Thinking Fast and Slow 137–45 (2011) ("Paul Slovic probably knows more about the peculiarities of human judgment of risk than any other individual. His work offers a picture of Mr. and Ms. Citizen that is far from flattering: guided by emotion rather than by reason, easily swayed by trivial details, and inadequately sensitive to differences between low and negligibly low probabilities.").

[111]Paul Slovic & Ellen Peters, *Risk Perception and Affect*, 15 Current Directions Psychol. Sci. 322, 322 (2006) ("Fortunately, most of the time people are in a calmer state, being guided by much subtler feelings. We shall focus this review on a 'faint whisper of emotion' called *affect.* We use the term affect to mean the specific quality of 'goodness' or 'badness' (a) experienced as a feeling state (with or without consciousness) and (b) demarcating a positive or negative quality of a stimulus. We have used the term 'the affect heuristic' to characterize reliance on such feelings."); Paul Slovic et al., *The Affect Heuristic*, 177 Eur. J. Operational Res. 1333, 1333–35 (2007).

[112]Slovic & Peters, *supra* note 111.

[113]*See* Ellen Peters et al., *Affect and Decision Making: A "Hot" Topic*, 19 J. Behav. Decision Making 79, 81–82 (2006).

[114]*See* Slovic & Peters, *supra* note 111, at 322 ("fear amplifies risk estimates"); Paul Slovic, *Perception of Risk*, 236 Sci. 280, 283, 285 (1987) ("Factor 1, labeled 'dread risk' is defined at its high (right-hand) end by perceived lack of control, dread, catastrophic potential, fatal consequences, and the inequitable distribution of risks and benefits. Nuclear weapons and nuclear power score highest on the characteristics that make up this factor."); *see also* Michael Siegrist & Bernadette Sutterlin, *Human and Nature-Caused Hazards: The Affect Heuristic Causes Biased Decisions*, 34 Risk Analysis 1482, 1488-89 (2014).

[115]*See, e.g.*, Slovic & Peters, *supra* note 111, at 323 (describing work by Alhakami and Slovic in which they found an inverse relationship between perceived risk and perceived benefit, in other words, that people assign a low benefit to a perceived high risk. "This finding implies that people judge a risk not only by what they think about it but also by how they feel about it. If their feelings toward an activity are favorable, they

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plane crash. While planes rarely crash, when they do, it is a major news story. Over 30,000 people die annually in car crashes and many more are seriously injured.[116] Yet, people do not appropriately assign the risk of flying compared to driving.[117]

Linking emotion to vaccine hesitancy may help explain how feelings of dread impact how a parent assigns risk to childhood vaccines, for example.[118] Some parents feel dread associated with a vaccine, although, irrationally not with the vaccine preventable disease.[119] If evidence-based assessment of risk was the driving factor, parents would dread the disease more than the childhood vaccines. The Affect Heuristic likely applies to the COVID-19 vaccine hesitancy. For example, fake information regarding COVID-19 vaccines and their purported impact on fertility (to be clear, there is no proven link) can conjure up the feeling of dread or fear in an individual's mind.[120] The individual assigns a high risk to the COVID-19 vaccine and a low risk to the disease, a risk perception that is not in line with evidence-based risk assessment.[121]

B. Ambiguity

Ambiguity aversion, with important work pioneered by Daniel Ellsberg, demonstrates that when a person receives conflicting information, they are unable to appropriately assign risk.[122] The additional component to this theory is that people are more comfortable with the known, even if it has a higher risk, than the unknown, even if that likely has a lower risk. For example, in a provocative thought experiment, Ellsberg demonstrated that people prefer to bet on a known ratio compared to an unknown ratio.[123]

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tend to judge the risks as low and the benefits as high; if their feelings toward the activity are unfavorable, they tend to make the opposite judgment-high risk and low benefit (i.e. the affect heuristic [internal citation omitted].").

[116] *Annual United States Road Crash Statistics*, Ass'n for Safe Int'l Road Travel (July 20, 2021), https://www.asirt.org/safe-travel/road-safety-facts/ [https://perma.cc/P68E-AGC9] ("More than 38,000 people die every year on U.S. roadways' … An additional 4.4 million are injured seriously enough to require medical attention.").

[117] David Sharpardson, *Aviation deaths rise worldwide in 2020 even as fatal incidents, flights fall*, Reuters (Jan. 1, 2021, 3:57 PM) ("Aviation consulting firm To70 said in 2020 there were 40 accidents involving large commercial passenger plants, five of which were fatal, resulting in 299 fatalities.").

[118] The false link between vaccines and autism has perpetuated feelings of fear and dread. *See, e.g.*, A.J. Wakefield et al., *Ileal-lymphoid-docular hyperplasia, non-specific colitis, and pervasive developmental disorder in children*, 351 Lancet 637, 637–41 (retracted) (1998).

[119] Joanna K. Sax, *Biotechnology and Consumer Decision-Making* 47 Seton Hall L. Rev. 433, 447 (2017).

[120] Andrew Satin & Jeanne Sheffield, *The COVID-19 Vaccine and Pregnancy: What You Need to Know*, Hopkins Med. (Aug. 23, 2021), https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/the-COVID19-vaccine-and-pregnancy-what-you-need-to-know [https://perma.cc/6E5F-CF76] ("No, getting the COVID-19 vaccine will not affect your fertility. […] Confusion around this issue arose when a false report surfaced in social media saying that the spike protein on this coronavirus was the same as another spike protein called syncitin-1 that is involved in the growth and attachment of the placenta during pregnancy.").

[121] *See, e.g., id.* ("During the Pfizer vaccine tests, 23 women volunteers involved in the study became pregnant, and the only one in the trial who suffered a pregnancy loss had not received the actual vaccine, but a placebo."). The assignment of a low risk to the COVID-19 vaccine can also be connected to the mishandling of the pandemic by the federal government, including, for example, the statements by President Trump that young people are immune and that the virus will disappear. See discussion *supra*, Part II.

[122] Daniel Ellsberg, *Risk, Ambiguity, and the Savage Axioms*, 75 Q. J. Econ. 643, 657 (1961).

[123] *Id.* at 656. In this experiment, participants were presented to two urns, one with a known ratio of white and red marbles and another urn with an unknown ratio. When asked which urn the participants preferred to obtain a red marble, the participants preferred the urn with the known ratio. Of course, the urn with the unknown ratio may have only had red marbles in it—which would mean that their chances of picking the winning marble color was one hundred percent. Nevertheless, Ellsberg demonstrated the aversion to unknown information, even if a chance existed that the unknown information provided a lower risk. *Id.*

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Ambiguity aversion helps us to understand how people assign risk when presented with conflicting information.[124] For example, if parents are presented with information about vaccines, like that vaccines are very safe and effective, but also that there is some risk of infection at the injection site and that physicians cannot promise that there will never be any other side effects, parents may receive this information as ambiguous and assign a higher risk than warranted.[125] The inability to say that no risk exists is perhaps the very thing that leads to ambiguity aversion and underscores why people might assign a high risk, even when the evidence-based risk assessment is low. Such is the case with vaccines, for example. Important work by Blaisdell and colleagues demonstrated that ambiguity aversion underscores why vaccine hesitant parents decline to vaccinate.[126]

Empirical studies demonstrate the link between ambiguity aversion and vaccine hesitancy. In a study using focus groups, Blaisdell and colleagues learned that vaccine-hesitant parents could not appropriately assign risk.[127] For example, vaccine hesitant parents resisted vaccinating their child(ren) because the parents thought that their child was not at risk of contracting a vaccine preventable disease.[128] Or, they thought that if their child contracts a vaccine preventable disease, then they could just take their child to the hospital for treatment.[129] Evidence based assessment of risk, however, does not support the decisions of the vaccine-hesitant parents.

Ambiguity aversion may also explain COVID-19 vaccine hesitancy. An individual may assign a low risk to COVID-19 and not receive the vaccine if, for example, they are young and think the risk of a major onset of the disease is low. This not only discounts the risk of the disease but ignores that asymptomatic, individuals can still spread the disease to others.[130] The more spread, the more likely variants will develop, thus the need for universal vaccination, regardless of risk factors.[131]

Ambiguity aversion may also help explain how individuals misperceive risk when they obtain false and misleading information from the internet. If an individual reads information that the government is trying to micro-chip people via vaccine or any other similar type of conspiracy theory, then that individual may not be able to appropriately discount that information.[132] The individual may assign a high risk and low benefit to the COVID-19 vaccine. A (mis)perception that is not based on evidence-based assessment of risk.

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[124] *Id.*; *see also*, Colin Camerer & Martin Weber, *Recent Developments in Modeling Preferences: Uncertainty and Ambiguity*, 5 J. Risk & Uncertainty 325, 333–41 (1992) (describing empirical studies of ambiguity).

[125] *See* Laura L. Blaisdell et al., *Unknown Risks: Parental Hesitation about Vaccination*, 36 Med. Decision Making 479, 480 (2016).

[126] *Id.*

[127] *Id.* at 482.

[128] *Id.*

[129] *Id.*

[130] Angela Betsaida B. Laguipo, *Over half of COVID-19 cases are spread by asymptomatic carriers, CDC study finds*, News Med. (Jan. 11, 2021), https://www.news-medical.net/news/20210111/Over-half-of-COVID-19-cases-are-spread-by-asymptomatic-carriers-CDC-study-finds.aspx [https://perma.cc/M2CJ-4KCY] ("In a new study conducted by researchers at the U.S. Centers for Disease Control and Prevention (CDC), over half of SARS-Co-V-2 infections are believed to be transmitted asymptomatically.").

[131] *See, e.g.*, Daniel C. DeSimone, *COVID-19 variants: What's the concern?*, Mayo Clinic (July 15, 2021), https://www.mayoclinic.org/diseases-conditions/coronavirus/expert-answers/COVID-variant/faq-20505779 [https://perma.cc/356S-JNKV].

[132] Jack Goodman & Flora Carmichael, *Coronavirus: Bill Gates "microchip" conspiracy theory and other vaccine claims fact checked*, BBC (May 30, 2020), https://www.bbc.com/news/52847648 [https://perma.cc/9HSB-SGT2] ("A new YouGov poll of 1,640 people suggest that 28% of Americans believe that Bill Gates wants to use vaccines to implant microchips in people—with the figure rising to 44% among Republicans.").

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C. Cultural Cognition

Cultural cognition, with work spearheaded by Dan Kahan at Yale University's Cultural Cognition Project, groups people based on four identities; the participants perceive risk in a way that advances the wellbeing of their group.[133] These identities correspond with philosophical categories: individualism, hierarchy, communitarianism, and egalitarianism.[134] Work by Kahan and colleagues recognizes that a particular individual may associate with more than one philosophical belief, but that even if an individual overlaps between one or more groups, their perception of risk can still be aligned with their place on the philosophical grid.[135]

The underlying idea behind cultural cognition is that people identify with philosophical categories and their placement in these categories helps us to understand or predict their perception of risk.[136] While cultural cognition does not rely on demographic factors as a predictive marker, it is likely that demographic factors contribute to the placement within a philosophical category. For example, white males, given their historical role, may be more individualistic compared to other demographic groups.

Kahan, along with work by others, suggests that to align the public's perception of risk with evidence-based assessment of risk, the evidence must be presented in a way that aligns or affirms the philosophical group's identity—fact sheets generally do not do this.[137] The method of communication is important. If the facts are communicated in a manner that affirms the group's identity, then it is more likely that the people in that group will appropriately assign risk. The communication of the same facts to the egalitarian group and the individualistic group would look quite different, even though the underlying facts are the same.[138]

Cultural cognition can help us understand vaccine hesitancy as well. Previous studies demonstrate that some individuals, depending on where they are on the group-grid configuration, may be skeptical of new technology.[139] This can potentially translate to the COVID-19 vaccine, which, at least for Pfizer and Moderna, has been lauded for being able to capture mRNA technology.[140] The "newness" of the technology can actually be the very reason that particular groups may assign a high risk and low benefit to the COVID-19 vaccines.

D. Dual Process Theory and Heuristics

Dual Process theory, with important work by Daniel Kahneman and Amos Tversky, explains that people utilize two forms of thinking, one fast and one slow.[141] Fast thinking relies on heuristics, like things that people can easily recall.[142] Often fast thinking

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[133] Dan M. Kahan, *Cultural Cognition as a Conception of the Cultural Theory of Risk*, *in* Handbook of Risk Theory 726, 726–28 (S. Roeser et al. eds., 2012).

[134] *Id.* at 727 fig.28.1 (showing the group-grid scheme).

[135] *Id.* at 734–35.

[136] *Id.* at 727.

[137] Dan M. Kahan et al., *Cultural Cognition of the Risks and Benefits of Nanotechnology*, 4 Nature Nanotechnology 87, 88 (2008).

[138] Kahan, *supra* note 133, at 753.

[139] *See, e.g.*, Kahan et al., *supra* note 137, at 87.

[140] *See supra* Part III.

[141] Kahneman, *supra* note 110 ("*System 1* operated automatically and quickly, with little or no effort and no sense of voluntary control. *System 2* allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.").

[142] *Id.* at 58.

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is useful, but it also leads to errors. Slow thinking requires deliberation and energy.[143] Slow thinking is called upon when the fast thinking process fails, such as when presented with a more complicated math problem, or when one deliberately engages the slow thinking process. Deliberately engaging the slow thinking process is not necessarily natural.

One way that fast thinking operates is to rely on heuristics, discussed more fully below. People may make quick decisions by relying on biases created throughout their life. For example, people may associate certain characteristics with specific professions. Kahneman and Tversky demonstrated that if subjects are presented with a hypothetical person with certain characteristics, such as shyness, withdrawn, and helpful and then presented with choices of that person's professions, people are likely to choose the answer choice of librarian over an answer choice of physician.[144] This is an interesting result given that there are more physicians than librarians. These experiments demonstrate that people rely on heuristics compared to statistical data, such as population size and percentage of physicians compared to librarians.[145] Other biases, or heuristics, also inform fast thinking.

Slow, or deliberative, thinking requires that people overcome their heuristics. In some cases, this is easy because the decision itself cannot rely on a heuristic, such as solving a complicated math problem.[146] In other cases, it is much more difficult to move from fast thinking to slow thinking. For example, it may be difficult to switch from fast thinking to slow thinking in facial recognition.[147] The fast thinking involved in facial recognition is part of our evolutionary development to quickly analyze and make decisions.[148] But, biases are involved in facial recognition. To switch to slow or deliberative thinking for something such as facial recognition poses challenges. Also challenging is to understand how people learn to "think slow."[149] This slow, or deliberative process, may be needed to help the public align their perception of risk with evidence-based assessment of risk.

Fast and slow thinking can help explain vaccine hesitancy as well. If, for example, someone knows an individual who suffered a strong reaction to the COVID-19 vaccine, then fast thinking may result in vaccine hesitancy. Another way in which fast thinking, or relying on a heuristic, could be employed is if someone knows an individual who got COVID-19, but had no or mild symptoms. That person may assign a low risk to the disease and a low benefit to the vaccine; thus, they might decline to be vaccinated. Or, if a person received messaging from government officials that young people are immune to COVID-19 or that the virus will soon disappear, relying on this information they might assign a low risk to the disease and a low benefit to the vaccine. Or, if individuals receive messaging that the COVID-19 vaccine is unsafe, then individuals might assign a high risk to the vaccine. Conversely, slow thinking might prompt the individual to consider the systemic risk of community transmission as a reason to be vaccinated, regardless of their individual risk.[150] In addition, the science behind the vaccines, discussed in Part III, allows the assignment of low risk to the vaccine, which might also require slow thinking to consider the mechanism of vaccines.

[143] *Id.* at 29-30.
[144] *Id.* at 4.
[145] *Id.*
[146] *Id.* at 19-20.
[147] *Id.*
[148] *Id.* at 21-22.
[149] *Id.* at 354-62.
[150] *See, e.g.*, *id.*

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Tversky and Kahneman's work demonstrates how bias influences decisionmaking.[151] While numerous biases exist, Tversky and Kahneman discuss the biases that impact risk perception: representativeness, availability, and adjustment and anchoring.[152] A large body of work discusses these heuristics, but for brevity, each bias is summarized here. Representativeness occurs when an individual associates certain characteristics with a particular class.[153] Availability bias occurs when an individual is influenced by the ease with which they can bring the frequency or probability of an event to their mind.[154] Adjustment and anchoring biases occur when individuals start with an initial value and then adjusts.[155] These are cognitive biases that impact the heuristics that individuals rely on to make their decisions as it relates to their perception of risk.

So, for example, if an individual knows someone who had a terrible experience with COVID-19, this can anchor that individual's perception of risk of contracting COVID-19. Or, on the other hand, if an individual knows someone who was asymptomatic with COVID-19, then their anchor will be different. The first individual might perceive a high risk of contracting COVID-19, while the second individual might perceive a low risk. This could also be the case with the COVID-19 vaccine. If an individual knows someone who experienced a terrible reaction to the COVID-19 vaccine, then they might assign a high risk to the vaccine. Conversely, if someone knows someone who had a mild reaction, they might assign a low risk. These biases can be layered. An individual might know someone who had an asymptomatic case of COVID-19 and know someone else who had serious side effects from the vaccine, this person might perceive low risk of the disease and a high risk of the vaccine. These heuristics might further be influenced by the messaging from federal, state, and local officials during the pandemic and social media.

E. Decision Making Theories and New Variables

Decision-making is dynamic[156] and in some cases, multiple theories may explain any decision at any time. In other cases, one decision-making theory may dominate a particular decision, but the person may make different decisions at other times for different underlying reasons. In sum, all these processes, as well as others, help us understand how people perceive risk. This is important for policy implementation.

The big question then becomes how to align the public's perception of risk of the COVID-19 vaccine with the evidence-based assessment of risk. The decision-making theories described above are the basis of the way we can analyze and understand individual (mis)perception of risk as compared to evidence-based assessment of risk. This Article posits that variables that are either untested or incompletely tested may contribute as well. These variables are (1) the rise of individualism, (2) internet, and (3) economic forces.[157]

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[151] Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, *in* Judgement Under Uncertainty: Heuristics and Biases 3 (Daniel Kahneman et al. eds., 1982) ("This article shows that people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors.").

[152] *Id.* at 4, 11, 14.

[153] *Id.* at 4.

[154] *Id.* at 11.

[155] *Id.* at 14.

[156] *See, e.g.*, Kahneman, *supra* note 110 at 137-45 ("Paul Slovic probably knows more about the peculiarities of human judgment of risk than any other individual. His work offers a picture of Mr. and Ms. Citizen that is far from flattering: guided by emotion rather than by reason, easily swayed by trivial details, and inadequately sensitive to differences between low and negligibly low probabilities.").

[157] Joanna K. Sax, *The Problems with Decision-Making*, 56 Tulsa L. Rev. 40, 65-73 (2020).

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The next Part connects the factual background in Part II and what we understand about decision-making and perception of risk with the science of COVID-19 and/or the mRNA vaccines and the evidence-based assessment of risk. This Article draws on previous work that suggests that these modern-day variables of individualism, internet, and economics, be evaluated to understand how individuals receive information and the ways in which it can help explain the disconnect between individual perception of risk and evidence-based assessment of risk.[158] Exploring these additional variables may also prove fruitful in creating policies, including interventions, that effectively allow individuals to appropriately assign risk.

V. MODERN DAY VARIABLES

Decades of attacks on science create fundamental challenges to align the public's perception of risk with evidence-based assessment of risk. This Article seeks to provide a roadmap out of the trajectory of misperception not only for the current public health crisis, but for the long-term ability to use evidence-based research to solve major problems, like climate change. Both COVID-19 and climate change require immediate action, but sectors of the public deny that climate change exists. Sectors of the public perceive COVID-19 as a hoax—an alarming impediment to action.[159] This problem of the public's misperception of risk has serious short-term and long-term consequences.

The failure of the federal response to this pandemic, described in Part II, helps to explain why it is so difficult to align some individuals' perception(s) of risk with evidence-based risk assessment.[160] In addition, a lack of understanding of how vaccines work, described in Part III, allowed misinformation to flourish. Without the ability to easily dismiss false statements about harms of vaccines, the individuals could not (or did not) take proper action. It is certainly not helpful and probably hurtful that the President's message to the public in January, February, March, and April of 2020 minimized the evidence-based risk assessment. In addition, the ability of the federal government to appropriately respond was crippled by years of underpreparing—and actually undoing—some processes put in place to address a global pandemic.[161]

These failures, as outlined in Part II, help to explain why members of the public did not understand the actual risk. The failure of the federal response was symbolic of the decades of the "war on science" that has crippled the public's ability to appropriately assign risk.[162]

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[158] *See id.* at 65-73.

[159] This problem is spurred, in part, by celebrity pundits spreading false information. Isaac Scher, *Dr. Oz is offering Trump advice for handling the coronavirus. Here are 8 times he's made false or baseless medical claims,* Business Insider (Apr. 8, 2020, 12:41 PM), https://www.businessinsider.com/dr-oz-false-misleading-baseless-medical-claims-coronavirus-2020-4 [https://perma.cc/87E7-7UGY].

[160] *See supra* Part III.

[161] Abigail Tracy, *How Trump Gutted Obama's Pandemic-Preparedness Systems*, Vanity Fair (May 1, 2020), https://www.vanityfair.com/news/2020/05/trump-obama-coronavirus-pandemic-response [https://perma.cc/W5U9-VEZH] ("But officials who worked on past crises and experts on pandemic response believe that Trump's dismissal—and in some aspects, wholesale discarding—of the Obama administration's preparedness structures and principles, and the current administration's ideas about government—that states could and should take take [sic] responsibility, that business could be more effective than government at solving problems at this scale—have left them dangerously unprepared.").

[162] *See, e.g.*, Joanna K. Sax, *The Separation of Politics and Science*, 7 Stan. J.L. Sci. & Pol'y 10, 14 (2014); *2004 Scientist Statement on Restoring Scientific Integrity to Federal Policy Making*, Union Concerned Scientists (July 13, 2008), https://www.ucsusa.org/resources/2004-scientist-statement-scientific-integrity [https://perma.cc/GT3C-2ZBR]. *See generally* CHRIS MOONEY, THE REPUBLICAN WAR ON SCIENCE (2005).

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The other end of the spectrum that underscores the problem of risk perception is that some states handled the problem very well, so the public could not understand why this pandemic required such extreme measures.

Both the under-preparedness of the federal response and the over-preparedness of the state responses possibly created some ambiguity in the real risk of the COVID-19 pandemic. This creates a firestorm in which it is very difficult to align the public's perception of risk with the evidence-based assessment of risk. This Article provides a description of some modern-day variables that likely contribute to (mis)perception of risk.

A. The Rise of Individualism and its Relationship to COVID-19 Vaccines

The rise of individualism refers to a change in society that occurred in the 1950s in which people broke out of their community structures.[163] In the 1950s, people often lived in tight knit communities where groupthink was the norm and individual expression received hostility. This allowed for a sense of community, but it also allowed for sexism and racism.[164] The Baby Boomer generation broke out of these norms, giving rise to anti-Vietnam protests and openness to the civil rights movement.[165] Thus, the rise of individualism created great social change, but with these positive developments also came some structural challenges, such as a liberty perspective that fails to understand that liberty is not absolute.

While community and society are not the same, the two are connected. To live in a civilized society, community rules and norms are needed. An example is the requirement to stop at a stop sign when driving; this is an organized method of driving to decrease accidents. Thus, to be part of a community and a society, people have individual liberty restrictions to preserve the larger community. Similarly, public health restrictions like immunization requirements have historically been used to protect the general public.[166] As stated in the foundational case, *Massachusetts v. Jacobson*:

> The liberty secured by the Constitution of the United States does not import an absolute right in each person to be at all times, and in all circumstances, wholly freed from restraint, nor is it an element in such liberty that one person, or a minority of persons residing in any community and enjoying the benefits of its local government, should have the power to dominate the majority when supported in their action by the authority of the State.[167]

The individualism referenced in this Article results from the misunderstanding of what liberty truly means—namely, mistakenly believing one's liberty is absolute, and acting without regard to societal obligations. So, what is a concrete example? The refusal to wear a mask in an indoor setting, such as an airplane, because this violates a personal sense of liberty.[168] The rule requiring a mask is similar to the rule that requires a driver to

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[163] David Brooks, The Second Mountain 6–20 (2019).

[164] *Id.*

[165] *Id.* at 10.

[166] *See, e.g.*, *Immunization Requirements*, Calif. Dep't Educ. (Nov. 17, 2020), https://www.cde.ca.gov/ls/he/hn/immunization.asp [https://perma.cc/KGS5-78EJ].

[167] *Jacobson v. Massachusetts,* 197 U.S. 11, 11 (1905). In this case, decided in 1905, the Court addressed whether a smallpox vaccine mandate was constitutional. The Court held that a small pox vaccine mandate was enforceable pursuant to the state's 10th amendment police power. *Id.* Importantly, the court focused on the data to support vaccination as a way to protect the community. *Id.*

[168] *See, e.g.*, Hugo Martín, *Ruckus in the skies: What happens when airline passengers refuse to wear masks*, L.A. Times (May 5, 2021, 3:10 PM), https://www.latimes.com/business/story/2021-05-05/airline-passengers-mask-rules-faa-fine-zero-tolerance [https://perma.cc/PK4S-EHGW].

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stop at a stop sign: the purpose is to create a safe environment where others can also use the space.

This individualism might be a variable in the vaccine hesitancy to the COVID-19 vaccine. An injection of a vaccine confronts autonomy, not only so, but may be especially acute if it is mandatory.[169] But, the deeper issue explored herein is the sense that individuals do not feel a responsibility to their communities to be vaccinated to help slow the spread of a highly contagious and deadly virus. An individual might take the position that they are low-risk, that they already had COVID-19, that the pandemic is a hoax, that they do not want their child vaccinated, or any other position that focuses solely on themselves and not the community or society.

Much of this perception, or really misperception, of the risk of COVID-19 can be connected to the mishandling of the COVID-19 pandemic at the federal level, which allowed for individuals to take a myopic view. For example, in February 2020, the U.S. government knew that the novel coronavirus spread via human-to-human contact, but President Trump also held political rallies, where groups of people gathered together.[170] While states were instituting lock-downs, which require compliance by the community, President Trump was sending the message that the reason the U.S. had so many cases is because we are testing more people.[171] Components of the messaging by the federal government, particularly by President Trump, can be characterized as feeding individualism and down-playing the reality that community-based buy-in was needed to slow the spread of the novel coronavirus.

This individualism and its impact on decision-making is the variable that needs to be studied in the decision-making theories of affect, ambiguity aversion, cultural cognition, and dual process theory/heuristics, which will be discussed in Part VI.

B. The Role of the Internet

The role of the internet and its impact on society is a large topic and not one that can be completely investigated herein. However, some general observations about how information is presented to people and its impact on risk perception can be accomplished. The internet is a major source in which people obtain information.[172] Social media companies have algorithms that feed people information that appears to be in line with their searches.[173] In addition, automated programs and trolls contribute to the spread of misinformation through social media.[174] While some efforts were made by some social

[169]*See* Lois A. Weithorn, & Dorit Rubenstein Reiss, *Legal approaches to promoting parental compliance with childhood immunization recommendations*, 14 Hum. Vaccines & Immunotherapeutics 1610, 1613 (2018).

[170]*See, e.g.*, *Campaign 2020 President Trump Campaign Event in North Carolina, South Carolina*, C-SPAN (Feb. 28, 2020), https://www.c-span.org/video/?469663-1/president-trump-campaign-event-north-charleston-south-carolina [https://perma.cc/E822-2WES].

[171]Trump, *supra* note 67.

[172]A. W. Geiger, *Key findings about online news landscape in America*, Pew Rsch Ctr. (Sept. 11, 2019), https://www.pewresearch.org/fact-tank/2019/09/11/key-findings-about-the-online-news-landscape-in-america/ [https://perma.cc/7HNA-8836] ("The share of Americans who prefer to get their news online is growing. In 2018, 34% of U.S. adults said they preferred to get news online, whether through websites, apps, or social media. That's compared to 28% in 2016.").

[173]Matteo Cinelli et al., *The echo chamber effect on social media*, 118 Proc. Nat'l Acad. Sci. 1, 1 (2021).

[174]Ana S. Rutschman, *Social Media Self-Regulation and the Rise of Vaccine Misinformation*, U. Pa. J. L. & Innov. (forthcoming); *see also*, David A. Broniatowski et al., *Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate*, 108 Am. Pub. Health Ass'n 1378, 1378 (2018) (describing how bots and trolls creates confusion that users believe that scientific consensus may not exist for vaccines).

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media companies to combat this phenomenon, the results demonstrate that these approaches were too small and wholly insufficient to fully address the spread of misinformation on the internet.[175] The methodology of providing information to users on the internet is persuasive. While this Article will not delve into the proliferation of conspiracy theories online, the concept that people fall prey to what they read online is important and instructive.

Some false information about vaccines led Google to change its algorithm to provide more accurate information in search results.[176] This response by Google is an interesting one, and perhaps the right one, given that their typical algorithm might bring up websites with false information. But, this problem and the response by Google raise issues: *How are people receiving their information on the internet and who is controlling what information is put in front of them? Do we want Google, Facebook, and other service providers determining how information reaches people?* This is a complicated question without an easy answer.

Looking at the issue of vaccines alone, the internet is rife with false and misleading information.[177] Facebook groups for anti-vaxxers or vaccine hesitant parents exist.[178] Communities are formed in which like-minded people can limit their exposure to information that does not conform with their beliefs—reason and logic are left out of the equation.[179]

For the COVID-19 vaccines, false but plausible-sounding theories are spreading. For example, people can readily find information that the COVID-19 vaccine causes miscarriages on the internet, despite no evidence backing this claim.[180] Yet, women of childbearing age and parents of female children may be hesitant about receiving the COVID-19 vaccine—the result of a misunderstanding of risk assessment. Other theories exist that the government is trying to microchip us or that this is a master plot for the pharmaceutical industry to make money.[181] These theories, which are false, are

[175]Rutschman, *supra* note 174 (recognizing the problem of misinformation on social media and suggesting soft law approaches to combat it).

[176]George Johnson, *The Widening World of Hand-Picked Truths*, N.Y. Times (Aug. 24, 2015), http://www.nytimes.com/2015/08/25/science/the-widening-world-of-hand-picked-truths.html?_r=0 [https://perma.cc/H4XU-E2XD] ("Google recently tweaked its algorithm so that searching for 'vaccination' or 'fluoridation', for example, brings vetted medical information to the top of the results.").

[177]Shannon Bond, *Just 12 People Are Behind Most Vaccine Hoaxes on Social Media, Research Shows*, NPR (May 14, 2021, 11:48 AM), https://www.npr.org/2021/05/13/996570855/disinformation-dozen-test-facebooks-twitters-ability-to-curb-vaccine-hoaxes [https://perma.cc/SG8U-9T7U].

[178]*See* Ben Collins & Brandy Zadrozny, *Anti-vaccine groups changing into 'dance parties' on Facebook to avoid detection*, NBC News (July 21, 2021, 3:01 PM), https://www.nbcnews.com/tech/tech-news/anti-vaccine-groups-changing-dance-parties-facebook-avoid-detection-rcna1480 [https://perma.cc/L3KS-3ERX].

[179]*See* Steve Lubet, *"Let's Be Reasonable: A Conservative Case for Liberal Education,"* Faculty Lounge (June 21, 2021, 5:44 AM), https://www.thefacultylounge.org/2021/06/lets-be-reasonable-a-conservative-case-for-liberal-education.html [https://perma.cc/8J6F-RDKF] (discussing Let's be Reasonable, A Conservative Case for Liberal Education, Jonathan Marks).

[180]Samantha Putterman, *Social media post misrepresents preliminary data on miscarriages and COVID-19 vaccine*, PolitiFact (July 9, 2021), https://www.politifact.com/factchecks/2021/jul/09/facebook-posts/post-misrepresents-preliminary-data-miscarriages-a/ [https://perma.cc/7RNE-2XZ2]; *COVID-19: Effects of Vaccines on Fertility and Pregnancy Outcomes*, U Penn (May 28, 2021), https://www.med.upenn.edu/CEP/assets/user-content/documents/covid-reports/vaccine-and-fertility-update-final-(003).pdf [https://perma.cc/DKG9-375V] ("There is currently no evidence that COVID-19 vaccination causes any problems with pregnancy, including the development of the placenta."); *Myths and Facts about COVID-19 Vaccines*, Ctrs for Disease Control & Prevention (Dec. 15, 2021), https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html [https://perma.cc/Q6XN-S5KB].

[181]Ctrs for Disease Control & Prevention, *supra* note 180 ("Receiving a COVID-19 vaccine will not make you magnetic[.]").

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presented in a way that elicits fear and dread—a known emotion that impacts risk assessment—and sway people into refusing or resisting the COVID-19 vaccine.[182] The impact of these false theories may also create ambiguity: *What if the vaccine is later shown to impact fertility? Is it better to wait to be vaccinated?* As explained previously, people will inappropriately assign risk in the face of such ambiguity. A lack of understanding of how vaccines are developed and work enables the misinformation spread on the internet. Another misunderstanding spread on the internet about vaccines in general is that they will give you the very disease that they seek to prevent. Yet, with the currently used COVID-19 vaccines, which are not live-virus vaccines, it is impossible to get COVID-19 from vaccination.[183] However, a misunderstanding of the science may lead some to believe such a theory.

The CDC website has an entire page dedicated to addressing "myths and facts" about the COVID-19 vaccine.[184] Among the myths addressed on this webpage is whether receiving the COVID-19 vaccine will make someone magnetic, whether vaccines impact fertility and menstruation, whether the vaccine will make someone test positive for COVID-19, whether the vaccine will make a person sick, etc.[185] While the information on the CDC website is accurate and fact-based, it is unclear that it can really overcome the volume of misinformation presented on the internet, especially when the misinformation is presented in such a way that impacts how people assign risk.

Obtaining information from the internet also highlights the problems with the messaging from the federal government regarding the seriousness of COVID-19 and how to implement mitigation efforts. Users can live in an echo-chamber. For example, President Trump stated that "Young people are almost immune to this disease[]," such a statement can not only be reiterated on the internet, but can take on an entirely new meaning, such as that schools should be open with no COVID-19 restrictions.[186] Not only are young people *not* immune to this disease, but the statement discounts their role in community spread. Application of this variable, the role of the internet, to the decision-making theories is discussed in Part VI.

C. Economic Forces Supporting Vaccine Hesitancy

Some leaders of anti-vaccine movements are economically incentivized to spread misinformation about vaccines so they can make money from alternative products.[187] These products are usually branded as 'natural' or 'holistic' and are advertised as a

[182]Sahil Loomba et al., *Measuring the Impact of COVID-19 Vaccine Misinformation on Vaccination Intent in the UK and USA*, 5 Nature Hum. Behav. 337, 337 (2021).

[183]Ctrs for Disease Control & Prevention, *supra* note 180.

[184]*Id.*

[185]*Id.*

[186]Donald Trump, *Remarks by President Trump in Press Briefing*, Trump White House Archives (July 30, 2020) https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-press-briefing-july-30-2020/ [https://perma.cc/N8AJ-PV24].

[187]*See* Elizabeth Dwoskin & Aaron Gregg, *The Trump administration bailed out prominent anti-vaccine groups during a pandemic*, Wash. Post (Jan. 18, 2021), https://www.washingtonpost.com/business/2021/01/18/ppp-loans-anti-vaccine/ [https://perma.cc/ALS2-47NC] ("[f]ive prominent anti-vaccine organizations that have been known to spread misleading information about the coronavirus received more than $850,000 in loans from the federal Paycheck Protection Program [PPP], raising questions about why the government is giving money to groups actively opposing its agenda and seeking to undermine public health during a critical period.").

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safe alternative to the dreadful vaccines.[188] This is a big share of our marketplace and a go-to alternative for 'anti-vaxxers' and vaccine hesitant people.

A main platform to spread vaccine misinformation and promote scientifically unproven alternatives is the internet. Thus, the economic forces are, not surprisingly, tied into the larger problems created by the internet, discussed above.[189] A leading anti-vaccine group, the National Vaccine Information Center, is largely funded by an osteopathic physician, Joseph Mercola, who "has amassed a fortune selling natural health products, court records show, including vitamin supplements, some of which he claims are alternatives to vaccines."[190] There is no scientific support for 'alternatives to vaccines.'[191]

These platforms that tout misinformation and hock their wares influence people to forgo or delay vaccination.[192] These purported alternatives play on the recipient's emotions. The sellers provide misinformation about vaccines that elicit feelings of dread and then provide purported alternatives that sound safe because they are 'natural.' 'Natural' does not mean safe and it does not mean effective,[193] but the word is associated with those characteristics.

The economic forces that support and promote vaccine refusal and vaccine hesitancy are not new; other industries utilize the same methods. The tobacco industry is a prime example of deception.[194] Some of the tactics included the creation of their own-self-serving publications that publish articles by their paid so-called 'scientists.'[195] Other tactics included undermining the funding mechanisms for scientists who conducted anti-tobacco research.[196] The tobacco industry also commercialized the benefits of smoking and completely lied about the effects of second-hand smoke.[197] These deceptive practices —publication, promotion, commercialization, vilifying opponents—are all used by some people/groups in the 'anti-vaxx' movement.[198] Similarly, individuals can find websites

[188]Geoff Brumfiel, *For Some Anti-Vaccine Advocates, Misinformation is Part of a Business,* NPR (May 12, 2021, 5:08 AM), https://www.npr.org/sections/health-shots/2021/05/12/993615185/for-some-anti-vaccine-advocates-misinformation-is-part-of-a-business [https://perma.cc/N4NC-TY2A].

[189]These variables may be strongly connected. *Id.*

[190]Neena Satija & Lena H. Sun, *A major funder of the anti-vaccine movement has made millions selling natural health products*, Wash. Post (Nov. 16, 2019), https://www.washingtonpost.com/investigations/2019/10/15/fdc01078-c29c-11e9-b5e4-54aa56d5b7ce_story.html [https://perma.cc/K98G-29ZA].

[191]Other forms of economic rewards are garnered by those leading the anti-vaccine movement. For example, well-known anti-vaccine advocate, Mr. Kennedy, receives salaries from their organizations for his work and speaker-fees. Keziah Weir, *How Robert F. Kennedy, Jr. Became the Anti-Vaxxer Icon of America's Nightmares*, Vanity Fair (May 13, 2021), https://www.vanityfair.com/news/2021/05/how-robert-f-kennedy-jr-became-anti-vaxxer-icon-nightmare [https://perma.cc/68WW-3TVK]. This article focuses on 'alternatives to vaccines,' but other forms of economic renumeration and incentives exist as well.

[192]*Id.*

[193]The FDA has declined to define the term natural, thus its use is without a regulatory definition.*See Use of the Term Natural on Food Labeling*, U.S. Food & Drug Admin. (Oct. 22, 2018), https://www.fda.gov/food/food-labeling-nutrition/use-term-natural-food-labeling [https://perma.cc/75VY-YVJL].

[194]Joanna K. Sax, *The Tobacco Diaries: Lessons Learned and Applied to Regulation of Dietary Supplements,* 73 Md. L. Rev. Endnotes 20, 28-31 (2013).

[195]*Id.*

[196]*Id.*

[197]*Id.*

[198]*See, e.g.*, Sheera Frenkel, *The Most Influential Spreader of Coronavirus Misinformation Online*, N.Y. Times (Oct. 6, 2021), https://www.nytimes.com/2021/07/24/technology/joseph-mercola-coronavirus-misinformation-online.html [https://perma.cc/7TZ6-BYPP] ("An internet-savvy entrepreneur who employs dozens, Dr. Mercola has published over 600 articles on Facebook that cast doubt on Covid-19 vaccines since the pandemic began, reaching a far larger audience than other vaccine skeptics, an analysis by The New York Times found. His claims have been widely echoed on Twitter, Instagram and YouTube.")

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dedicated to anti-vaccine movements.[199] In addition, the federal government suspended funding to a researcher studying coronavirus, which is analogous to the work by the tobacco industry that lobbied to restrict funding to researchers who studied smoking.[200] Just like the tobacco industry, a lot of money is to be made through these deceptive practices.[201]

The dietary supplement industry, which uses tactics very similar to the tobacco industry, is even closer to the anti-vaxx movement because it also promotes access to alternatives to modern medicine. Yet, the government does not substantiate safety and efficacy of such supplements.[202] The thriving supplement industry shows, however, that consumers appear not to accurately assess the risk corresponding to lack of oversight. Similarly, anti-vaxxers make millions providing unproven 'alternatives to vaccines'—a term in quotes because there is no scientifically equivalent alternative to vaccines.[203] To accomplish this, those who benefit economically must either directly or indirectly promote anti-vaccine tales to create interest.[204] While it is possible that the sellers and manufacturers of alternatives believe in their product, it is certain they profit from it.

Regardless of motivation, the economics of such products creates an avenue to provide goods to individuals and an incentive to create a misperception of the risk of the vaccine preventable disease. Further, government messaging did not help matters with respect to individuals looking for alternative therapeutics. President Trump became interested in pseudo-oleander-based products, for example, which were touted by Mr. Lindell in August 2020.[205] It is not unreasonable to connect the susceptibility of individuals to 'alternatives to vaccines' from the messaging from leaders in the federal government.

D. Putting All the Variables Together

The above discussion demonstrates that different variables either individually or, more likely, collectively contribute to individual misperception of risk. The discussed modern variables—individualism, internet, and economics—are important components to understand decision-making as it relates to risk perception. These variables are likely strongly correlated and may provide targets for interventions to allow individuals to appropriately assign risk. Further research is needed to understand the strength of each variable as tested using decision-making theories.[206] For example researchers may ask: *Do anti-vaxx groups use emotion or ambiguity in both promoting anti-vaccine propaganda*

[199] *See e.g.*, P. Davies, S. Chapman, & J. Leask, *Antivaccination activists on the world wide web*, 87 Archives Disease Childhood 22, 22-25 (2002).

[200] Beth Mole, *supra* note 75; Lim & Ehley, *supra* note 75; Sax, *supra* note 194.

[201] *See, e.g.*, Satija & Sun, *supra* note 190.

[202] Joanna K. Sax, *Dietary Supplements are Not all Safe and Not all Food: How the Low Cost of Dietary Supplements Preys on the Consumer*, 41 Am. J. L. & Med. 374, 388-93 (2015).

[203] *See Homeopathic remedies are not a substitute for vaccines*, Gov't Canada (Mar. 6, 2019), https://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2019/69260a-eng.php [https://perma.cc/4JEZ-Q6SM].

[204] *See, e.g.*, Satija & Sun, *supra* note 190.

[205] Jonathan Swan, *Trump eyes new unproven coronavirus "cure,"* AXIOS (Aug. 16, 2020) https://www.axios.com/trump-COVID-oleandrin-9896f570-6cd8-4919-af3a-65ebad113d41.html [https://perma.cc/79LW-URD6].

[206] Vaccine hesitancy is not a new phenomenon. Research in this area acknowledges that risk assessment is a component in vaccine hesitancy. See, e.g., Daniel A Salmon et al., *Vaccine Hesitancy Causes Consequences, and a Call to Action*, 33 Vaccine D66, D66-67 (2015). The problem, which is addressed in this article, is how to close the divide between individual misperception of risk and evidence-based assessment of risk – this problem has not been adequately solved.

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and in selling their 'alternatives to vaccination'? Can emotion be used to countenance this misinformation and misperception of risk? If so, how?

The problem is how to address these modern variables in a way that allows individual perception of risk to align with evidence-based assessment of risk. To be clear, this Article does not address the final decision; for example, whether to vaccinate or not. This Article addresses the perception of risk. Thus, an individual may appropriately assign risk to a COVID-19 vaccine, *i.e.*, low risk and high benefit, but still choose not to vaccinate.

The normative answer posited in this Article is that the solution lies in the decision-making theories discussed in Part IV above. The anti-vaccine movement, which is larger than the COVID-19 crisis, uses the concepts from decision-making theories to obtain their results. The potential solution to this is to use the decision-making theories to provide information in a way that allows consumers to appropriately assign risk. To accomplish this, the variables of the individualism, internet, and economics must be part of that concerted effort and may provide possible points of interventions.[207]

Overarchingly, the variables of individualism, internet, and economics, provided pathways for the anti-vaxx movement to take hold. First, the rise of individualism has led many to believe that personal liberty interest supersedes an obligation to the broader community. While a nuanced concept, this is a misperception of what liberty means. Liberty is not absolute. While the rise of individualism has some positive attributes, its negative externalities include individual responses to the COVID-19 pandemic and the anti-vaxx movement.

Second, the internet further made space for the anti-vaxx movement. While the access to information has many positive attributes, it is hardly contested that misinformation is a major contribution of the internet and the ease and speed of the internet allows for quick dissemination. The promoters of misinformation use emotion, ambiguity, quick thinking, and other decision-making theories to convey their misinformation. For example, conveying the completely false link between vaccines and autism. Even more specifically, the unfounded link between the COVID-19 vaccine and fertility. The promoters of false vaccine narratives also use emotion, the feelings of fear and dread, to convey their information. *What if I give my child autism? What if I ruin my child's fertility? What if I ruin my own fertility?* These feelings of fear and dread lead people to inappropriately assign risk. The science does not support these associations, thus the risk of COVID-19 or any other vaccine preventable disease is the real risk; not the vaccine.

These false associations with vaccines also create ambiguity. The individual learns information from the internet about these purported risks of vaccines leading to autism or infertility and then they receive information that the vaccine is safe – these are conflicting pieces of information. Further, we know from studies analyzing vaccine hesitant parents that mixed messaging creates ambiguity and the parents inappropriately assign risk to the vaccine.[208] Similarly, if people read false information about links between vaccines and human ailments, this can become part of their quick thinking (type 1) response. When confronted with an opportunity to be vaccinated, they quickly draw to their mind the horrible story they read on the internet about someone who says they had a miscarriage as a result of being vaccinated. This quick thinking does not account for actual risk.

[207] *See* Sax, *supra* note 157 at 73.
[208] Blaisdell, *supra* note 125.

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Third, there are underlying economic interests at play. There is an economic incentive to present information in a way that utilizes risk perception. Again, while words like 'natural' might elicit positive feelings, 'vaccine' may elicit a feeling of dread. The sellers of these so-called 'alternatives to vaccines,' can use emotion to sway consumers in their perceptions of risk and create ambiguity—*why take the vaccine when a natural alternative exists?* Or, such terms may elicit quick thinking; for example, when a consumer recalls reading about a natural alternative with no side effects compared to a vaccine that purportedly caused an ailment. Quick thinking lends itself to the so-called 'alternative.' Advertisers of these 'alternatives to vaccines' utilize these components in decision-making to sell their product.

Providing factual information to correct the misinformation is simply not enough.[209] The CDC website has space dedicated to debunking the false information about a link between the COVID-19 vaccine and miscarriages, but simply providing this information is clearly insufficient.[210] This is because decision-making is complicated. Even when provided with the factual information that corrects the misinformation, it is too late. Emotion, ambiguity, heuristics, and other theories explain why the individual is not able to appropriately assign risk.

Thus, risk-(mis)perception is a difficult problem to solve. One potential answer, as more fully described below, is to transparently utilize what we know about decision-making to provide information in a way that allows individuals to appropriately assign risk. Transparency is key.

VI. NORMATIVE FRAMEWORK FOR POLICY INTERVENTIONS

This Part proposes a normative framework to provide a roadmap for possible interventions. The overarching question is: *How can governments provide information to individuals in a way that allows them to appropriately assign risk?* This question is not concerned with the ultimate decision, i.e., whether to vaccinate or not, but is concerned with closing the gap between individual misperception of risk as compared to evidence-based assessment of risk to aid legal policy.

Notably, COVID-19 vaccine hesitancy was entirely predictable. Vaccine hesitancy, in general, has grown over the last few decades and corresponding legal policies are inadequate. While K-12 school mandates are effective; at the same time, data show that vaccine hesitancy is on the rise. This Article posits that unless we align individual perceptions of risk with evidence-based assessment of risk, our current strategies for legal policy implementation will be less and less effective. In other words, this Article aims to address the root cause of such hesitancy so legal policies have the best chance to obtain desired behavior. The specifics of COVID-19 vaccine hesitancy and policy lend itself to the root cause analysis, especially due to the missteps of the handling of the pandemic.

The empirically tested theories described in Part IV form the backbone of the framework. These theories, however, have not yet been used to answer the question presented in this Article, which is how to allow individuals to appropriately assign risk to the COVID-19 vaccine. This Article proposes utilizing what we know about decision-making and testing new variables: internet, economics, and individualism, to understand how they impact decision-making and how they can be used in a way that allows an

[209] *See* Kahan, *supra* note 133 at 753–57.
[210] Ctrs for Disease Control & Prevention, *supra* note 180.

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individual to appropriately assign risk. Added to this is a discussion of possible interventions to allow individuals to appropriately assign risk.

A. Affect Heuristic and Possible Interventions

This Section asks if correct information can be provided in a way that changes an individual's experiences of fear or dread (affect) regarding the vaccine-preventable disease such that the individual appropriately assigns risk to the disease, and correspondingly, the vaccine.[211] One could approach this question in a number of ways, using the modern variables of the internet, economics, and individualism.

The variable of the internet is associated with the affect heuristic because anti-vaxxers use emotion to promote misinformation on the internet. Thus, one approach could be to expose the misinformation on the internet as misinformation and communicate to individuals how the providers of misinformation are using emotion or affect to elicit feelings of fear and dread.[212] Another way is to provide correct information in a way that utilizes emotion. One suggestion is to draw from the anti-smoking campaigns that show very sick people dying from smoking. Some data suggests that this might work with vaccines.[213]

The variable of economics can also be associated with the affect heuristic. The promoters of 'alternatives to vaccines' might utilize dread to scare people about the effects of vaccines and then elicit emotions of happiness that alternatives exist and they can purchase these so-called alternatives. Again, this variable can be approached in different ways. One possible intervention is to expose how a promoter of 'alternatives to vaccines' is manipulating the consumer. Alternatively, eliciting feelings of dread and fear by exposing how the 'alternatives to vaccines' are ineffective, may also impact how individuals assign risk.

The variable of individualism, likewise, is associated with the affect heuristic. Promoters of anti-vaxx misinformation and 'alternatives to vaccines' may lend itself to the feeling that people need to take care of themselves, without fully appreciating how their decisions impact their community. Their personal feeling of fear or dread may overshadow the ability to think about the impact on the community-at-large.[214] Interventions can be crafted to utilize the role of emotions in how individuals feel about their role in a community—either the fear of being a bad actor within the community or the good feeling of participating in an activity that promotes the health of the community.

For COVID-19 vaccine hesitancy, the acts of government officials—like attitudes and claims that young people are immune, encouragement to attend rallies, and statements that the increasing numbers of cases were due to increased testing and that the virus will disappear—created specific instances to help researchers understand COVID-19 vaccine hesitancy. This research should focus on how interventions can influence the affective response such that individuals appropriately assign risk.

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[211] *Cf.* Eve Dube et al., *Vaccine Hesitancy, Vaccine Refusal and the Anti-Vaccine Movement: Influence, Impact and Implications*, 14 Expert Rev. Vaccines 99, 109 (2015).

[212] Sax, *supra* note 157 at 75-76.

[213] Vanessa Milne, *Seven ways to talk to anti-vaxxers (that might actually change their minds)*, Healthy Debate (Aug. 31, 2017), https://healthydebate.ca/2017/08/topic/vaccine-safety-hesitancy/ [https://perma.cc/8UHM-9947]; Zachary Horne et al., *Countering antivaccination attitudes*, 112 Proceedings of the Nat'l Acad. Of Sci. 10321, 10324 (2015).

[214] *Key Things to Know About COVID-19 Vaccines,* Ctrs for Disease Control & Prevention (Dec. 23, 2021), https://www.cdc.gov/coronavirus/2019-ncov/vaccines/keythingstoknow.html [https://perma.cc/5RPJ-Q32J] ("COVID-19 vaccines reduce the risk of people spreading the virus that causes COVID-19.").

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B. Ambiguity Aversion and Possible Interventions

Ambiguity aversion can also be utilized for intervention. The internet and economic variables create ambiguity aversion through the presentation of conflicting information. If an individual receives conflicting information, then they may experience ambiguity aversion. Even if they later receive correct information, the individual is impacted by the original information. Interventions should focus on preventing false information because it impacts the individual's ability to discount false information.

The variable of individualism may also be important. The government's messaging about the pandemic created conflicting information. On the one hand, government officials instituted lock downs, masking requirements, and closed schools. On the other hand, government officials communicated that the virus would disappear and that young people are immune. This created conflicting, ambiguous information about the risk of COVID-19, discounted the concern about community spread and influenced individual risk assessment. Interventions should focus on clear, consistent messaging.

C. Cultural Cognition and Possible Interventions

Interventions utilizing cultural cognition should focus on the messaging, that is, the messaging should speak to the group with which the individual aligns. Participation on the internet allows for the creation of communities that support their world view. Interventions should therefore be mindful of the audience their information is expected to reach on the internet—similar to how those with economic gain target ads. As explained by Kahan, information must be provided in a way that affirms the individual's cultural identity.[215]

The variable of individualism is already baked into the cultural cognition theory. One study found that individuals with "strong individualistic/hierarchical worldviews" had antivaccination attitudes.[216] This study analyzed vaccine hesitancy prior to the COVID-19 pandemic, thus recognizing that vaccine hesitancy was a problem prior to COVID-19 and trying to understand the root causes remains critically important.[217] Such information can inform messaging to certain groups.

Understanding how different communities responded to the missteps of federal, state, and local messaging will be important to create interventions that allow individuals to appropriately assign risk to the COVID-19 vaccine.

D. Heuristics/Dual Process and Possible Interventions

Heuristics and Dual Process Theory can also inform interventions. The internet might be a gold mine of psychological manipulation that biases individuals and impacts their type 1 thinking. For example, (false) stories linking vaccines to terrible outcomes can anchor individuals and the stories will be considered when faced with a decision to vaccinate or not. Undoing these biases and/or challenging individuals to move into type 2 thinking poses barriers to implementation. Even determining what information created the bias in the first place is challenging, although it is reasonable to postulate that the mishandling of the pandemic contributes to risk perception of the vaccine preventable

[215]Kahan, *supra* note 133 at 755–57.

[216]Matthew J. Horney et al., *The Psychological Roots of Anti-Vaccination Attitudes: A 24-Nation Investigation*, Health Psych. 1, 1 (2018). Although this study did not focus on the United States, the results are informative for the U.S. vaccine-hesitancy problem.

[217]*Id.* Interestingly, this study also analyzed the emotion of disgust towards needles and blood as another root cause of vaccine hesitancy.

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disease. Interventions aimed at exposing how biases are created and impact subsequent decisions may prove useful.

The variable of economics similarly can anchor people to 'alternatives to vaccines' as a safe and natural approach compared to the purported harms of vaccination. Another way to approach this is to anchor people to the harms of not being vaccinated and manipulate the quick thinking in a way that allows individuals to appropriately assign risk.

The variable of individualism may also lend itself to heuristics and dual process thinking. If individuals believe that the decision to vaccinate only impacts themselves, then their bias is focused on their autonomy, without completely comprehending the impact on the community. Anchoring people to the problems with community spread of vaccine preventable diseases might allow individuals to appropriately assign risk.

Plausibly, the missteps by the federal government, described in Part II, created biases about the risks posed by COVID-19. Understanding these biases, and using the variables as possible points of interventions, may allow the biases to shift so that individuals can appropriately assign risk.

E. Tying This in to the COVID-19 Vaccines

It is crucial to understand and address vaccine-hesitancy because the COVID-19 vaccines are the most effective solution to the current pandemic.[218] The above suggestions are descriptive. This Article provides a normative framework to provide the basis for future work. The psychological dimension of decision-making cannot be ignored as we have seen how poorly individuals responded to the science in the COVID-19 pandemic. Decades of anti-vaccine advocacy is underscoring the difficulty of slowing the spread of COVID-19. While this Article is focused on vaccine hesitancy, it should be noted that many millions of people *are* vaccinated against COVID-19 and thus understand the safety and efficacy of vaccines.

Recent studies analyzing vaccine hesitancy, in general, focus on the impact of social media.[219] This literature suggests that an intervention, as described above, could be to utilize social media as a way to influence decision-making. Put differently, *can policymakers use the problem as the solution?* This approach can be empirically tested to determine if communicating information via social media decreases the role of individualism, misinformation, or economic interests as it relates to perceptions of risk. If, for example, information can be communicated in a way that decreases a person's individualistic attitude, then that person might more accurately assign risk and be more likely to receive a vaccine. Solving the (mis)perception of risk must be a primary goal for any regulatory policy to be easily implemented.

With the COVID-19 vaccine, an added layer of the novelty of the mRNA technology, described in Part III, provides fodder for exploitation of the psychological dimension of risk perception. From a scientific perspective, the mRNA vaccine ultimately

[218]This is likely true for future pandemics as well. Ernie Mundell & Robin Foster, *Fauci Pushes Ambitious Plan to Guard Against Future Pandemics*, U.S. News (July 26, 2021, 8:50 AM), https://www.usnews.com/news/health-news/articles/2021-07-26/fauci-pushes-ambitious-plan-to-guard-against-future-pandemics [https://web.archive.org/web/20220222202620/https://www.usnews.com/news/health-news/articles/2021-07-26/fauci-pushes-ambitious-plan-to-guard-against-future-pandemics] ("In an effort to avoid another pandemic in the coming years, Dr. Anthony Fauci wants to launch an ambitious plan to make prototype vaccines that could protect against pathogens from 20 families of viruses that threaten human lives.").

[219]Mark Dredze et al., *Understanding Vaccine Refusal*, 50 Am. J. Prv. Med 550, 550-51 (2016); Rutschman, *supra* note 174; Broniatowski et al., *supra* note 174 at 1378-80.

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leads to the same results as traditional vaccines; the scientific novelty is the ability to harness and preserve mRNA for delivery to the individual.[220]

The explosion of the internet and social media, the politicization of non-pharmaceutical interventions and charlatans seeking to profit from 'alternatives,' and the rise of individualism created a perfect storm to undermine the scientific solutions to the COVID-19 pandemic. This psychological response can be addressed. This Article suggests utilizing well-known decision-making theories and incorporating the variables discussed above as a way to align individual perception of risk with evidence-based assessment of risk. The next step is testing possible intervention(s) and determining which intervention(s) will accomplish the goal of closing the disconnect between individual (mis)perception of risk with evidence-based assessment of risk.

VII. CONCLUSION

This Article addresses the question of how to align an individual's perception of risk with evidence-based assessment of risk, using the COVID-19 vaccine and hesitancy as an example. Importantly, the spread of misinformation and a failure to provide a coordinated and science-based approach of containment created a perfect storm to showcase the psychological dimension of risk perception. The overview of the timeline of events, presented in Part II requires further forensic evaluation and reflection. Since we are in the middle of the global pandemic, much of this autopsy will need to occur in the future. Cataloging these events, however, has important utility in and of itself.

The public's response in the U.S. contributed to the continued spread of death and disease. This Article seeks to understand and evaluate how this came to be utilizing decision-making theories, incorporating variables, and providing a normative framework to propose interventions to change the trajectory of future legal policy responses to pandemics and other critical issues that require an individual's perception of risk to align with evidence-based assessment of risk.

[220] *See e.g.*, Vanderbilt Institute for Infection, Immunology and Inflammation, *How does a mRNA vaccine compare to a traditional vaccine?* VAND. U. MED. CTR (Nov. 16, 2020), https://www.vumc.org/viiii/infographics/how-does-mrna-vaccine-compare-traditional-vaccine [https://perma.cc/DEV6-DZKM].

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