What the American Public Thinks About Vaccines and How Framing Can Help. A Literature Review.

April 2021

FRAME WORKS

A literature review sponsored by
the American Academy of Pediatrics

Contents

1. Introduction

As the US is preparing to distribute vaccines across all 50 states to curtail a deadly pandemic, the issue of vaccination is, more than ever, top of mind for many, in the US and globally. Public health professionals view vaccines as one of the most important health advances in history; some among the public see them as a toxin-laden threat to themselves and their children, while many people—at least until this year—don't spend a lot of time thinking about them, taking them for granted as simply part of health care. And while vaccination programs are currently estimated to prevent between 2 and 3 million deaths a year worldwide, the World Health Organization recently declared vaccine hesitancy, which has affected uptake of vaccinations in 90% of countries worldwide, one of the top 10 global health threats.

The current vaccination coverage rate in the United States reflects this global problem, as diseases that were thought to be eradicated (e.g., the measles) have started reemerging over the past couple of years because of suboptimal vaccination rates. Vaccine hesitancy is only one in a series of factors that shape vaccination rates in the country and the world—affordability and access to health care, for instance, play key roles as well, as do countries' vaccination policies. The US's current federal vaccination policy likely contributes to suboptimal rates of vaccination across the country. It is mostly made up of guidelines and recommendations, which doesn't give government and public health officials the authority they need to prevent and address outbreaks. And while federal policy does include the obligation to vaccinate school-age children, most states allow exemptions based on medical, religious, and philosophical reasons, which hampers the effective implementation of any vaccine mandate. In the absence of consistent vaccine policy at the federal and state levels, decisions to get a vaccine or to vaccinate one's child ultimately become a matter of individual judgment.

Members of the public bring a wide variety of beliefs and assumptions to their thinking and decision-making about childhood and adult vaccination, ranging from beliefs about the side effects of vaccines, attitudes toward science, values (e.g., around individual freedom and community), and assumptions about what makes someone a good—or a bad—parent. These beliefs and attitudes not only shape whether or not people decide to get a vaccine for themselves or their children, but they may also indirectly inform and shape state and federal policy on vaccination in the US. Conversely, the fact that the US's vaccination policy ultimately

leaves the burden of decision-making on individuals may reinforce or confirm people's existing beliefs and attitudes about vaccines and vaccination.

This paper further explores the question of public understandings, beliefs, and attitudes about vaccination in general, and childhood vaccination more specifically, by providing an overview of existing literature on public thinking about vaccination and on effective communication strategies and interventions that have been either suggested or empirically tested. It is the first step of a wider research project led by the FrameWorks Institute and sponsored by the American Academy of Pediatrics. The project aims to analyze public thinking about vaccination in the US in order to develop effective framing strategies capable of building a better understanding of the science of vaccination, shifting public attitudes towards more vaccine acceptance, and generating public support for structural policy change.

The paper begins with a deep dive into the American public's understandings, beliefs, and attitudes about vaccination. This review will provide the basis for and help give direction to original research on public thinking that FrameWorks will conduct in 2021. We then give an overview of communications-based interventions that have been suggested or empirically tested to date. We conclude by offering preliminary ideas and directions for frame design and frame testing that could be explored in future stages of the current project.

2. Public Understandings, Beliefs, and Attitudes towards Vaccination in The United States

2.1. Understandings, Beliefs, and Attitudes About the Science of Vaccines and Immunity

2.1.1. Vaccines as Poison *and* Antidote

Existing literature suggests that members of the American public do not have a clear understanding of what vaccines are and how they work; neither do they accurately grasp what immunity is and how the immune system works.

When people reduce vaccination to the process of injecting someone with a disease to inoculate them against it, they often see it as a dangerous poison and an antidote at the same time. They believe that vaccines can infect people with the illness that they are intended to prevent, that too many vaccines at once can overwhelm the immune system (especially in children and/or high-risk/immunocompromised individuals), and that vaccines weaken the body's natural immune response (Smith et al., 2017). These beliefs can affect parents' attitudes and decision-making about childhood vaccination. For instance, a significant number of parents of children at high risk for influenza complications expressed concerns that the influenza vaccine would have harmful side effects for their child (Smith et al., 2015). An older study also revealed that 61% of the parents who refused the influenza vaccine reported believing that the vaccine itself could cause influenza, 54% expressed "other safety concerns," and 30% believed the vaccine was ineffective (Mirza et al., 2008). Smith et al. (2015, 2017) cite previous studies linking decreased influenza vaccine uptake with parental concern that the vaccine itself may cause illness by infecting their child with influenza or with Guillain-Barré syndrome, or by weakening their child's immune system.

Concerns about vaccines having harmful side effects generally include a fear that "toxins" hidden in vaccines may cause autism, other neurological disorders, or unknown illnesses. For example, thiomersal (or thimerosal), a mercury compound removed from most routine vaccines in the late 1990s, has been linked with neurotoxicity and increased rates of autism diagnoses for some people, despite no evidence of harm. Members of the public also report concerns about toxins they know to be harmful in other contexts, but that are either present in vaccines in harmless amounts (e.g., aluminum) or have never been used in vaccines, such as antifreeze (Dubé et al., 2013; Smith, 2017).

The belief that "toxins" in vaccines may cause autism or unknown short- or long-term neurological side effects is particularly salient in thinking about childhood vaccination in general and the measles, mumps, rubella (MMR) vaccine specifically. It persists among vaccine-hesitant parents in general (Smith et al., 2017; Dubé et al., 2013) but appears to be more pronounced among vaccine-hesitant parents of children on the autism spectrum (Goin-Kochel et al., 2020). Children who are on the autism spectrum are less likely to receive all childhood vaccine doses recommended between ages 4 and 6 in comparison with the general population (81% versus 94%), and their younger siblings were overall significantly less likely to receive vaccines recommended at any age (Zerbo et al., 2018). Bazzano et al., (2012) also found that half of American parents of children on the autism spectrum reported discontinuing or changing vaccination practices for their children, based on a belief that vaccines "contributed to autism spectrum disorders." Goin-Kochel et al., (2020) found that 29% of surveyed US parents with children on the autism spectrum reported vaccine hesitancy in comparison with an average of 15% of parents in the general population. Among parents with children on the autism spectrum, vaccine hesitancy was significantly linked with a belief that vaccines were the cause of their child's autism spectrum disorder; 64% believed that "toxins found in vaccines" contributed to their child's disorder.

Anti-vaccination misinformation capitalizes on people's fears and uncertainty about the potentially harmful side effects of vaccination (Gross, 2009). To do this, messages often rely on personal narratives about individuals being harmed by vaccination and fear-inducing visuals (e.g., large needles or masks and gloves presented alongside skulls and crossbones, or faces with terrified expressions) that further cement and magnify a link between vaccines and serious potential harm (Guidry et al., 2020). Misinformation and conspiracy theories circulating on social media platforms can be especially harmful when they focus on emerging vaccines for novel illnesses (e.g., COVID-19), for which scientific knowledge is still scant or inconclusive (Puri et al., 2020; Dubé et al., 2013; Broniatowski et al., 2018).

2.1.2. Herd Immunity

In addition to misunderstanding the science behind vaccines, more than 60% of Americans don't know what "herd immunity" or "community immunity" means or how it works (Funk

et al., 2017). As a result, people sometimes assume that once a disease has disappeared, it can no longer reemerge, which means that vaccination is no longer needed (Luyten et al.,2019).

2.1.3. Understandings and Perceptions of Risk

Existing research also points to a lack of awareness or knowledge of what individuals or parents risk by opting out of vaccination, especially for diseases considered benign (e.g., influenza). Perceptions of risk from influenza have been well studied and help illustrate how perceptions of risk can affect people's behavior. Smith et al., (2015) argue that parents' lack of knowledge about the increased risk posed by influenza complications to children with neurologic or neurodevelopmental disorders partially contributes to persistent suboptimal vaccine coverage in this high-risk group. They found that only 49% of parents of children with neurologic or neurodevelopmental conditions reported that they considered their child to be at increased risk for developing complications from influenza. The perceived "newness" of the link between a child's medical condition and their being high-risk for health complications also plays a role in parents' decision-making about vaccination: Parents of children who had a condition that was only more recently recognized as high-risk were even more reluctant to receive a flu shot, with a 47% vaccination rate, compared to children with traditionally recognized high-risk conditions (e.g., respiratory conditions), who had a 63% vaccination rate (Smith et al., 2015).

People also tend to underestimate the risks associated with diseases affecting adults, especially with newly emerging ones like H1N1 or COVID-19. In a multi-country study of low vaccine rates during the H1N1 pandemic, people who refused the vaccine cited concern about the risk of adverse side effects from the H1N1 vaccine, lack of complete knowledge about the risks of the disease, and perceived non-severity of the disease (Fournet et al., 2018; The Royal Society & The British Academy 2020).

In cases where vaccines have been highly effective in preventing illness, lack of experience with the disease likely contributes to an underestimation of risk. Because many vaccine-preventable diseases have been almost eradicated in the developed world, laypeople and even some health care providers have little to no personal experience with the severity of illnesses that vaccines prevent and, in turn, tend to underestimate the risks posed by them (Royal Society of Public Health, 2019).

While members of the public tend to underestimate the risks of opting out of vaccination, as well as the risks from seemingly benign diseases, they often make too much of the marginal uncertainties associated with vaccines. This leads them to further question the validity, the efficacy, or the safety of vaccines. This tendency is reinforced by a rhetoric of "impossible expectations" deployed by anti-vaxxers, who claim that vaccines are only safe and acceptable under impossible conditions—that is, with "100% certain results or health treatments with

no possible side effects." By routinely concentrating on unknowns and uncertainties, which are unavoidable even with extremely low-risk medical innovations, anti-vaccine advocates undermine the public's trust in information provided by scientists and government officials on vaccine-related issues like the public health threat of disease outbreaks, the potential severity of vaccine-preventable diseases, and specific concerns for vulnerable high-risk populations (Hobson-West 2007).

Correlation between levels of scientific knowledge, confidence about vaccine efficacy, and vaccination uptake

Many studies have revealed a correlation between people's level of basic knowledge about science or vaccination and specific beliefs, attitudes, and behaviors. Those who hold low levels of vaccine knowledge are not confident about vaccine efficacy, hold more negative attitudes, and are more reluctant to vaccinate.

The more people know about science and vaccination generally, the better their understanding of the benefits and risks of vaccines. According to Pew Research Center (Funk et al., 2017), Americans with low science knowledge are much less likely to see high preventive health benefits from vaccines (55%) compared with those possessing high science knowledge (91%). Within this low-knowledge group, 47% consider the risk of side effects to be at least moderate or worse, in comparison with only 19% of those with high knowledge. Relatedly, the 68% of Americans surveyed who could not correctly define "herd immunity" were less likely to rate the benefits of the MMR vaccine as high and more likely to see the risk of side effects as at least moderate or worse. Those with low levels of general science knowledge were also less likely to think that there is a scientific consensus regarding the safety of the MMR vaccine (37% versus 64% of high science knowledge respondents). All of these results indicate a link between a poor overall understanding of how vaccinations work and a tendency to underestimate the individual and communal benefits of vaccines and overestimate risks.

The evidence is also robust regarding a link between increased knowledge and childhood vaccination uptake. Active information seeking, absorbing information from specific sources (e.g., parents who got information through national television news were more likely to get their children the H1N1 vaccine than those who obtained information from the local television news), and degree of media exposure were associated with parents' level of vaccine knowledge, and these factors ultimately influenced vaccine uptake for children (Jung et al., 2013). Parents reported that lack of information or confusion about vaccines was a reason for refusing, delaying, or failing to receive all shots in the childhood vaccine schedule (Smith et al., 2017). As such, children of parents who displayed some vaccine hesitancy were found to be under-immunized for 14% more days than children whose parents displayed only little vaccine hesitancy, and children of highly hesitant parents were under-immunized for 51% more days than those with low-hesitancy parents (Amin et al., 2017).

Most relevant cognitive biases at play

People's understandings about and attitudes towards vaccination interact with a set of deep cognitive biases and information processing tendencies that reinforce and exacerbate misperceptions. Below, we identify these biases and explain how they shape thinking about vaccination, especially around people's evaluation of health risks and benefits:

— **Dunning Kruger effect:** It is a well-established fact that the less people know about an issue, the more likely they are to think of themselves as experts in it. This means that the less people know about the science of vaccination and immunity, the more they are likely to think they know a lot and to disregard scientific authority on the subject. This reinforces people's tendency to act like and perceive themselves to be "lay epidemiologists" (Bond & Nolan, 2011) as part of a socio-cultural shift that has rapidly gained traction in both the United Kingdom and the United States since the 1970s (Hobson-West, 2007). Motta et al., (2018) discovered a similar pattern wherein individuals who exhibit less knowledge about autism are significantly more likely to consider themselves better informed than medical and scientific experts about the causes of autism and to demonstrate anti-vaccine attitudes. Individuals who are both overconfident in their own knowledge and less informed express greater support for non-expert involvement in the vaccine policymaking process and less support for mandatory vaccine policy compared to people with higher levels of knowledge.

— **Intolerance of uncertainty:** People tend to have difficulty coping with the fear that is naturally triggered by "a perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty" (Carlton, 2016). In the context of vaccination, this can reinforce people's belief that a range of unknown side effects pose a bigger threat to themselves or their children than the illness the vaccine is designed to prevent, or that familiar illnesses (e.g., the flu) are generally benign because they are well known. This bias can also further legitimize anti-vaxxers' rhetoric of "impossible expectations" (see p. 3 above for more detail).

— **Risk aversion bias:** People tend to fear risk, which leads them to overemphasize risks and downplay benefits for any given situation. In the context of vaccination, this means that negative scientific information (or misinformation) about adverse health risks tends to receive more public attention than information about the benefits of vaccination.

— **Omission bias:** People tend to judge harmful actions as worse than harmful inactions, even if inactions result in similar or worse consequences. As a result, the risk of opting out of vaccination is perceived as lower than the risk of opting in (Dubé et al., 2013). Vaccine-hesitant parents are likely to avoid taking action they feel is dangerous, as the risks of inaction remain more abstract and seem less serious (Zerbo et al., 2018; Dubé, 2013; Omer et al., 2017). This bias helps explain the power of misinformation claiming

an MMR vaccine-autism link, as it makes parents of children with autism spectrum disorder wary of the action of vaccinating their children and less attuned to the risks of inaction posed by vaccine-preventable diseases.

— **"Like me" bias:** People are more likely to think that they are at risk of contracting a disease if they perceive the infected population to be "like them and theirs." When receiving information about serious complications or fatalities from an infectious disease, parents have been found to think there is more threat to their own child if negatively affected individuals are similar to their child in terms of geographical location or health status (Bond and Nolan, 2011).

2.2. Broad Mindsets and Values Underlying Public Thinking about Vaccination

In addition to beliefs about the science of vaccination and immunity, members of the US public also rely on a series of broader mindsets and values that shape their attitudes and behavior towards vaccination in deep, often implicit ways. People have recently become more likely to question or reject scientific authority and misunderstand what science generally entails. At an even deeper level, they often believe in individual freedom and individual responsibility for choices and outcomes, a belief which sometimes manifests in a preference for natural remedies and spiritual self-care. People's views of government or other societal actors like "big pharma" also come into play when reasoning about whether to get a vaccine or not. And while many of these beliefs mainly rest on cultural assumptions and may be effectively addressed by communications strategies, others are grounded in historical evidence of abuse and mistreatment of specific groups in society, and may not be overcome without significant changes in policy and institutional practices upfront.

2.2.1. Rejection of Scientific Authority

Over the past few decades, the effects of a lack of understanding of the science of vaccines and immunity have been compounded by a growing public rejection of scientific and expert authority in general.

When members of the public do not fully understand what scientific inquiry consists of, they can struggle to see the distinction between *seeking and consuming* information available online and producing scientific knowledge—both of which tend to be seen as "doing research" and considered as equally valid. In this way, people can reject the knowledge presented to them by official sources in favor of alternate truths more congruent with their values, which they feel they have arrived at through their own research efforts (Hobson-West, 2007).

The post-modern belief that "there is no truth"[1] and that all opinions are equally valid further encourages members of the public to see themselves as "lay epidemiologists" and to reject expert knowledge. In this way of thinking, any singular source of scientific truth is viewed as "part of the problem" and pitted against a multitude of self-appointed online spokespersons (Kata, 2009; Dubé et al., 2014).

In the US, the rejection of science and scientific expertise has also become a matter of partisan loyalty among conservatives. Pazzanese (2020) argues that the greater comparative skepticism conservatives harbor towards expert opinion surrounding vaccines and public health issues is part of an overall conservative cultural shift characterized by loss of faith in expert scientific opinion in general. The rejection of experts and disavowal of science is, in turn, now used to signal conservative political in-group loyalty.

Some religious beliefs might also undermine people's faith in science and lack of trust in vaccination. For instance, White Evangelical Protestantism in the US is associated with low trust in information from medical scientists about the MMR vaccine, decreased belief that medical scientists are knowledgeable about vaccines in general, and more skepticism that scientific research on childhood vaccines uses the best evidence available. White Evangelical Protestants and the religiously unaffiliated express less support for MMR vaccine requirements for schoolchildren and more support for letting parents decide (Funk et al., 2017).

People's distrust of scientific authority should not, however, be overstated, especially in the context of well known childhood vaccines. A US-based 2017 poll, for instance, found that about 55% of Americans fully trust medical scientists to give full and accurate information about the risks and benefits of childhood vaccines (Funk et al., 2017). An additional 35% were found to somewhat trust medical scientists, and only 9% said they strongly distrust information from medical scientists about the risks and benefits of childhood vaccination. Trust in information from other groups (e.g., the pharmaceutical industry, news media, elected officials) was much lower by comparison (see p. 6 onward for a more detailed discussion).

Pro-vaccine social media content is typically impersonal and one-size-fits-all

On social media, pro-vaccine groups consistently rely on an impersonal tone: They appeal to scientific authority without trying to connect to people on a more personal level. These pages often take a one-sided approach to communications and are not designed to allow readers to interact with each other or with the content creators. They also offer "one-size-fits-all" content, rarely tailoring messages to the needs and expectations of specific audiences.

Anti-vaccine groups, on the other hand, rely on more tailored narratives that appeal to specific demographics (e.g., mothers or specific cultural groups) (Johnson et al., 2020; Mbaeyi et al., 2020; Smith & Graham, 2019).

2.2.2. Individual Freedom and Autonomy

Over the past 20 years, FrameWorks research in the US and internationally has found that members of the public first and foremost think about health as an individual issue,[2] rather than a collective one, and believe that health outcomes are primarily determined by the choices and decisions individuals make for themselves. In the broader literature, the core values of individual choice and freedom have similarly been linked to anti-vaccine beliefs (Moran et al., 2016; Amin et al., 2017). In one study, individuals who rated high in vaccine hesitancy were also found to place greater value than others on liberty (Amin et al., 2017). These individualistic beliefs and values can be expressed through and inform some more specific ideas, including an emphasis on natural and spiritual self-care as an alternative to vaccination, as well as a rejection of "big government" and larger entities and systems such as the pharmaceutical industry and health care systems.

2.2.3. Natural and Spiritual Self-Care

People's tendency to prioritize the role of individual freedom and autonomy can manifest through a focus on individual wellness practices, and a rejection of human-made or artificial forms of prevention and treatment. The latter are deemed fundamentally inferior to practices and remedies that are "natural"—not directly associated with science, technology, or other symbols of the modern world. This way of thinking leads to a rejection of the hierarchy of expert-driven medical practice. When people think in this way, they often maintain that better lifestyle choices and holistic health practices—not vaccines—are the way to prevent illness. This focus on holistic health is often woven with consumerism, as people look to procure the right products and services to maintain holistic health (Dubé et al., 2013; Hobson-West, 2007; Moran et al., 2016; Kata, 2009).

Proponents of natural or spiritual self-care tend to believe that healthful individual behaviors and alternative forms of self-care can have the same effect as vaccination, and that it is better to trust natural immunity than immunity that is artificially created through vaccines. There is compelling evidence to show that parents' beliefs in the values of what has been termed "organic culture" play a key role in their refusal to vaccinate their children. Parents who share "organic culture" believe in the superiority of natural immunity, that illness can boost their child's immune system in the long run, and that vaccines can actually impair their child's natural immunity—by not giving their immune system a chance to fight off illnesses on its own and build up naturally. Terry (2019), for instance, explores this trend in Waldorf-inspired charter schools[3] in Oregon and across the US. Vashon Island in Washington state, a noted enclave of organic culture, has consistently stood out as one of the most under-vaccinated communities in the US, with nearly one in four parents of kindergarteners opting out of vaccinations in 2015, a rate five times higher than the state average (Carson, 2015).

While the idea of "organic culture" immediately conjures images of hippy counterculture on the West Coast, this holistic emphasis on self-care and natural remedies is not too dissimilar from religious conservatives' beliefs in natural purity. There are faith-healing churches across the US who encourage their followers to refuse vaccination or medical treatment, and to rely solely on prayers for healing as a sign of personal faith, which has led to deadly outbreaks involving both children and adults (Grabenstein, 2013).

Anti-vaxxers appeal to individual freedom and choice, but are a heterogeneous group politically and ideologically

Most anti-vaccine advocates rely on arguments that emphasize individual choice and freedom and oppose control by "big business," "big pharma," or "big government." Anti-vaccine websites, for instance, emphasize and reinforce the link between individual freedom and anti-vaccine attitudes. About 50% of online anti-vaccination content relies on *us* vs. *them* arguments that pit individuals (who embrace organic living and are healthy, freethinking, responsible, caring, and authentic) against authorities (physicians, government, corporations, the scientific establishment) (Shelby & Ernst, 2013; Moran et al., 2016).

Despite this common denominator, outspoken anti-vaccine advocates are quite a heterogeneous group in terms of political ideology and partisanship (The Royal Society & The British Academy, 2020). In addition to left-wing communities/organizations opposed to vaccination, many of which are most closely associated with "organic culture," right-wing anti-vaccination groups, some of which are connected to extremist groups like Q-Anon or the Tea Party, proliferate as well (McNeil, 2019). During the 2020 pandemic, for instance, extreme far-right groups also appear to have become more involved with anti-vaccination groups debating COVID-19 issues (Ball, 2020).

2.2.4. Distrust of Government

People's attitudes and behaviors towards vaccination are also informed by their views of what government is and what its role should be. Vaccine rejection or hesitancy often rests on beliefs that government shouldn't intervene in individuals' lives and health care choices, or that it is inefficient and unable to address serious crises when they arise. Mesch and Schwirian (2015), for instance, found that trust in the national government's ability to deal with an epidemic outbreak shaped many Americans' willingness to be vaccinated against the H1N1 virus: In their US-based study, over 84% of Americans who were "not confident at all" in the government said they were unwilling to receive an H1N1 vaccine. According to Baumgaertner et al., (2018), those with lower trust levels in government health experts and the general competency of the government express less intent to vaccinate. Pew's US-based 2017 poll found that 67% of Americans do not trust information from elected officials about the health effects of the MMR vaccine, which signals

a much higher level of distrust for government officials than for medical scientists regarding information on childhood vaccination.

Existing research finds two key rationales underlying people's trust or distrust of government: political partisanship and knowledge of historical abuses and injustice.

2.2.4.1. Distrust of Government Due to Political Partisanship

Mesch and Schwirian (2015) argue that people's attitudes towards government-mandated vaccines, as well as their trust in the government's ability to handle health crises, is at least in part shaped by political partisanship. In their US-based study of the H1N1 pandemic of 2009–2010, they found that "trust in the government's ability to deal with the H1N1 outbreak is based on political partisan attitudes about the proper role of government." Conservatives, who believe that government as an institution should be as limited in its role as possible, were more likely to question or reject the H1N1 vaccine, while Democrats and members of other parties that have a more expansive view of government were found to be more willing to be vaccinated than others. Similarly, Baumgaertner et al. (2018) argue liberals are more likely than conservatives to support pro-vaccine statements, and that conservatives express less intent to vaccinate than liberals (see also Motta et al., 2018).

The correlation between political partisanship and vaccine-related beliefs, attitudes, and behaviors seems to be weaker in the context of childhood vaccination, however. According to the recent Pew Research Center survey study (Funk et al., 2017), a wide majority of 82% of American adults responded that they support requiring all healthy schoolchildren to take the MMR vaccine, and there was much less difference in opinion between Republicans and Democrats.

2.2.4.2. Distrust of Government Due to Historical Abuses and Current Structural Racism in Healthcare

Trust in vaccinations and vaccine information presented by government health experts can also be mediated by past and current injustices and violations committed against specific religious and ethnic groups. This makes historically oppressed groups less likely to trust information about vaccines coming from the government or the scientific community.

In the US, past abuses committed by the medical and scientific communities have led to high levels of skepticism about public health interventions and clinical trials among Black communities. Plough et al., (2011) point to the Tuskegee Syphilis Study as a reason for H1N1 vaccine refusal among Black individuals in the US. The Tuskegee Syphilis study committed abuses against 399 African American sharecroppers in Macon Country, Alabama who were the subjects of a 40-year United States Public Health Service (USPHS) study of the effects

of untreated syphilis in Black men. It has long been considered unethical and arguably "the most infamous biomedical research study in US history" (Katz et al.,2008). Many studies assume that knowledge of the Tuskegee Syphilis Study is at the heart of Black communities' distrust of public health and government officials and of their reluctance to participate in biomedical studies and clinical trials. For instance, despite increased rates of employment in high-exposure jobs and greater rates of preexisting medical conditions that increase the risk of COVID-19 complications, only 3% of those initially registered to participate in the COVID-19 vaccine trial were African American (Hoffman, 2020). This is particularly problematic in the context of the COVID-19 pandemic, as people of color are significantly more affected by the pandemic. Research also suggests that lack of trust in the ethical integrity and competence of the government and health care experts is especially likely to lead to suboptimal vaccination rates for novel vaccines (Harrison and Wu, 2020).

Past and current disparities in the quality of health care received by different communities, as well as other forms of systemic discrimination and persecution, have been shown to increase people's distrust of institutions in general, including government and health officials. Recent analysis has stressed that while historical traumas provide critical context, they shouldn't overshadow the everyday racism that Black communities still face in health care settings and the severe health disparities that have always followed[4] (Bajaj & Stanford, 2021). As a result, experts actually suggest that "framing the conversation about distrust in COVID vaccines in terms of everyday racism rather than historical atrocities may increase underserved communities' willingness to be vaccinated" (Ibid.). Ongoing discrimination and injustice built into the structure of US society at large (e.g., police brutality) is also cited within the African American community as reasons for refusing a potential COVID-19 vaccine (Hoffman, 2020).

Skepticism towards government and public health officials based on evidence of past and current abuse, injustices, and disparities can also make historically oppressed groups more likely to adhere to conspiracy theories and misinformation about vaccines. According to Quinn et al., (2017), African Americans are more hesitant about vaccines in general and the flu vaccine specifically, and are more likely to believe in conspiracy theories, to use natural practices and remedies as an alternative to vaccination, and to overemphasize risk from vaccine side effects but underestimate risk from influenza itself. In 2019, an anti-vaccine rally in New York made the false claim that the government of New York was giving Jewish children a special shot that would infect them with a more virulent and dangerous new strain of measles, instrumentalizing fears of anti-Semitism and religious persecution among ultra-Orthodox Jewish communities (de Freytas-Tamura, 2019).

2.2.5. Rejection of Corporate Power

People have also grown increasingly skeptical of entities and systems thought to hold a lot of corporate power and place profit above the wellbeing and health of individuals—such as

health care systems, pharmaceutical companies, or media corporations (Hobson-West, 2007; Rauhala 2020). Pew's US-based 2017 poll, for instance, found that only 13% of Americans fully trust information on the MMR vaccine from pharmaceutical industry leaders and that few people have a lot of trust in information from the news media (8%) when it comes to childhood vaccination. On the contrary, 56% of Americans say they do not trust media information on the MMR vaccine at all, or only very slightly (Funk et al.,2017).

The recent opioid crisis and ongoing debates about the cost of medication and health care are valid reasons for members of the US public to distrust "Big Pharma" and health care systems (deShazo et. al., 2018; Sharfstein & Olsen, 2019). But this rejection often also builds on conspiracy theories that emphasize the importance of personal medical needs over those of public health and present symbols of modernity (global businesses being one of them) as threats to the public. This has notably been the case since the start of the COVID-19 pandemic, as online anti-vaccination misinformation has increasingly built on anti-mask messages and "Big Pharma" conspiracy theories (Rauhala, 2020). The "plandemic" conspiracy theory claiming that Bill Gates, a global vaccination advocate, is using the 2020 pandemic as a cover to implant microchip tracking devices using coronavirus vaccines is a good example of how distrust of health care systems, fear of modernity, and emphasis on individual freedom and agency can be woven together in people's minds and lead to negative beliefs and attitudes towards vaccination. A recent US-based poll found that 50% of respondents who favored Fox News, 44% identifying as Republicans, and 28% of adults, in general, believed the Gates conspiracy (YouGov 2020).

2.2.6. Beliefs and Assumptions about Children and Parenting

When it comes to childhood vaccination specifically, parents rely on deep-seated assumptions and beliefs about parenting and children to reason about vaccination.

Parents often assume that all children are innately different and that caring for the health of a child means adapting to their unique needs. When parents think in this way, it can make it hard for them to accept one-size-fits-all childhood vaccination policies because these cannot account for each child's specific needs. Parents' refusal to vaccinate their children has been linked with concerns that doctors would not properly account for their child's specific medical circumstances, and to the belief that doctors "vaccinate without discrimination" (Smith et al., 2017). Parents who assume that children are more or less vulnerable to adverse effects depending on their individual characteristics tend to worry about doctors ignoring their children's individual needs in their approach to vaccination (Hobson-West, 2007).

Parents often think of good parenting as, first and foremost, protecting children from harm.[5] When people think in this way, the environment outside the home is mainly seen as a threat

to children's physical and emotional safety, and parents' role is to act as a protection wall, warding off any danger from the child's safe home bubble. When this thinking is applied to vaccination, parents may assume that vaccines are part of the dangerous, threatening world that good parenting practices must protect children from.

This notion of protection can apply to a range of perceived threats. For example, it might lead parents to dread subjecting their children to the short-term pain and fear caused by vaccination syringes. Research suggests that up to 24% of adults and 63% of children have a fear of needles and that needle-sensitive parents are about 15% more likely to delay childhood vaccination (Callaghan et al., 2019). In another study, 44% of parents named pain caused to their child by multiple vaccinations as one of their greatest concerns (Kennedy et al., 2011). Feelings of fear or disgust towards needles and blood were also cited as a significant global cause of vaccine hesitancy (Hornsey et al., 2018). Believing that parents' main responsibility is to protect their children from danger and harm can also exacerbate concerns about toxins that lead to adverse side-effects in vaccines (see p. 2 above for detailed discussion). Anti-vaccination websites and social media pages often capitalize on this definition of what a *good* parent is to build their platform and specifically target parents seeking vaccine information online to protect their own children from harm (Smith, 2017; Smith & Graham, 2017). Half of all anti-vaccination sites make emotional pleas for parents to "be responsible" (i.e., avoid vaccination because it is "toxic" or may cause autism) (Kata, 2010), and some even question whether parents who expose their children to dangerous vaccines actually love them (Ball, 2020).

Parents widely assume that children's wellbeing and happiness is another central goal of parenting and that children's wellbeing and happiness should always come first. This is true of parents who choose to vaccinate their children and those who refuse to do so: Both groups think that the decision they made about vaccination means that they are being *good* parents. However, the groups tend to differ in their orientation toward the broader community. Vaccine-accepting parents typically see protecting the greater community as a secondary reason for their decision, whereas vaccine-refusing parents emphasize that being a "good parent" means ignoring social pressures to vaccinate and placing their child's individual wellbeing and happiness above group interests (Forster et al., 2016).

Most relevant cognitive biases at play:

The beliefs and assumptions about individual freedom, government, children, and parenting described above are often deeply ingrained in people's minds as part of their values and ideology, which is why they often shape people's beliefs and attitudes about vaccines (Baumgaertner et al., 2018). They also are often reinforced by the following cognitive biases:

- **Confirmation bias:** People tend to notice and look for information that confirms their beliefs and ignore what contradicts them, regardless of reliable evidence to the contrary. This means that when people encounter communications about vaccination, they are more likely to engage with and remember arguments that build on their existing beliefs about the role and responsibilities of individuals, government, or parents than on arguments that don't, regardless of their scientific validity or truth value.
- **Motivated reasoning:** People tend to find ways to justify what they want to believe and to discount what they don't want to believe. This explains, for instance, why "fact checks" and straightforward provision of scientific evidence often do little to correct misunderstandings, especially when they are pitted against emotionally charged human-interest stories that appeal to parents' care and concern for their children, their deeply-held personal identities and values, and their fears and anxieties (Krause et al., 2020; Omer, 2017; Glanz et al., 2017; Jarrett et al., 2015; Gross, 2009). When misinformation is framed in a way that aligns with people's existing beliefs about individual freedom, government, children, or parenting, they can become invested in the misinformation and resistant to attempts to disprove the misunderstanding.
- **Time discounting:** People tend to put more weight on short-term gains or losses, and less weight on longer-term outcomes. This makes parents more likely to reject childhood vaccination because they are highly attuned to shielding their children from immediate pain and fear induced by needles while paying less mind to the much more serious risks incurred by contracting the disease the vaccine is designed to inoculate children against.

2.3. Public Perceptions of Social Norms Around Vaccination

Social norms are major drivers of human behavior and play a critical role in everyday decision-making: People often take the expectations and behaviors of others into consideration when they decide what is appropriate, and social norms thus profoundly influence their preferences and decisions. Social norms have been consistently identified as a factor that

shapes beliefs, attitudes, and behaviors about vaccination (Brewer et al., 2018). This is especially true of childhood vaccination. Whether parents perceive vaccination as a social norm or, conversely, think that other parents have decided not to vaccinate their children, affects their own decisions about vaccination (Smith et al., 2017). In this sense, social norms may act as a double-edged sword, which can either increase or decrease vaccine coverage depending on people's perception of what vaccine-related attitudes and behavior are considered normal by their in-group (Oraby et al., 2014).

The proliferation of anti-vaccination discourse on social media may create sets of online social norms that compete with existing, offline norms about vaccination, by creating echo chambers for skeptical and undecided individuals. Facebook pages promoting anti-vaccine messages were found to be very well connected with undecided individuals in a highly complex web of links, while pro-vaccine messages are sidelined and less interconnected with other pages, thereby receiving less engagement from vaccine-hesitant information seekers (Johnson et al., 2020; Mbaeyi et al., 2020; Smith & Graham, 2019; Rutschman, 2020).[6] The emergence of competing social norms around vaccination on social media is all the more concerning as hesitant parents tend to be more likely to seek vaccine information from the internet (Dubé et al., 2013; Johnson et al., 2020). In particular, parents exhibiting more information-seeking behavior before deciding to vaccinate their child report being more likely to rely on online media and less likely to feel pressured by offline social norms or to rely on the opinions of personal acquaintances, including their child's doctor, when making vaccination decisions (Brunson, 2013; Jung et al., 2013).

Most relevant cognitive biases at play

— **Salience bias:** People tend to place more weight on information that is prominent than on information that is scarce, even if the latter is in reality more valid. In other words, "repeating myths might contribute to increasing their acceptance due to their perceived familiarity" (Pluviano et al., 2017). Applied to the context of vaccination, this means that the more prominent anti-vaccination groups are on social media, the more likely people are to believe in their arguments, regardless of their scientific validity.

3. Directions for Future Research on Public Beliefs and Attitudes Towards Vaccination

The existing literature about public understandings, beliefs, and attitudes towards vaccination offers a rich, multi-faceted starting point for the project FrameWorks and AAP are partnering on. The findings above cover public understandings of the science of vaccination and immunity, deeply seated beliefs about individual freedom, government, children, and parenting, and the role played by cognitive biases and social norms. They also open promising avenues for us to explore in the next steps of this project, notably:

- How do cognitive biases interact with deeply ingrained beliefs and assumptions in people's thinking about vaccines and vaccination and their feelings about systemic public health policy? While we know biases can reinforce or undermine particular ways of thinking about vaccines, more work is needed to understand precisely how these interactions work.
- What's the relationship between deeply ingrained mindsets, assumptions, and values about government, parenting, and the role of individuals in society, and more surface-level attitudes and behaviors towards vaccination?
- Which of the beliefs and assumptions identified in the literature are the most likely to shape public support for systemic policies to increase vaccination rates? Which are particularly detrimental to public support for systemic policies?
- Which of the beliefs and assumptions identified in the literature are the most widely shared across different groups in the American public, such that shifting them would give future communications strategies the most potential for impact?
- How are people's beliefs and assumptions about vaccines being mobilized and remapped by the COVID pandemic? For example, will lack of trust in health care systems and government undermine acceptance of emerging COVID-19 vaccines, which were developed much faster than usual and used as a political weapon during the 2020 election? Will the public response to COVID-19, in turn, shift thinking about vaccination more broadly?

4. Communications-Based Interventions to Improve Understandings, Beliefs, and Attitudes Towards Vaccination

This section offers an overview of the communications-based interventions that have been either suggested or empirically tested to improve understandings, beliefs, attitudes, and behaviors towards vaccination, both in the US and abroad. Given that the FrameWorks-AAP project is focused on framing strategies, we will not detail the many examples of interventions that are not communications-based but rather aim at directly changing behaviors through nudging strategies (e.g., electronic records that can send digital reminders for vaccination to providers and patients) (Appleby et al., 2016; Stockwell & Fiks, 2013) or by changing health care practices (e.g., standing-order protocols, Make Every Contact Count in the UK) (Appleby et al., 2016; Community Preventative Services Task Force, 2015; Royal Society for Public Health, 2019).

We start with communications-based interventions that focus on aspects of communication other than framing (e.g., communication channel or mode of engagement), and then move on to a substantial discussion of existing framing interventions.

4.1. Interventions that Do Not Center on Framing

4.1.1. Increase Social Media Presence to Improve Public Knowledge and Counter Misinformation

Governments of tech-savvy countries such as South Korea and Singapore have worked to counteract vaccine misinformation and improve vaccine knowledge by ensuring that national health care entities maintain a strong presence on social media. FAQs with health care experts are widely dispersed through a wide variety of social media platforms. Targeted

advertisements linked to vaccine information are also deployed across platforms and are tailored to local audiences (The Royal Society & The British Academy, 2020).

Official messages from US health care experts, on the other hand, are mostly absent from or scarce on most social media and online platforms, such that misinformation can easily enter in to fill the gaps and dwarf any available pro-vaccination content. Government health agencies should consider following the lead of countries that have built a strong online presence across multiple social media platforms to eliminate information "gaps" and improve online engagement with people seeking vaccine information. Reaching individuals early in the information-seeking stage is important, as even skeptics tend to be more open to information early on in the process of forming opinions about vaccinations. Existing studies recommend combining proactive early outreach with personally tailored messages (Guidry et al., 2017).

4.1.2. Teach Media Literacy to Counter Misinformation and Build Self-Efficacy

Teaching media literacy can empower people to spot online vaccine misinformation on their own and even report it. This can help individuals be more proactive in their consumption of online vaccine information and encourage them to approach information they encounter more critically. The World Health Organization, for instance, as well as local governments, have attempted to engage individuals in this process and to link scientific literacy with self-efficacy more concretely through the content and structure of their websites (The Royal Society & The British Academy, 2020).

4.1.3. Use Personalized Interactions to Build Trust and Self-Efficacy

Individuals are more likely to adopt pro-vaccine attitudes and behaviors if they trust the information provider (Forster et al., 2016) and if they feel that they have agency over their decision-making process. Individuals who feel empowered and in control are also less likely to believe and adhere to conspiracy theories (Hornsey et al., 2018; Lewandowsky & Cook, 2020).

In a recent Canada-based study on the influenza vaccine, motivational interviewing between health care providers and patients proved effective in achieving these goals. The interviews fostered personalized interactions with parents of children with autism and with other conditions that put children at high risk for influenza complications. These interactions decreased parental vaccine hesitancy rates by 40% and significantly increased full coverage for childhood vaccinations (by 9%) when conducted well ahead of the standard

vaccine schedule time window (Gagneur et al., 2018). It also improved uptake for the human papillomavirus vaccine with adolescents and their parents (Gagneur et al., 2018).

Motivational interviewing involves techniques that avoid polarizing the issue or driving away vaccine-hesitant individuals, such as empathetic listening and open-ended Q&A sessions during which parents and a health care provider can talk about fears and concerns, as well as the importance of vaccination and the risks incurred by refusing it. One of the key goals of this approach is to make vaccine-hesitant parents feel that they are in charge of the decision-making process (Gagneur et al., 2018). Motivational interviewing also leverages the important role played by discussions with health care providers in alleviating patients' vaccination concerns, particularly among parents (Connors et al., 2016).

More generally speaking, more research is needed to identify a broader range of communication and interaction strategies that health providers can rely on to argue for vaccination. For now, what the existing, mostly qualitative studies on the issue appear to agree on is the importance of building trust between provider and patient, and that parents with serious concerns about vaccine safety can end up feeling greater trust towards their child's health care provider after taking part in personalized interactions like motivational interviewing (Connors et al., 2016). In the United Kingdom and mainland Europe, the WHO Tailoring Immunization Programs (TIPs) have used a related framework to improve vaccine coverage in several at-risk communities. TIP encourages health care experts to take an engaged and tailored "listen and learn" approach with community members to better understand their concerns and build trust around the issue of vaccination (Dubé et al., 2017).

Personalized interactions can also be facilitated online through the use of social media technologies that allow for intensive two-way feedback between experts and parents. This type of platform has proven more effective in reducing parental vaccine hesitancy than websites that simply present vaccine facts with no interactive tools (Glanz et al., 2017). Use of a web-based personally controlled health management system (PCHMS) including consumer care pathways, social forums, and messaging links with a health service provider has also shown promise in encouraging adult patients to get a flu shot. The PCHMS was presented as a way to take individuals on a personal "influenza vaccine journey," giving them the decision-making power to book an appointment and acknowledging their desire to feel more empowered in their own health care decision-making process. In this study, patients who used a PCHMS were more likely to get a flu shot than patients from the control group. (Lau et al., 2012).

4.2. Framing Interventions

4.2.1. Use Explanation to Address Risk Perception

Explanation has shown promise in its ability to build better understanding of what vaccines are and how they work, and to address inaccurate perceptions of risk among members of the public. These findings are in line with existing FrameWorks research, which has repeatedly shown the power of explanation in building understanding and shifting attitudes about a range of social issues,[7] notably by using explanatory examples or conceptual metaphors.

One study shows that providing a straightforward account of the consequences of previous outbreaks helped shift mothers' perception of the severity of diseases, and as a result, increased their willingness to vaccinate their children (Omer et al., 2017). In the case of children at high-risk for influenza complications, researchers also recommend that health care providers discuss the severity of outbreaks such as H1N1 with parents, explaining that nearly two-thirds of associated pediatric deaths occurred in individuals with an underlying neurological condition (Blanton et al., 2012).

Similarly, acknowledging the small but statistically unavoidable medical uncertainties about vaccines and explaining why it is dangerous for people to expect vaccines to be 100% safe before using them can be a winning strategy for communicators seeking to increase levels of public trust about vaccination (Krause et al., 2020; World Health Organization, 2017; Bond & Nolan, 2011). By contrast, official narratives that deny or downplay uncertainties inherent to science and only emphasize that vaccines are safe were found to be damaging to public trust (Hobson-West, 2007).

Finally, short, straightforward videos with animations that illustrate important vaccine-related concepts (such as herd immunity, the risks of diseases and vaccines, etc.) hold promise for public outreach (Guidry et al., 2017). In a recent study, such videos were among the content that registered some of the highest levels of engagement and attention from visitors to an experimental vaccine information website (Finnegan et al., 2018). This last example suggests that conceptual metaphors, which rely on familiar concepts and images in people's minds to explain more complex, less well known ideas, might be effective frames to help the public better understand the science behind vaccination and immunity.

4.2.2. Use Tone to Build Self-Efficacy

Message tone is another framing strategy that has recently shown promise to build feelings of self-efficacy among members of the public. Guidry et al, (2020), for instance, recommend messages that provide a balance between urgency and the idea that something can be done to prevent health threats: "When messages emphasize the severity and susceptibility

of a vaccine-preventable illness, they should also sufficiently aim to increase an individual's perceptions of their abilities to take action against the threat of infection" by getting vaccinated (Guidry et al., 2020).[8]

4.2.3. Use Trusted Messengers to Build Trust and Establish Social Norms

Empirical evidence is relatively robust that trusted messengers are effective in reaching a variety of groups classified as "pockets of under-vaccination" in the United States and the United Kingdom (Brunson et al., 2020). Trusted messengers, who serve as local liaisons between the community and health care providers, may come from a variety of backgrounds but are typically established community leaders or members (e.g., religious leaders, local health care providers, local business owners, educators) or health care experts from outside the community who have a solid rapport with local leaders. Trusted messengers have helped improve community vaccine uptake by building trust and openly discussing vaccine-related concerns and risks associated with vaccine-preventable illnesses.

Community leaders and health care professionals are two of the most prominent messenger types discussed in the literature. One program, for instance, focused on community leaders engaging interpersonal dialogue and taking a culturally sensitive approach to encourage vaccine uptake in Amish communities in the US following a pertussis outbreak. Building trust with community leaders and individual residents helped establish vaccination as a social norm and vaccine uptake increased during the campaign (Medina-Marino et al., 2013). Similarly, following a serious measles outbreak in the Somali American community in Minnesota, the state health department recruited outreach workers from the Somali community and engaged with faith leaders to disseminate accurate vaccine information and discuss community members' specific concerns and misunderstandings. Child MMR uptake rose from 42% in 2017 (the year of the outbreak) to 58% the following year (Richert, 2018).

The use of trusted messengers appears to be effective in the current moment as well, in the context of the COVID-19 pandemic. To address dangerous levels of under-vaccination for influenza in African American communities, who are also at a disproportionately high risk of COVID-19 infection and fatality, an outreach program worked with community leaders to build trust towards participation in COVID-19 vaccine trials and increase vaccine acceptance for seasonal influenza and COVID-19. "Community health deputies" in Pittsburgh, comprised mostly of local volunteers, discussed issues of historical mistrust and present-day concerns about vaccine safety with individual residents in a Neighborhood Resilience Project alongside local faith leaders. Health deputies shared their personal experiences participating in a vaccine trial, answered questions, and provided accurate information about the trials and the development of vaccines. During the project, African American vaccine trial volunteer rates rose locally from 3% to 8% in Pittsburgh (Hoffman, 2020).

Parents have also shown promise as effective messengers about childhood vaccination. Personal narratives from parents emphasizing the serious and sometimes fatal consequences of infection from vaccine-preventable diseases have proven more effective in drawing the attention of vaccine-hesitant parents than fact-checking and raw information (Shelby & Ernst, 2013; Gross, 2009). One pilot study of a new vaccine information website (Vaccines Today) found that user engagement and readership were highest surrounding articles that told stories, mainly written by parents, about children who experienced serious complications or even died from vaccine-preventable diseases. This format allowed authors to express emotions about vaccination, illness, and their children's health. According to Finnegan et al., (2018), the articles on the site that generated the longest engagement time (time spent reading the page content) had been written by parents talking about their own experiences with decision-making about vaccination.

4.2.4. Tie Facts and Science to Narratives, Emotions, and Values

Exposure to facts alone does not necessarily translate into changed beliefs, attitudes, and behaviors towards vaccination. This is particularly true when people are confronted with misinformation about vaccines, which is often presented through effective, emotionally charged human-interest stories that appeal to parents' care and concern for their children, their deeply held personal identities and values, and their fears and anxieties (Krause et al., 2020; Omer, 2017; Glanz et al., 2017; Jarrett, et al., 2015; Gross, 2009). While more research is needed about the best ways to frame scientific facts to make them more accessible and relatable for individuals and parents, embedding this information within personal narratives and values-driven messages is likely to increase the effectiveness of messages (Krause et al., 2020; Shelby and Ernst, 2013; Hobson-West, 2007; Berman, 2020). Attwell et al., (2018) suggest that to reach followers of organic culture in particular, it may be useful to ideologically "relocate" vaccination away from the medical establishment so that people are less likely to view vaccination "as an instrument of a hostile and imposing outgroup."

4.3. Focus on Individual Benefits Rather than Collective Benefits

Studies have suggested that embracing people's individualistic ways of thinking about health and parenting by stressing the individual benefits of vaccination (or risks of not vaccinating) may be more effective at shifting beliefs, attitudes, and behaviors than a focus on herd immunity or community responsibility (Attwell et al., 2018; Hobson-West, 2007). This may be especially true of vaccine-hesitant parents, whose primary goal is to avoid any potential risks posed to their *own* child, rather than the community (Bond & Nolan, 2011). By contrast,

messages emphasizing societal benefits without focusing on direct benefits for the individual child have so far not proven effective in increasing parents' intention to vaccinate (Hendrix et al., 2014). Likewise, emphasizing vaccination as a decisive personal action against the immediate threat of severe illness (thereby demonstrating individual empowerment and self-efficacy) may be more effective at reducing vaccine hesitancy than a more general discussion of the importance of vaccination for public health (Omer et al., 2017; Guidry et al., 2020).

Although messages that focus on the individual benefits of vaccination may lead to improved rates of vaccine uptake, existing FrameWorks research suggests that they might also make it harder for people to reach a more collective understanding of health and immunity, as well as undermine support for vaccination policies, both of which would be detrimental to the field's long-term goals of achieving systemic change.

4.4. Target Messages to Specific Identities and Ideologies

For vaccine refusers with strong stances based on personal values and ideology, a targeted approach appealing to personal identity may be more persuasive than fact-checking posts on social media alone, which are more likely to be rejected outright if the information provided is perceived to clash with preexisting worldviews (Berman, 2020; World Health Organization, 2017; Omer et al., 2017; Hornsey et al., 2018). However, this strategy remains mostly theoretical for now, and existing qualitative studies suggest that the process may be "finicky," require considerable tweaks along the way, and could turn out to be ineffective. For example, a recent UK study attempting to target conservatives and liberals with politically tailored pro-influenza vaccine messages failed to show a link between targeted framing and intentions to receive the influenza vaccine (British Politics and Policy, 2020).

5. Directions for Future Research on Framing Strategies to Shift Understandings and Attitudes Towards Vaccines

While many of the strategies outlined above require more empirical testing to determine how effective they can be at shifting beliefs, attitudes, and behaviors about vaccination, they help identify promising directions to explore in the frame-testing phase of the FrameWorks-AAP project, from trusted messengers to build trust and establish social norms around vaccination, to tone and personal narratives to build a sense of self-efficacy and empowerment among parents and individuals. It also raises important questions to explore in the next stages of the project:

— What are the most effective ways of explaining the science of vaccination? Are there particular conceptual metaphors or other types of explanation that are most helpful?

— More broadly speaking, what are the most effective ways of increasing basic knowledge of science among the American public?

— Is explaining the dangers and risks of vaccine-preventable diseases a good framing strategy to build support for structural policy change around vaccination?

— Can norming strategies help build a better understanding of the science of vaccination, or build support for policy change, in addition to increasing vaccination uptake?

— More generally, can the same strategies help build a better understanding of the science, shift attitudes towards vaccine acceptance, *and* build support for better vaccination policies? Or are different strategies needed to reach different goals (e.g., shifting attitudes may be the best way to increase vaccine acceptance, while building understanding of the science may be most effective to build support for policy and systemic changes)? If different strategies are needed, it will be vital to make sure strategies to advance each goal don't undercut the other goals.

— Which of the unhelpful beliefs and assumptions discussed in section 2 above can best be dispelled by framing strategies, and which ones might also require policy change up front?

- How does the framing of COVID-19 vaccines affect thinking about vaccination more generally? Are there particular ways of framing these vaccines that could help create more acceptance of childhood vaccines?
- What are the tradeoffs and potential backfire effects of some of the communications strategies outlined in section 4 above?
  - If, as hypothesized above, focusing only on the individual benefits of vaccination undermines both people's ability to think of health as a collective issue and their support for policy change, are there different strategies that could connect individual benefits with collective benefits in productive ways?
  - How can communicators tap into the potential of personal narratives and individual stories without reinforcing unhelpful, individualistic thinking about vaccines and vaccination?
  - Can we design a unified strategy that helps address different types of resistance to vaccination at the same time, instead of having to rely on different strategies tailored to different demographics, as suggested above?

References

Abhyankar, P., O'Connor D. B., & Lawton, R. (2008). The role of message framing in promoting MMR vaccination: Evidence of a loss-frame advantage. *Psychology, Health & Medicine, 13*(1), 1–16.

Amin, A. B., Bednarczyk, R. A., Ray, C. E., Melchiori, K. J., Graham, J., Huntsinger, J. R., & Omer, S. B. (2017). Association of moral values with vaccine hesitancy. *Nature Human Behaviour, 1*(12), 873–880.

Appleby, J., Hodin, M., Satcher, D., Schaffner, W., & Tan, L., (2016). *The value and imperative for quality measures of adult vaccines.* Adult Vaccine Access Coalition. https://adultvaccinesnow.org/wp-content/uploads/2016/07/Value-Imperative-Adult-Vaccines-Final.pdf.

American Academy of Pediatrics. (2020). *What's the latest with the flu in an era of COVID-19, September 2020.* www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Pages/ What's-the-Latest-with-the-Fl.aspx.

Attwell, K., Smith, D. T., & Ward, P. R. (2018). "The unhealthy other": How vaccine rejecting parents construct the vaccinating mainstream. *Vaccine, 36*(12), 1621–1626.

Bajaj, S. S., & Stanford, F. C. (2021). Beyond Tuskegee – Vaccine distrust and everyday racism. *New England Journal of Medicine.* Advance online publication. https://doi.org/10.1056/NEJMpv2035827.

Ball, P. (2020). Anti-vaccine movement could undermine efforts to end Coronavirus pandemic, researchers warn. *Nature, 581*(7808), 251–251.

Banerjee, A. V., Duflo, E., Glennerster, R., & Kothari, D. (2010). Improving immunisation coverage in rural India: Clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *BMJ, 340*, c2220. https://doi.org/10.1136/bmj.c2220.

Baumgaertner, B., Carlisle, J. E., & Justwan, F. (2018). The influence of political ideology and trust on willingness to vaccinate. *PLOS One, 13*(1), e0191728.

Bazzano, A., Zeldin, A., Schuster, E., Barrett, C., & Lehrer, D. (2012). Vaccine-related beliefs and practices of parents of children with autism spectrum disorders. *American Journal on Intellectual and Developmental Disabilities, 117*(3), 233–242.

Bedford, H., Attwell, K., Danchin, M., Marshall, H., Corben, P., & Leask, J. (2018). Vaccine hesitancy, refusal, and access barriers: The need for clarity in terminology. *Vaccine, 36*(44), 6556–6558.

Belongia, E. A., & Osterholm, M. T. (2020). COVID-19 and flu, a perfect storm. *Science, 368*(6496), 1163.

Bish, A., Yardley, L., Nicoll, A., & Michie, S. (2011). Factors associated with uptake of vaccination against pandemic influenza: A systematic review. *Vaccine, 29*(38), 6472–6484.

Blank, P. R., Schwenkglenks, M., & Szucs, T. D. (2009). Vaccination coverage rates in eleven European countries during two consecutive influenza seasons. *Journal of Infection, 58*(6), 446–458.

Blank, P. R., Schwenkglenks, M., & Szucs, T. D. (2009). Disparities in influenza vaccination coverage rates by target group in five European countries: Trends over seven consecutive seasons. *Infection, 37*(5), 390.

Blanton, L., Peacock, G., Cox, C., Jhung, M., Finelli, L., & Moore, C. (2012). Neurologic disorders among pediatric deaths associated with the 2009 pandemic influenza. *Pediatrics, 130*(3), 390–96.

Blume, S. (2006). Anti-vaccination movements and their interpretations. *Social Science & Medicine, 62*(3), 628–642.

Bond, L., & Nolan, T. (2011). Making sense of perceptions of risk of diseases and vaccinations: A qualitative study combining models of health beliefs, decision-making, and risk perception. *BMC Public Health, 11*(1), 943. https://doi.org/10.1186/1471-2458-11-943.

Boodman, E. (2020, September 21). *Not trusting the FDA, Black doctors' group creates panel to vet COVID-19 vaccines*. STAT. www.statnews.com/2020/09/21/black-doctors-group-creates-panel-to-vet-covid19-vaccines.

Brewer, N. T., Chapman, G. B., Rothman, A. J., Leask, J., & Kempe, A. (2018). Increasing vaccination: Putting psychological science into action. *Psychological Science in the Public Interest, (18)*3, 149–207.

Broniatowski, D. A., Hilyard, K. M., & Dredze, M. (2016). Effective vaccine communication during the Disneyland measles outbreak. *Vaccine, 34*(28), 3225–3228.

Broniatowski, D. A., Jamison, A. M., Qi, S., AlKulaib, L., Chen, T., Benton, A., Quinn, S., & Dredze, M. (2018). Weaponized health communication: Twitter bots and Russian trolls amplify the vaccine debate." *American Journal of Public Health, 108*(10), 1378–1384.

Brown, K. F., Kroll, J. S., Hudson, M. J., Ramsay, M., Green, J., Vincent, C. A., Fraser, G., & Sevdalis, N. (2010). Omission bias and vaccine rejection by parents of healthy children: Implications for the influenza A/H1N1 vaccination programme." *Vaccine, 28*(25), 4181–4185.

Brown, K. F., Long, S. J., Ramsay, M., Hudson, M. J., Green, J., Vincent, C. A., Kroll, J. S., Fraser, G., & Sevdalis, N. (2012). UK parents' decision-making about measles–mumps–rubella (MMR) vaccine 10 years after the MMR-autism controversy: A qualitative analysis. *Vaccine, 30*(10), 1855–1864.

Brunson, E. K. (2013). How parents make decisions about their children's vaccinations. *Vaccine, 31*(46), 5466–5470. www.sciencedirect.com/science/article/pii/ S0264410X13012462.

Brunson, E. K., & Schoch-Spana, M., and on behalf of the Working Group on Readying Populations for COVID-19 Vaccine. (2020). A social and behavioral research agenda to facilitate COVID-19 vaccine uptake in the United States. *Health Security, 18*(4), 338–344.

Bryan, M. A., Gunningham, H., & Moreno, M. A. (2018). Content and accuracy of vaccine information on pediatrician blogs. *Vaccine, 36*(5), 765–770.

Burgess, D. C., Burgess, M. A., & Leask, J. (2006). The MMR vaccination and autism controversy in the United Kingdom 1998–2005: Inevitable community outrage or a failure of risk communication? *Vaccine, 24*(18), 3921–3928.

Callaghan, T. (2019, August 7). *Conspiracy theories and fear of needles contribute to vaccine hesitancy for many parents.* Vital Record. https://vitalrecord.tamhsc.edu/conspiracy-theories-and-fear-of-needles-contribute-to-vaccine-hesitancy.

Callaghan, T., Motta, M., Sylvester, S., & Trujillo, K. L. (2019). Parent psychology and the decision to delay childhood vaccination. *Social Science & Medicine, 238,* 112407. https://doi.org/10.1016/j.socscimed.2019.112407.

Carleton, R. N. (2016). Into the unknown: A review and synthesis of contemporary models involving uncertainty. *Journal of Anxiety Disorders, 39,* 30–43. https://doi.org/10.1016/j.janxdis.2016.02.007.

Carrieri, V., Madio, L., & Principe, F. (2019). Vaccine hesitancy and (fake) news: Quasi-experimental evidence from Italy. *Health Economics, 28*(11), 1377–1382.

Carson, R. (2015, February 6). Nearly one-quarter of Vashon Island parents opt out of vaccinations for their children. *Tacoma News Tribune*. www.thenewstribune.com/news/local/article26252716.html.

Casiday, R., Cresswell, T., Wilson, D., & Panter-Brick, C. (2006). A survey of UK parental attitudes to the MMR vaccine and trust in medical authority. *Vaccine, 24*(2), 177–184.

Catalan-Matamoros, D., & Peñafiel-Saiz, C. (2019). How is communication of vaccines in traditional media: A systematic review. *Perspectives in Public Health, 139*(1), 34–43.

Chang, L. J., & Sanfey, A. G. (2013). Great expectations: Neural computations underlying the use of social norms in decision making. *Social, Cognitive, & Affective Neuroscience, 8*(3), 277–284.

Christ, C. (2019, April 12). Increased use of immunization exemptions put Arizona at-risk for an outbreak in 2019. *Arizona Department of Health Services*. https://directorsblog.health.azdhs.gov/increased-use-of-immunization-exemptions-put-arizona-at-risk-for-an-outbreak-in-2019.

Community Preventative Services Task Force. (2015). *Increasing appropriate vaccination: Standing orders*. www.thecommunityguide.org/sites/default/files/assets/Vaccination-Standing-Orders.pdf.

Connors, J. T., Slotwinski, K. L., & Hodges, E. A. (2017). Provider-parent communication when discussing vaccines: A systematic review." *Journal of Pediatric Nursing, 33,* 10–15.

Cornwall, W. (2020). Officials gird for a war on vaccine misinformation. *Science, 369*(6499), 14–15.

Coronavirus: Only half of Britons say they would get a vaccine, poll reveals. (2020, August 9). Sky News. https://news.sky.com/story/coronavirus-only-half-of-britons-say-they-would-get-a-vaccine-poll-reveals-12045605.

Cunningham, G. (2019, December 20). *Vaccination isn't a question for kids who have special needs.* Gillette Children's Specialty Healthcare. www.gillettechildrens.org/ khm/vaccination-isnt-a-question-for-special-needs-kids.

Dar, O., Gobin, M., Hogarth, S., Lane, C., & Ramsay, M. (2013). Mapping the Gypsy Traveller community in England: What we know about their health service provision and childhood immunization uptake. *Journal of Public Health, 35*(3), 404–412.

deShazo, R. D., Johnson, M., Eriator, I., & Rodenmeyer, K. (2018). Backstories on the US opioid epidemic. Good intentions gone bad, an industry gone rogue, and watch dogs gone to sleep. *The American Journal of Medicine, 131*(6), 595–601.

Dempsey, A. F., & O'Leary, S. T. (2018). Human papillomavirus vaccination: Narrative review of studies on how providers' vaccine communication affects attitudes and uptake. *Academic Pediatrics, 18*(2, Suppl.), S23–S27.

Dixon, G. N., & Clarke, C. E. (2013). Heightening uncertainty around certain science: Media coverage, false balance, and the autism-vaccine controversy. *Science Communication, 35*(3), 358–382.

Dombkowski, K. J., Leung, S. W., & Clark, S. J. (2007). Provider attitudes regarding use of an immunization information system to identify children with asthma for influenza vaccination. *Journal of Public Health Management and Practice, 13*(6), 567–571.

Doward, J. (2020, September 20). "Quite frankly terrifying": How the QAnon conspiracy theory is taking root in the UK. *The Guardian*. www.theguardian.com/world/2020/sep/20/the-qanon-conspiracy.

Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. (2013). Vaccine hesitancy: An overview. *Human Vaccines & Immunotherapeutics, 9*(8), 1763–1773.

Dubé, E., Gagnon, D., Nickels, E., Jeram, S., & Schusterd, M. (2014). Mapping vaccine hesitancy—Country-specific characteristics of a global phenomenon. *Vaccine, 32*(49), 6649–6654.

Dubé, E., Vivion, M., & MacDonald, N. E. (2015). Vaccine hesitancy, vaccine refusal, and the anti-vaccine movement: Influence, impact, and implications. *Expert Review of Vaccines, 14*(1), 99–117.

Dubé, E., Gagnon, D., MacDonald, N. E., & SAGE Working Group on Vaccine Hesitancy. (2015). Strategies intended to address vaccine hesitancy: Review of published reviews. *Vaccine, 33*(34), 4191–4203. www.sciencedirect.com/science/article/pii/S0264410X15005058.

Dubé, E., Leask, J., Wolff, B., Hickler, B., Balaban, V., Hosein, E., & Habersaat, K. (2018). The WHO Tailoring Immunization Programmes (TIP) approach: Review of implementation to date. *Vaccine, 36*(11), 1509–1515. www.sciencedirect.com/science/article/pii/S0264410X17317528.

Dutch "Bible Belt" town tries to boost measles coverage. (2019, August 29). Medical Xpress. https://medicalxpress. com/news/2019-08-dutch-bible-belt-town-boost.html.

Durant, W. (2019). How do we respond to the challenge of vaccine misinformation?" *Perspectives in Public Health*, *139*(6), 280–282. https://journals.sagepub. com/doi/abs/10.1177/1757913919878655.

Edelstein, M., Müller, M., Ladhani, S., Yarwood, J., Salathé, M., & Ramsay, M. (2020). Keep calm and carry on vaccinating: Is anti-vaccination sentiment contributing to declining vaccine coverage in England? *Vaccine, 38*(33), 5297–5304.

Edwards, K. M., Hackell, J. M., Committee on Infectious Diseases, & Committee on Practice & Ambulatory Medicine. (2016). Countering vaccine hesitancy. *Pediatrics, 138*(3), e20162146–e20162146.

Enkel, S. L., Attwell, K., Snelling, T. L., & Christian, H. E. (2018). "Hesitant compliers": Qualitative analysis of concerned fully – vaccinating parents. *Vaccine, 36*(44), 6459–6463.

Finnegan, G., Holt, D., English, P. M., Glismann, S., Thomson, A., Salisbury, D. M., Bogaerts, H., & Bonanni, P. (2018). Lessons from an online vaccine communication project. *Vaccine, 36*(44), 6509–6511.

Fisher, K. A., Bloomstone, S. J., Walder, J., Crawford, S., Fouayzi, H., & Mazor, K. M. (2020). Attitudes toward a potential SARS-CoV-2 vaccine: A survey of U.S. adults. *Annals of Internal Medicine, 173*(12), 964–973. https://doi.org/10.7326/M20-3569.

Forman, R., & Thompson, L. (2020, September 12). What a successful COVID-19 vaccination campaign would look like." *LSE USAPP.* https://blogs.lse.ac.uk/usappblog/2020/09/12/what-a-successful-covid-19-vaccination-campaign-would-look-like.

Forster, A. S., Rockliffe, L., Chorley, A. J., Marlow, L. A. V., Bedford, H., Smith, S. G., & Waller, J. (2016). A qualitative systematic review of factors influencing parents' vaccination decision-making in the United Kingdom. *SSM – Population Health, 2*, 603–612.

Fournet, N., Mollema, L., Ruijs, W. L., Harmsen, A., Keck, F., Durand, J. Y., Cunha, M. P., Wamsiedel, M., Reis, R., French, J., Smit, E. G., Kitching, A., & van Steenbergen, J. E. (2018). Under-vaccinated groups in Europe and their beliefs, attitudes, and reasons for non-vaccination; two systematic reviews. *BMC Public Health, 18,* 196. www.ncbi.nlm.nih.gov/pmc/articles/PMC5789742.

Frankovic, K. (2016, December 27). *Belief in conspiracies largely depends on political identity.* YouGov. https://today.yougov.com/topics/politics/articles-reports/2016/12/27/belief-conspiracies-largely-depends-political-iden.

de Freytas-Tamura, K. (2019, May 14). Despite measles warnings, anti-vaccine rally draws hundreds of ultra-Orthodox Jews. *The New York Times.* www.nytimes.com/2019/05/14/nyregion/measles-vaccine-orthodox-jews.html?action=click&module=RelatedLinks&pgtype=Article.

de Freytas-Tamura, K. (2019, June 13). Bastion of anti-vaccine fervor: Progressive Waldorf schools. *The New York Times*. www.nytimes.com/2019/06/13/nyregion/measles-outbreak-new-york.html.

Fu, L. Y., Bonhomme, L., Cooper, S. C., Joseph, J. G., & Zimet, G. D. (2014). Educational interventions to increase HPV vaccination acceptance: A systematic review. *Vaccine, 32*(17), 1901–1920.

Funk, C., Kennedy, B., & Hefferon, M. (2017). *Vast majority of Americans say benefits of childhood vaccines outweigh risks*. Pew Research Center. www.pewresearch.org/internet/wp-content/uploads/sites/9/2017/02/PS_2017.02.02_Vaccines_FINAL.pdf.

Gagneur, A., Lemaître, T., Gosselin, V., Farrands, A., Carrier, N., Petit, G., Valiquette, L., & De Wals, P. (2018). A postpartum vaccination promotion intervention using motivational interviewing techniques improves short-term vaccine coverage: PromoVac study. *BMC Public Health, 18*(1), 811.

Gerend, M. A., & Shepherd, J. E. (2007). Using message framing to promote acceptance of the human papillomavirus vaccine. *Health Psychology, 26*(6), 745–752.

Gilbert, L. (2019, February 1). *Children with chronic lung diseases at higher risk of flu hospitalisation*. Medical Xpress. https://medicalxpress.com/news/2019-02-children-chronic-lung-diseases-higher.html.

Glanz, J. M., Newcomer, S. R., Jackson, M. L., Omer, S. B., Bednarczyk, R. A., Shoup, J. A., DeStefano, F., & Daley, M. F. (2016). White paper on studying the safety of the childhood immunization schedule in the vaccine safety datalink. *Vaccine, 34*(Suppl. 1), A1–A29.

Glanz, J. M., Wagner, N. M., Narwaney, K. J., Kraus, C. R., Shoup, J. A., Xu, S., O'Leary, S. T., Omer, S. B., Gleason, K. S., & Daley, M. F. (2017). Web-based social media intervention to increase vaccine acceptance: A randomized controlled trial. *Pediatrics, 140*(6), e20171117. https://pediatrics.aappublications.org/content/140/6/e20171117.

Goin-Kochel, R. P., Fombonne, E., Mire, S. S., Minard, C. G., Sahni, L. C., Cunningham, R. M., & Boom, J. A. (2020). Beliefs about causes of autism and vaccine hesitancy among parents of children with autism spectrum disorder. *Vaccine, 38*(40), 6327–6333.

Grabenstein, J. D. (2013). What the world's religions teach, applied to vaccines and immune globulins. *Vaccine, 31*(16), 2011–2023.

Greenberg, J., Dubé, E., & Driedger, M. (2017). Vaccine hesitancy: In search of the risk communication comfort zone. *PLOS Currents, 9*. www.ncbi.nlm.nih.gov/pmc/articles/PMC5346025.

Gross, L. (2009). A broken trust: Lessons from the vaccine-autism wars. *PLOS Biology, 7*(5), e1000114.

Guidry, J. P. D., Coman, I., Vraga, E., & O'Donnell, N. H. (2020). (S)pin the flu vaccine: Recipes for concern. *Vaccine, 38*(34), 5498–5506.

Gupta, V. B. (2010). Communicating with parents of children with autism about vaccines and complementary and alternative approaches. *Journal of Developmental & Behavioral Pediatrics, 31*(4), 343–345.

Gust, D., Brown, C., Sheedy, K., Hibbs, B., Weaver, D., & Nowak, G. (2005). Immunization attitudes and beliefs among parents: Beyond a dichotomous perspective. *American Journal of Health Behavior, 29*(1), 81–92.

Harrison, E. A., & Wu, J. W. (2020). Vaccine confidence in the time of COVID-19. *European Journal of Epidemiology, 35*(4), 325–330.

Hendrix, K. S., Finnell, S. M. E., Zimet, G. D., Sturm, L. A., Lane, K. A., & Downs, S. M. (2014). Vaccine message framing and parents' intent to immunize their infants for MMR. *Pediatrics, 134*(3), e675–e683.

Henrikson, N. B., Opel, D. J., Grothaus, L., Nelson, J., Scrol, A., Dunn, J., Faubion, T., Roberts, M., Marcuse, E. K., & Grossman, D. C. (2015). Physician communication training and parental vaccine hesitancy: A randomized trial. *Pediatrics, 136*(1), 70–79.

Hill, H. A., Elam-Evans, L. D., Yankey, D., Singleton, J. A., & Kang, Y. (2017). Vaccination coverage among children aged 19–35 months — United States, 2016. *Morbidity and Mortality Weekly Report, 66*, 1171–1177. www.cdc.gov/mmwr/volumes/66/wr/mm6643a3.htm.

Hilton, S., Petticrew, M., & Hunt, K. (2006). "Combined vaccines are like a sudden onslaught to the body's immune system": Parental concerns about vaccine "overload" and "immune-vulnerability." *Vaccine, 24*(20), 4321–4327.

Hobson West, P. (2007). "Trusting blindly can be the biggest risk of all": Organised resistance to childhood vaccination in the UK. *Sociology of Health & Illness, 29*(2), 198–215.

Hoffman, J. (2020, August 16). Fearing a "twindemic," health experts push urgently for flu shots. *The New York Times*. www.nytimes.com/2020/08/16/health/coronavirus-flu-vaccine-twindemic.html.

Hoffman, J., & Lee, C. W. (2020, October 7). "I won't be used as a guinea pig for white people." *The New York Times*. www.nytimes.com/2020/10/07/health/coronavirus-vaccine-trials-african-americans.html.

Holton, A., Weberling, B., Clarke, C. E., & Smith, M. J. (2012). The blame frame: Media attribution of culpability about the MMR–autism vaccination scare. *Health Communication, 27*(7), 690–701.

Hornsey, M. J., Harris, E. A., & Fielding, K. S. (2018). The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychology, 37*(4), 307–315.

I Vaccinate. (2020). *Beaumont doctor urges flu shots as prevention of "twindemic" with COVID-19.* https://ivaccinate.org/beaumont-doctor-urges-flu-shots-as-prevention-of-twindemic-with-covid-19.

Ipsos MORI. (2020, September 1). *Three in four adults globally say they would get a vaccine for COVID-19.* www.ipsos.com/ipsos-mori/en-uk/three-four-adults-globally-say-they-would-get-vaccine-covid-19.

Jacob, V., Chattopadhyay, S. K., Hopkins, D. P., Morgan, J. M., Pitan, A. A., Clymer, J. M., & Community Preventive Services Task Force. (2016). Increasing coverage of appropriate vaccinations: A Community Guide systematic economic review. *American Journal of Preventive Medicine, 50*(6): 797–808. https://doi.org/10.1016/j.amepre.2015.11.003.

Jamison, A. M., Quinn, S. C., & Freimuth, V. S. (2019). "You don't trust a government vaccine": Narratives of institutional trust and influenza vaccination among African American and white adults." *Social Science & Medicine, (1982)*221, 87–94.

Jang, S. M., Mckeever, B. W., Mckeever, R., & Kim, J. K. (2019). From social media to mainstream news: The information flow of the vaccine-autism controversy in the US, Canada, and the UK. *Health Communication, 34*(1), 110–117.

Jarrett, C., Wilson, R., O'Leary, M., Eckersberger, E., Larson, H. J., & SAGE Working Group on Vaccine Hesitancy. (2015). Strategies for addressing vaccine hesitancy— A systematic review. *Vaccine, 33*(34), 4180–4190.

Johnson, N. F., Velásquez, N., Restrepo, N. J., Leahy, R., Gabriel, N., El Oud, S., Zheng, M. Manrique, P., Wuchty, S., & Lupu, Y. (2020). The online competition between pro-and anti-vaccination views. *Nature, 582,* 230–233. https://doi.org/10.1038/s41586–020–2281–1.

Jones, A. M., Omer, S. B., Bednarczyk, R. A., Halsey, N. A., Moulton, L. H., & Salmon, D. A. (2012). Parents' source of vaccine information and impact on vaccine attitudes, beliefs, and nonmedical exemptions. *Advances in Preventive Medicine, 2012*. www.hindawi.com/journals/apm/2012/932741.

Jung, M., Lin, L., & Viswanath, K. (2013). Associations between health communication behaviors, neighborhood social capital, vaccine knowledge, and parents' H1N1 vaccination of their children. *Vaccine, 31*(42), 4860–4866.

Kahneman, D. (2011). *Thinking, Fast, and Slow*. Macmillan.

Kata, A. (2010). A postmodern Pandora's box: Anti-vaccination misinformation on the internet. *Vaccine, 28*(7), 1709–1716.

Katz, R. V., Green, B. L., Kressin, N. R., Kegeles, S. S., Wang, M. Q., James, S. A., Russell, S. L., Claudio, C., & McCallum, J. M. (2008). The legacy of the Tuskegee Syphilis Study: Assessing its impact on willingness to participate in biomedical studies. *Journal of Health Care for the Poor and Underserved, 19*(4), 1168–1180.

Kennedy, A., Basket, M., & Sheedy, K. (2011). Vaccine attitudes, concerns, and information sources reported by parents of young children: Results from the 2009 HealthStyles Survey. *Pediatrics, 127*(Suppl. 1), S92–S99. https://pediatrics.aappublications.org/content/127/ Supplement_1/S92.short?.

Kings College London. (2020). *Coronavirus uncertainties: Vaccines, symptoms, and contested claims*. www.ipsos.com/sites/default/files/ct/news/documents/2020-08/coronavirus_uncertainties_.pdf.

Krause, N. M., Freiling, I., Beets, B., & Brossard, D. (2020). Fact-checking as risk communication: The multi-layered risk of misinformation in times of COVID-19. *Journal of Risk Research, 23*(7–8): 1052–1029.

Krupenkin, M. (2020). Does partisanship affect compliance with government recommendations? *Political Behavior, 43,* 451–472. https://doi.org/10.1007/s11109-020-09613-6.

Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M. D., & Paterson, P. (2014). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine, 32*(19), 2150–2159.

Larson, H. J., de Figueiredo, A., Xiahong, Z., Schulz, W. S., Verger, P., Johnston, I., Cook, A. R., & Jones, N. S. (2016). The state of vaccine confidence 2016: Global insights through a 67-country survey. *EBioMedicine, 12,* 295–301.

Lau, A. Y. S., Sintchenko, V., Crimmins, J., Magrabi, F., Gallego, B., & Coiera, E. (2012). Impact of a web-based personally controlled health management system on influenza vaccination and health services utilization rates: A randomized controlled trial. *Journal of the American Medical Informatics Association, 19*(5), 719–727.

Lazarus, J. V., Ratzan, S., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., Kimball, S., & El-Mohandes, A. (2020). *Hesitant or not? A global survey of potential acceptance of a COVID-19 vaccine.* medRxiv. https://doi.org/10.1101/2020.08.23.20180307.

Leader, A. E., Weiner, J. L., Kelly, B. J., Hornik, R. C., & Cappella, J.N. (2009). Effects of information framing on human papillomavirus vaccination. *Journal of Women's Health, 18*(2), 225–233.

Leask, J., Kinnersley, P., Jackson, C., Cheater, F., Bedford, H. & Rowles, G. (2012). Communicating with parents about vaccination: A framework for health professionals. *BMC Pediatrics, 12*(1), 154.

Lin, C. J., Nowalk, M. P., Zimmerman, R. K., Ko, F., Zoffel, L., Hoberman, A., & Kearney, D. H. (2006). Beliefs and attitudes about influenza immunization among parents of children with chronic medical conditions over a two-year period. *Journal of Urban Health, 83*(5), 874–883.

Luyten, J., Bruyneel, L., & van Hoek, A. J. (2019). Assessing vaccine hesitancy in the UK population using a generalized vaccine hesitancy survey instrument." *Vaccine, 37*(18), 2494–2501.

MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope, and determinants. *Vaccine, 33*(34), 4161–4164.

Mann, B. W. (2019). Autism narratives in media coverage of the MMR vaccine-autism controversy under a crip futurism framework. *Health Communication, 34*(9), 984–990.

Mbaeyi, S., Cohn, A., & Messonnier, N. (2020). A call to action: Strengthening vaccine confidence in the United States. *Pediatrics, 145*(6), e20200390.

McAteer, J., Yildirim, I., & Chahroudi, A. for the Society for Pediatric Research Advocacy Committee. (2020). The VACCINES Act: Deciphering vaccine hesitancy in the time of COVID-19. *Clinical Infectious Diseases, 71*(15), 703–705.

McIntyre, N., & Quinn, B. (2020, September 19). Engagement with anti-vaccine Facebook posts trebles in one month. *The Guardian*. www.theguardian.com/media/2020/sep/19/engagement-anti-vaccine-facebook-posts-trebles-one-month-coronavirus.

McNeil, D. (2019, April 24). Measles outbreak infects 695, highest number since 2000. *The New York Times*. www.nytimes.com/2019/04/24/ health/measles-outbreaks-us.html.

Medina-Marino, A., Reynolds, D., Finley, C., & Hays, S. (2013). Communication and mass vaccination strategies after pertussis outbreak in rural Amish communities—Illinois, 2009–2010. *The Journal of Rural Health, 29*(4), 413–419.

Mendel-Van Alstyne, J. A., Nowak, G. J., & Aikin, A. L. (2018). What is "confidence" and what could affect it?: A qualitative study of mothers who are hesitant about vaccines. *Vaccine, 36*(44), 6464–6472.

Mesch, G., & Schwirian, K. (2015). Social and political determinants of vaccine hesitancy: Lessons learned from the H1N1 pandemic of 2009–2010. *American Journal of Infection Control, 43*(11), 1161–1165. https://doi.org/10.1016/j.ajic.2015.06.031.

Milkman, K. L., Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (2011). Using implementation intentions prompts to enhance influenza vaccination rates. *Proceedings of the National Academy of Sciences, 108*(26), 10415–10420.

Mills, E., Jadad, A. R., Ross, C., & Wilson, K. (2005). Systematic review of qualitative studies exploring parental beliefs and attitudes toward childhood vaccination identifies common barriers to vaccination. *Journal of Clinical Epidemiology, 58*(11), 1081–1088.

Mirza, A., Subedar, A., Fowler, S. L., Murray, D. L., Arnold, S., Tristram, D., Abuelreish, M., Wludyka, P., Chiu, T. T., & Rathore, M.H. (2008). Influenza vaccine: Awareness and barriers to immunization in families of children with chronic medical conditions other than asthma. *Southern Medical Journal, 101*(11), 1101–1105. https://europepmc.org/article/med/19088517.

Moran, M. B., Lucas, M., Everhart, K., Morgan, A., & Prickett, E. (2016). What makes anti-vaccine websites persuasive? A content analysis of techniques used by anti-vaccine websites to engender anti-vaccine sentiment. *Journal of Communication in Healthcare, 9*(3), 151–163.

Motta, M., Callaghan, T., & Sylvester, S. (2018). Knowing less but presuming more: Dunning-Kruger effects and the endorsement of anti-vaccine policy attitudes. *Social Science & Medicine,* 211, 274–281.

Mytton, J., Bedford, H., Condon, L., Jackson, C., & UNITING team. (2020). Improving immunization uptake rates among Gypsies, Roma and Travellers: A qualitative study of the views of service providers." *Journal of Public Health,* fdaa100. https://academic.oup.com/jpubhealth/advance-article/doi/10.1093/pubmed/fdaa100/5869187.

Nan, X., Xie, B., & Madden, K. (2012). Acceptability of the H1N1 vaccine among older adults: The interplay of message framing and perceived vaccine safety and efficacy. *Health Communication, 27*(6), 559–568.

National Prevention Information Network. (2020, August 10). *New Methods for Health Strategy Communication*. https://npin.cdc.gov/pages/health-communication-strategies-methods.

Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *The European Journal of Health Economics, 21*(7), 977–982.

Neuzil, K. M., Wright, P. F., Mitchel, E. F., & Griffin, M. R. (2000). The burden of influenza illness in children with asthma and other chronic medical conditions. *The Journal of Pediatrics, 137*(6), 856–864.

Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014). Effective messages in vaccine promotion: A randomized trial. *Pediatrics, 133*(4), e835–e842.

O'Connor, A. M., Pennie, R. A., & Dales, R. E. (1996). Framing effects on expectations, decisions, and side effects experienced: The case of influenza immunization. *Journal of Clinical Epidemiology, 49*(11), 1271–1276.

Odone, A., Ferrari, A., Spagnoli, F., Visciarelli, S., Shefer, A., Pasquarella, C., & Signorelli, C. (2015). Effectiveness of interventions that apply new media to improve vaccine uptake and vaccine coverage. *Human Vaccines & Immunotherapeutics, 11*(1), 72–82.

Offit, P. A., & Coffin, S. E. (2003). Communicating science to the public: MMR vaccine and autism. *Vaccine, 22*(1), 1–6.

Ohlrogge, A. W., & Suggs, L. S. (2018). Flu vaccination communication in Europe: What does the government communicate and how? *Vaccine, 36*(44), 6512–6519.

O'Keefe, D. J., & Nan, X. (2012). The relative persuasiveness of gain-and loss-framed messages for promoting vaccination: A meta-analytic review. *Health Communication, 27*(8), 776–783.

Omer, S. B., Amin, A. B., & Limaye, R. J. (2017). Communicating about vaccines in a fact-resistant world. *JAMA Pediatrics, 171*(10), 929–930.

Opel, D. J., Mangione-Smith, R., Taylor, J. A., Korfiatis, C., Wiese, C, Catz, S., & Martin, D. P. (2011). Development of a survey to identify vaccine-hesitant parents. *Human Vaccines, 7*(4), 419–425.

Oraby, T., Thampi, V., & Bauch, C. T. (2014). The influence of social norms on the dynamics of vaccinating behaviour for paediatric infectious diseases. Proceedings. Biological sciences, *281*(1780), 20133172. https://doi.org/10.1098/rspb.2013.3172.

Page, B. (2020, October 20). *Britons increasingly abiding by the COVID-19 rules, with social responsibility and the NHS the primary drivers.* Ipsos MORI. www.ipsos.com/ipsos-mori/ en-uk/britons-increasingly-abiding-covid-19-rules-social-responsibility-and-nhs-primary-drivers.

Pazzanese, C. (2020, October 30). Why isn't the right more afraid of COVID-19? *Harvard Gazette*. https://news. harvard.edu/gazette/story/2020/10/what-caused-the-u-s-anti-science-trend.

Penţa, M. A., & Băban, A. (2018). Message framing in vaccine communication: A systematic review of published literature. *Health Communication, 33*(3), 299–314.

Plough, A., Bristow, B., Fielding, J., Caldwell, S., & Khan, S. (2011). Pandemics and health equity: Lessons learned from the H1N1 response in Los Angeles County. *Journal of Public Health Management and Practice, 17*(1), 20–27.

Pluviano, S., Watt, C., & Della Sala, S. (2017). Misinformation lingers in memory: Failure of three pro-vaccination strategies. *PLOS ONE, 12*(7), e0181640.

Professor, J. P., & Niemeyer, S. (2004). Health risk communication and amplification: Learning from the MMR vaccination controversy. *Health, Risk & Society, 6*(1), 7–23.

Puri, N., Coomes, E. A., Haghbayan, H., & Gunaratne, K. (2020). Social media and vaccine hesitancy: New updates for the era of COVID-19 and globalized infectious diseases. *Human Vaccines & Immunotherapeutics, 16*(11), 2586–2593.

Quinn, S. C., Jamison, A., Freimuth, V. S., An, J., Hancock, G. R., & Musa, D. (2017). Exploring racial influences on flu vaccine attitudes and behavior: Results of a national survey of white and African American adults. *Vaccine, 35*(8), 1167–1174.

Quinn, S. C., Hilyard, K. M., Jamison, A. M., An, J., Hancock, G. R., Musa, D., & Freimuth, V. S. (2017). The influence of social norms on flu vaccination among African American and white adults. *Health Education Research, 32*(6), 473–486.

Rauhala, E. (2020, October 7). The pandemic is amplifying the U.S. anti-vaccine movement — and globalizing it. *The Washington Post*. www.washingtonpost.com/world/coronaviurs-antivax-conspiracies/2020/10/06/96ddd2c2-028e-11eb-b92e-029676f9ebec_story.html.

Redelmeier, D. A., Rozin, P., & Kahneman, D. (1993). Understanding patients' decisions: Cognitive and emotional perspectives. *JAMA, 270*(1), 72–76.

Reiter, P. L., Pennell, M. L., & Katz, M. L. (2020). Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated?" *Vaccine, 38*(42), 6500–6507.

Resnick, B. (2020, September 10). *A third of Americans might refuse a COVID-19 vaccine. How Screwed Are We?* Vox. www.vox.com/science-and-health/21364099/covid-19-vaccine-hesitancy-research-herd-immunity.

Reyna, V. F. (2012). Risk perception and communication in vaccination decisions: A fuzzy-trace theory approach. *Vaccine, 30*(25), 3790–3797.

Richert, C. (2018, August 24) *A year after severe outbreak, more Somali-American kids are vaccinated against measles.* MPR News. www.mprnews.org/story/2018/08/24/measles-vaccinated-somali-american-children-up-more-outbreak.

Rogers, M. A. M., Kim, C., & Hofstetter, A. M. (2019). Geospatial variation in rotavirus vaccination in infants, United States, 2010–2017. *Emerging Infectious Diseases, 25*(10), 1993–1995.

Rosenthal, S. L., Rupp, R., Zimet, G. D., Meza, H. M., Loza, M. L., Short, M. B., & Succop, P. A. (2008). Uptake of HPV vaccine: Demographics, sexual history and values, parenting style, and vaccine attitudes. *Journal of Adolescent Health, 43*(3), 239–245.

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain-and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56*(Suppl. 1), S202–S220.

Royal Society of Public Health. (2019). *Moving the needle: Promoting vaccination uptake across the life course.* www.rsph.org.uk/static/uploaded/3b82db00-a7ef-494c-85451e78ce18a779.pdf.

Rutschman, A. S. (2020, November 5). Facebook's latest attempt to address vaccine misinformation—And why it's not enough. *Health Affairs Blog.* www.healthaffairs.org/do/10.1377/hblog20201029.23107.

Sadaf, A., Richards, J. L., Glanz, J., Salmon, D. A., & Omer, S. B. (2013). A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy. *Vaccine, 31*(40), 4293–4304.

Sahar, N., Lee, O., Hoffman, S. J., & Sritharan, L. (2020). Overview of key legal, political, and social challenges facing global vaccination efforts. *Imaginations: Journal of Cross-Cultural Image Studies, 11*(2), 127–153.

Sanders, L. (2020, May 26). *The difference between what Republicans and Democrats believe to be true about COVID-19.* YouGov. https://today.yougov.com/topics/politics/articles-reports/2020/05/26/republicans-democrats-misinformation.

Schertzer, R., & Woods, E. T. (2020, April 9). How nationalism can be a force for good in the struggle against COVID-19. *LSE USAPP*. https://blogs.lse.ac.uk/usappblog/2020/04/09/how-nationalism-can-be-a-force-for-good-in-the-struggle-against-covid-19.

Schiavo, R. (2020). Vaccine communication in the age of COVID-19: Getting ready for an information war. *Journal of Communication in Healthcare, 13*(2), 73–75.

Schmid, P., MacDonald, N. E., Habersaat, K., & Butler, R. (2018). Commentary to: How to respond to vocal vaccine deniers in public.*Vaccine, 36*(2), 196–198.

Schmidtke, K. A., & Kudrna, L. (2020, October 15). Speaking to hearts before minds? Public health messages aligned with people's political intuitions may not increase vaccination uptake. *LSE British Politics and Policy.* https://blogs.lse.ac.uk/politicsandpolicy/public-health-messages-political-intuition.

Sharfstein, J. M., & Olsen, Y. K. (2019). Lessons learned from the opioid epidemic. *JAMA, 322*(9), 809–810. https://doi.org/10.1001/jama.2019.9794.

Sharon, A. J., & Baram-Tsabari, A. (2020). The experts' perspective of "ask-an-expert": An interview-based study of online nutrition and vaccination outreach. *Public Understanding of Science,* 29(3), 252–269. https://journals.sagepub.com/doi/abs/10.1177/0963662519899884.

Shelby, A., & Ernst, K. (2013). Story and science. *Human Vaccines & Immunotherapeutics, 9*(8), 1795–1801.

Skinner, G. (2020). *Who's least likely to say they'll get a COVID-19 vaccine?* Ipsos MORI. www.ipsos.com/ipsos-mori/en-uk/whos-least-likely-say-theyll-get-covid-19-vaccine.

Smith, L. E., Amlôt, R., Weinman, J., Yiend, J., & Rubin, G. J. (2017). A systematic review of factors affecting vaccine uptake in young children. *Vaccine, 35*(45), 6059–6069.

Smith, M. J., Ellenberg, S. S., Bell, L. M., & Rubin, D. M. (2008). Media coverage of the measles-mumps-rubella vaccine and autism controversy and its relationship to MMR immunization rates in the United States." *Pediatrics, 121*(4), e836–e843.

Smith, M., Peacock, G., Uyeki, T. M., & Moore, C. (2015). Influenza vaccination in children with neurologic or neurodevelopmental disorders. *Vaccine, 33*(20), 2322–2327.

Smith, N., & Graham, T. (2019). Mapping the anti-vaccination movement on Facebook. *Information, Communication & Society, 22*(9), 1310–1327.

Smith, T. C. (2017). Vaccine rejection and hesitancy: A review and call to action. *Open Forum Infectious Diseases 4*(3). https://academic.oup.com/ofid/article/4/3/ofx146/3978712.

Stack, L. (2020, April 21). "Plague on a biblical scale": Hasidic families hit hard by virus. *The New York Times*. www.nytimes.com/2020/04/21/nyregion/coronavirus-jews-hasidic-ny.html

Stefanoff, P., Mamelund, S., Robinson, M., Netterlid, E., Tuells, J., Riise Bergsaker, M. A., Heijbel, H., Yarwood, J., & VACSATC Working Group on Standardization of Attitudinal Studies in Europe. (2010). Tracking parental attitudes on vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VACSATC). *Vaccine, 28*(35), 5731–5737.

Stevenson, E., Barrios, L., Cordell, R., Delozier, D., Gorman, S., Koenig, L. J., Odom, E., Polder, J., Randolph, J., Shimabukuro, T., & Singleton, C. (2009). Pandemic influenza planning: Addressing the needs of children. *American Journal of Public Health, 99*(S2), S255–S260.

Stockwell, M. S., & Fiks, A. G. (2013). Utilizing health information technology to improve vaccine communication and coverage. *Human Vaccines & Immunotherapeutics, 9*(8), 1802–1811.

Stöckl, A., & Smajdor, A. (2017). The MMR debate in the United Kingdom: Vaccine scares, statesmanship and the media. In C. Holmberg, S. Blume, & P. Greenough (Eds.), *The politics of vaccination* (pp. 239–259). Manchester University Press. www.manchesteropenhive.com/view/9781526110916/9781526110916.00018.xml.

Sweet, L. J. (2015, February 9). Statistics reveal state has "dangerous pockets" of under-vaccination. *Boston Herald*. www.bostonherald.com/2015/02/09/statistics-reveal-state-has-dangerous-pockets-of-under-vaccination.

Terry, L. (2018, February 11). Low vaccination rates put some Oregon schools at high risk for measles. *OregonLive*. www.oregonlive.com/health/2018/02/low_vaccination_rates_put_oreg.html.

The Community Guide. (2015). *Vaccination programs: Client or family incentive rewards*. www.thecommunityguide.org/findings/vaccination-programs-client-or-family-incentive-rewards.

The Community Guide. (2014). Vaccination programs: Client or family incentive rewards archived review. www.thecommunityguide.org/findings/vaccination-programs-client-or-family-incentive-rewards-archive.

The Royal Society and The British Academy. (2020). *COVID-19 vaccine deployment: Behaviour, ethics, misinformation and policy strategies.* https://royalsociety.org/-/media/policy/projects/set-c/set-c-vaccine-deployment.pdf.

Tomeny, T. S., Vargo, C. J., & El-Toukhy, S. (2017). Geographic and demographic correlates of autism-related anti-vaccine beliefs on Twitter, 2009–15. *Social Science & Medicine, 191,* 168–175.

U.S. anti-vaccine conspiracies spread around the world. *The Washington Post*. www.washingtonpost.com/world/coronaviurs-antivax-conspiracies/2020/10/06/96ddd2c2–028e-11eb-b92e-029676f9ebec_story.html.

Vaccine exemptions for kindergartners still rising. (2019, October 18). WebMD. Retrieved October 20, 2020, from www.webmd.com/children/vaccines/news/20191018/vaccine-exemptions-for-kindergartners-still-rising.

Wheelock, A., Thomson, A., & Sevdalis, N. (2013). Social and psychological factors underlying adult vaccination behavior: Lessons from seasonal influenza vaccination in the US and the UK. *Expert Review of Vaccines, 12*(8), 893–901.

Wilson, M. E. (2020). *Paying the price for undervaccination in New York City.* NEJM Journal Watch. www.jwatch.org/na51024/2020/03/16/paying-price-undervaccination-new-york-city.

Witteman, H. O., & Zikmund-Fisher, B. J. (2012). The defining characteristics of Web 2.0 and their potential influence in the online vaccination debate." *Vaccine, 30*(25), 3734–3740.

Wolfe, R. M., & Sharp, L. K. (2005). Vaccination or immunization? The impact of search terms on the internet. *Journal of Health Communication, 10*(6), 537–551.

World Health Organization Regional Office for Europe. (2017). *How to respond to vocal vaccine deniers in public.* www.euro.who.int/_data/ assets/pdf_file/0005/315761/Vocal-vaccine-deniers-guidance-document.pdf.

Zerbo, O., Modaressi, S., Goddard, K., Lewis, E., Fireman, B. H., Daley, M. F., Irving, S. A., Jackson, L. A., Donahue, J. G., Qian, L., Getahun, D., DeStefano, F., McNeil, M. M., & Klein, N. P. (2018). Vaccination patterns in children after autism spectrum disorder diagnosis and in their younger siblings. *JAMA Pediatrics, 172*(5), 469.

Endnotes

1. For a detailed analysis of how this way of thinking works in the context of history, see Miller, T.L., L'Hôte, E., & Volmert, A. (2020). Communicating about history: Challenges, opportunities, and emerging recommendations: *A FrameWorks Strategic Brief*. Washington, DC: FrameWorks Institute.

2. See for instance Davis, C., L'Hôte, E., Volmert, A., Segar, M., & Busso, D. (2020). Communicating about physical activity: Challenges, opportunities, and emerging recommendations: *A FrameWorks Strategic Brief*. Washington, DC: FrameWorks Institute. See also L'Hôte, E., Volmert, A., Davis, C., & Down, L. (2019). Public health reaching across sectors: Mapping the gaps between how public health experts and leaders in other sectors view public health and cross- sector collaborations. Washington, DC: FrameWorks Institute. See L'Hôte, E., Fond, M., & Volmert, A. (2018). Seeing upstream: Mapping the gaps between expert and public understandings of health in the United Kingdom. Washington, DC: FrameWorks Institute.

3. The Waldorf philosophy is associated with "organic culture," holistic health, and alternative medicine, and the schools have been linked with significant anti-vaccination sentiment (de Freytas-Tamura, 2019).

4. "There has never been any period in American history where the health of Blacks was equal to that of whites. Disparity is built into the system." (Bajaj & Stanford, 2021).

5. For a detailed analysis of how this belief plays out in Australian public thinking, see Volmert, A., Kendall-Taylor, N., Cosh I. & Lindland, E. (2016). Cuing Context: Mapping the gaps between expert and public understandings of effective parenting in Australia. Washington, DC: FrameWorks Institute.

6. In October 2020, Facebook implemented new measures to promote vaccine trust "while prohibiting ads with misinformation that could harm public health efforts." This new approach consists of a multiprong informational campaign about the seasonal flu vaccine to encourage its widespread use as well as anticipate the emergence of new COVID-19 vaccines. Public health experts argue that, while this is an improvement over the status quo, it will not solve the widespread dissemination of inaccurate content because

it does “virtually nothing to remove the well-established sources of vaccine misinformation within the Facebook network” (Rutschman, 2020).

7. See for instance FrameWorks Institute (2019). Unleashing the power of how: An explanation declaration. Washington, DC: FrameWorks Institute.

8. This is in line with existing FrameWorks research on tone as a framing strategy. See for instance L’Hôte, E., Hawkins, N., & Levay, K. (forthcoming). Changing the childhood obesity conversation to improve children’s health. Washington, DC: FrameWorks Institute.

About FrameWorks

The FrameWorks Institute is a nonprofit think tank that advances the mission-driven sector's capacity to frame the public discourse about social and scientific issues. The organization's signature approach, Strategic Frame Analysis®, offers empirical guidance on what to say, how to say it, and what to leave unsaid. FrameWorks designs, conducts, and publishes multi-method, multidisciplinary framing research to prepare experts and advocates to expand their constituencies, to build public will, and to further public understanding. To make sure this research drives social change, FrameWorks supports partners in reframing, through strategic consultation, campaign design, FrameChecks®, toolkits, online courses, and in-depth learning engagements known as FrameLabs. In 2015, FrameWorks was named one of nine organizations worldwide to receive the MacArthur Award for Creative and Effective Institutions.

Learn more at www.frameworksinstitute.org

What the American Public Thinks About Vaccines and How Framing Can Help. A Literature Review.

April 2021

Please follow standard APA rules for citation, with the FrameWorks Institute as publisher.

***What the American Public Thinks About Vaccines and How Framing Can Help. A Literature Review*. Washington, DC: FrameWorks Institute.**

FRAME WORKS

www.designbysoapbox.com