

# RETHINKING DEBATES ABOUT PEDIATRIC VACCINE SAFETY

## A Feminist View

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### Introduction

This chapter frames the problem of vaccine hesitancy as a problem of public mistrust of scientific institutions and rejects the common thinking that vaccine hesitancy persists because members of the public misunderstand the science or endorse science denialism and/or anti-intellectualism. This rethinking of the supposed war on science and expertise, and how the war allegedly animates pediatric vaccine hesitancy and refusal, is informed by key themes from feminist philosophy of science about the nature and aims of science as well as unequal power relationships between experts and non-experts. These considerations resituate the problem in poor scientific governance rather than the moral and epistemic failings of the public. Vaccine outreach tends to focus on education interventions, but attention and resources need to be additionally directed toward building and maintaining public trust. This chapter will conclude with recommendations for how to build this trust.

The common framing of public controversies over scientific claims, such as the safety and efficacy of vaccines, is in combative terms. The combatants are: science vs nonsense, reason vs ignorance, expertise vs non-expertise. We frequently hear that science, rationality, and expertise, the rightful vanguards of public health and well-being, are losing the war. Furthermore, the public<sup>1</sup> is to blame. Despite continued science communications efforts to expose pseudoscientific claims and counter misinformation, members of the public seem all too ready to question, challenge, and ignore scientific advice.

The stakes are high in the so-called “war on science” (Otto 2016). Public rejection of scientific claims and scientific experts is viewed as deeply dangerous and threatening to democracy. The influential Bodmer Report on Public Understanding of Science (London Royal Society 1985) sounded the alarm in 1985, offering the somber assessment that:

the nature and extent of public understanding of science and technology are limited by a general lack of scientific literacy and are inadequate for the majority of the population to play an active informed role in an advanced industrial democracy.

This concern is still expressed today, albeit the language and tone are more emotive. See, for example, the anxious titles of a fast-growing genre of popular science books dedicated to the woeful fallout of science denialism: *Unscientific America: How Scientific Illiteracy Threatens Our Future* (Mooney and Kirshenbaum 2009), *Denialism: How Irrational Thinking Harms the Planet and Threatens Our Lives* (Specter 2010), *Reality Check: How Science Deniers Threaten Our Future* (Prothero

2008), *Deadly Choices: How the Anti-Vaccine Movement Threatens Us All* (Offit 2011), and many more. It is this common linking of science denial and existential threat that led science communicator Neil deGrasse Tyson to decree that “science illiteracy is a tragedy of our time” (Davey 2015; in response, see Goldenberg 2015) and made it politically expedient for progressive politicians to declare their allegiances to science—for instance, Hillary Clinton told convention delegates “I believe in science” in her acceptance speech for the US Democratic Party’s presidential candidate in 2016 (Lehmann 2016).<sup>2</sup> Similarly, in his 2017 inaugural agency-wide address as the new director of Center for Disease Control and Prevention (CDC), Robert Redfield Jr. became “overcome with emotion” as he promised to defend science in his new role. He mentioned vaccine refusal as a particular challenge (Sun 2018).

Yet there is good reason to challenge this dominant narrative that there is a culture war on science and expertise. The challenge draws from themes that are well-grounded in feminist thinking about science regarding the nature of science and its entangled relationship with society. Whereas feminist science studies has often been accused of attacking science, ignoring expertise, or threatening the objectivity of science, this feminist reframing of vaccine hesitancy and disavowing of the war on science will refute this misconception of feminist contributions to science and science studies. It follows feminist science studies themes of recognizing and interrogating the values and power dynamics that influence policy-relevant science with an eye toward improving scientific practices in ways that enhance the objectivity and/or the credibility of science.

The analysis begins with feminist social epistemologist Helen Longino’s influential characterization of science as *social practice*, a conceptual framework that highlights the process by which multiple stakeholders, standing in relationship to each other, co-constitute objective scientific knowledge (Longino 1990). Social understandings of science have highlighted the importance of trust and credibility in the successful operations of scientific institutions—both within research communities and in relation to the public (Hardwig 1991; Rolin 2002; Goldenberg 2016; Grasswick 2017). Expert knowledge is thereby legitimated as expert, or refused as such, amidst relations of unequal power and epistemic dependency. These considerations will be brought together to defend the novel thesis that public resistance to scientific claims (about vaccines and other hot-button issues like GMOs, climate change, and water fluoridation) stems from a crisis of trust rather than a war on science, specifically poor public trust in scientific institutions rather than poor public understanding and appreciation of science. Poor trust, not scientific illiteracy or anti-intellectualism among the general public, leads some people to reject the strong scientific consensus on vaccines. Thinking about vaccine hesitancy as a symptom of public mistrust also redraws the lines of responsibility. Vaccine hesitancy is a problem of scientific governance rather than a problem of the public.

### **The Nature of Science**

The divisive “us versus them” discourse of the so-called war on science is grounded in a misunderstanding of the nature of science and how it operates in society. Science, its embattled defenders assume, cuts through partisan politics and rationalizes democratic choice by informing and directing the populace. Scientific experts are indispensable to the flourishing of the polis in a constrained advisory role, as a division of cognitive and deliberative labor is thought to balance the democratic need for both informed policy and political legitimation through public participation (Kappel 2014). Democracy needs science to ensure social stability, and public resistance to scientific claims destabilizes the social order. The lines of responsibility are equally clear in the war on science framework: insofar as it is the public challenging the science, the problem lies squarely with the public, while science and its institutions require little or no scrutiny. At most, one hears the tepid criticism that scientists could be better communicators. Whether it’s a war on evidence,

or a war on experts, public resistance to scientific claims is similarly envisioned as a high-stakes battle between established knowledge and destructive ignorance.

The difficulty with this framing as a war on science and expertise is that science, even sound science, does not work that way—cutting through politics and confusion to produce optimal policies and optimal social benefit. One can in principle agree to the scientific superiority of the majority view on vaccine safety and efficacy without supporting the presumed corollary claims that the best policies follow from the best science, and that the public are the problem. Against the “linear model” of science-to-policy (Pielke Jr. 2007), science and society are far more entangled. Underlying this relationship, like all relationships, is the matter of trust. Public acceptance or rejection of scientific claims pivots on the perceived trustworthiness of the scientific bodies underwriting those claims. Feminist social epistemologies of science offer insight into the role of trust in science.

### Trust, Trust within Science, Trust in Science

Trust is heavily theorized across multiple disciplines, including moral theory, philosophy of science, and social theory, with particular attention provided by feminist theorists in these domains due to their focus on the relational aspects of morality, knowledge production, and social structures, especially relationships involving imbalances of power between participants. By highlighting how knowledge and justification occur at the community level (Nelson 1993), and thereby rely on relationships of interdependence, relations of trust are understood to have epistemic significance. The concept of trust is generally taken to mean having confidence in someone or something. Discussions about trust in the context of science usually refer to *epistemic trust*; “to invest *epistemic trust* in someone is to trust her in her capacity as a provider of information” (Wilholt 2013). Wilholt’s helpful theorizing of epistemic trust adopts Baier’s (1986) distinction between “mere reliance” and “trust”; epistemic trust is more than mere reliance insofar as it is the kind of dependence that makes the trusting person dependent on the trustee’s good will.

Trusting others is risky, but it is also unavoidable. This tension makes trust ripe for ethical analysis. When we find ourselves in situations where we lack adequate information to know for ourselves—and this happens often!—we must trust others. Knowing the risk that this trust may be broken requires that the trustor partake in what has been described as “leaps of faith” in the sociology literature (Lewis and Weigert 1985; Mollering 2006).<sup>3</sup>

This “leap” refers to the necessary bridging of an information gap in situations of risk. Epistemically dependent people will fill any perceived knowledge gap with “a kind of suspension or bracketing-off of uncertainties” (Brownlie and Howson 2005; see also Luhmann 1979). The confidence with which the trustee “leaps” is captured in the expectation of the trusted expert’s goodwill (or perhaps the less demanding expectation of the expert’s moral integrity is enough (McLeod 2002))<sup>4</sup>; there is the additional expectation that the expert will be properly motivated to act (Jones 1996). Confidence hinges on the moral character, not just the epistemic credentials, of the expert. Hardwig (1985) argued that the moral legitimacy of the expert source is a prerequisite for rational epistemic dependence.

There has been qualitative research into parental decision-making regarding vaccines that has highlighted multiple “leaps of faith” taken in the face of incomplete knowledge and anxiety over future unknowns (Brownlie and Howson 2005). In Brownlie and Howson’s (2005) interviews with British parents facing childhood immunization decisions in the early 2000s (the height of the media frenzy over the alleged link between the MMR vaccine and autism), some parents were able to continue, but others suspended, the previous familiar routineness of childhood immunizations. The hesitators, moreover, bracketed off the uncertainties unevenly, sometimes choosing to vaccinate one child but not another, or to choose some vaccines and skip others. The choice

depended on the health history of that particular child and the timing of media reports. The dynamism of the trusting leap or refusal was made by parents carefully gathering warrants to trust or distrust the assurances made by public health agencies and medical providers that vaccines had been and continued to be safe, effective, and necessary (Goldenberg 2016).

Parents' trusting "leaps" are taken or denied based on vaccine advice from relations of familiarity such as peers, family members, and health professionals, and also with regard to perceptions of the trustworthiness of scientific bodies or institutions. Trust is thereby a means of social cohesion (Misztal 1996) through affective commitments (Jones 1996).

What is important for thinking about vaccine acceptance, hesitancy, and refusal is that it is *not* the growing mountain of data that are convincing parents to vaccinate their children, but a willing "leap" in favor of the scientific consensus.<sup>5</sup> Similarly, vaccine hesitators and refusers situate themselves in different spheres of familiarity that disqualify the majority view on vaccines. These calculations, these moves toward in-group belonging, are not well explained by risk assessment accounts of trust. Instead Baier (1991) seems correct to describe trust as cognitive, affective, and conative.<sup>6</sup>

Feminist science studies and STS scholarship strongly advance the position that trust is endemic to science—it supports knowledge creation, including the management of dissent, as well as consensus building. Yet trust *within* science communities operates invisibly: so opaque are these lines of trust that science is commonly thought to be rigorous by being *wary* of trust. Rather than listen to authority, scientific rationality allegedly demands that one examines the evidence for oneself. This popular understanding of science made STS's alternative thesis radical: trust relations make scientific progress possible. Because there is too much to know for oneself, to test all background assumptions, and to check all features of a colleague's work in large collaborative projects, trust enables much of the knowledge that we call science. In short, trust operates behind the scenes within science in establishing and legitimating knowledge as true and universal (that is, true for everyone) (Shapin 1995).

Moving from science communities to science-public relationships, epistemic dependency and trust in experts are more visible. Members of the public rely on scientific knowledge to inform everyday choices and practices. Lacking the time and skill to check each claim for ourselves, non-experts routinely look to experts for advice. When the channels of knowledge transfer, translation, and mobilization work well, this move from expert advice to non-expert action can go smoothly. Public resistance to science occurs because relations between experts and non-experts are not so secure.

Members of the public are arguably well advised to defer to scientists with relevant expertise (Hardwig 1985). Collins and Evans (2008) explain that those scientists' "interactional expertise," the expertise that arises from being part of the relevant knowledge community, makes it likely that their judgments will be better than our own. Thus, the public benefits from well-placed trust.<sup>7</sup> The challenge is knowing when that trust is well placed. The risk of harm remains, but non-experts can work to reduce that risk by assessing expert advice. Where non-experts are presumably unqualified to assess the content of scientific claims, we can evaluate the character of the scientific expert or the integrity of the institutions they represent. Members of the public will follow expert advice *if* those experts are trusted to be both epistemically and morally responsible.<sup>8</sup> The rationality of following expert advice hinges on trust and credibility: experts must be trustworthy and non-experts must recognize them as such.<sup>9</sup> And so, relations of trust mediate successful exchanges between scientific institutions and the public.

Because knowledge is produced in communities, disagreement between members can be expected. Science even encourages it: dissent and disagreement are seen as signs of healthy epistemic enterprise. Trust therefore does not preclude disagreement, but it can help manage it. Disagreement does not need to undercut trust either. The avenues for managing dissent and disagreement in science follow from a generally accepted democratic orientation toward truth seeking and consensus building: one that is public and accountable. Social epistemologists view these mechanisms favorably and even make recommendations to *improve* the democratic tenor of science, for example by increasing diversity



in scientific communities to make dissent and criticism more robust (Keller 1985; Longino 1990, 2002; Kitcher 2011). They also recommend limiting spurious dissent that is meant to be obstructionist rather than knowledge seeking (see Solomon's three conditions for normatively appropriate dissent (2002) and De Melo Martin and Intemann's (2018) useful distinctions between helpful and harmful forms of dissent<sup>10</sup>). It is with these communicative practices in place that robust scientific consensus can arise on some issues, while points of disagreement can still respectfully endure without rupturing community cohesion.

The contrast between debates within scientific communities and public controversies over science is striking. In the public arena, where science-public controversy takes place, we do not find comparable shared rules for the management of disagreement and for consensus building. There are no shared frames of reference; instead we have facts, "alternative facts" (Blake 2017), and disagreements over which side wields legitimate science while the other side is "junk science."<sup>11</sup> Conflicts of interest are often present on both sides of the disagreement. These disputes over facts have been popularly characterized as "post-truth"—Oxford Dictionary's 2016 word of the year.<sup>12,13</sup> But "post truth" wrongly suggests that there was a prior time when truth was unequivocally stable. Instead, facts have always been negotiated and contested by those who see and experience the world differentially. Case studies in the history of science offered by Poovey (1998) and Shapin and Schaffer (1985) detail how the modern scientific fact came to be established—that is, how the criteria for "matters of fact" (as Shapin and Schaffer called them) were historically negotiated as a feature of the European Enlightenment. Acknowledging the social history of facts should not be misunderstood as downgrading the epistemic status of facts,<sup>14</sup> as there is no contradiction in saying that facts are true *and* that they are embedded in social mechanisms that establish their epistemic authority as claims that demand universal uptake. The current problem of post-truth should signal that it is these mechanisms that need attention. Re-establishing the common ground for constituting matters of fact requires trusting relationships among differently situated people rather than a powerful reinstatement of science and expertise.

It can be a hard realization that science cannot singularly guide us to good policy and right action, neutralize political partisanship, and rationalize democratic decision-making. It is shocking to many vaccine advocates that the scientific consensus on vaccines does not settle public concern. Instead the consensus gets positioned as one side of a debate, where scientific experts must jockey for legitimacy against seemingly disreputable opponents proclaiming to have science (and moral credibility) on *their* side.

We should appreciate the surprise. After all, the consensus functions to settle debate, not invite it, by representing the majority view of those most suited to pronounce on the issue. Consensus claims can also serve a public function: to educate the public on issues and promote appropriate response, whether personally or politically. The failure to achieve these aims is no doubt frustrating. Doesn't the consensus deserve more deference? The consensus claim, when done well, is the best approximation of scientific truth; it is produced by the best of science's truth-seeking procedures and practices. The universal applicability of the findings rests in the methods of consensus building. For the public to suggest impartiality is to reject an elaborate set of epistemic, methodological, and institutional mechanisms meant to ensure reliable knowledge and public benefit from that knowledge. Science isn't something you are supposed to "believe" in or be against. To say otherwise is to say that science depends on trust. But it does.

It is important to consider that much of what members of the public know about vaccines pivots on epistemic trust. Almassi (2012) has drawn the same conclusion regarding our beliefs on climate change. Tied into the consensus statement is a claim to the epistemic and moral legitimacy of its authors and their institutions. Vaccine hesitators and more strident vaccine refusers reject those claims of legitimacy.

So what is the appropriate response when the consensus does not fulfill its function of engendering public trust? Here is what is happening now: vaccine hesitators and refusers are ridiculed

for raising concerns. Against the democratic tenor of science, science journalists write articles like “Why You Have No Business Challenging Scientific Experts” (Mooney 2014) to convey sincere disgust over the current state of affairs. Why, vaccine supporters ask incredulously, would one take the word of a media-savvy celebrity mom who attributed her knowledge of autism to the “University of Google” over *many* expert scientists? (van Heuvel 2013).

Consensus claims are expert-generated directives for epistemically dependent outsiders; yet the mechanisms used to ensure the trustworthiness of that information—the negotiation of conflicting views in academic conference settings and in expert journals, replication of findings, peer review, and so on—are internal to the scientific community and are therefore largely shielded from public view. Thus the final step in the expert-lay exchange, where (if all goes well) the public accepts the scientific consensus view, requires some degree of a trusting “leap of faith” that the scientific experts have done their due diligence and reported responsibly. The trust requirement places the outsider in a vulnerable position, and there is no sympathy for that predicament. The public are then implored to “*trust* science”: trust in a process whose trustworthiness lies in it being shielded from public opinion or other non-expert contributions (cf. (Scheman 2001). Without an eye on, or participation in, the innermost practices of scientific knowledge and consensus building, with various threats of sanction for *not* accepting the findings, the public is instructed to trust. Some are not willing to do so.

When parents make vaccine decisions, the trusting leaps or refusals are surely influenced by the misinformation peddled on the internet (CBC Radio 2017), but those dubious claims only gain traction because they fit with a broader narrative of perilous health care. Informed news consumers are well aware of problems in health research and practice. The replication crisis, the weaknesses of the peer review system, disease mongering (Payer 1992; Moynihan and Henry 2006), and law suits against pharmaceutical companies are part of health consumers’ background knowledge. They draw on these narratives when they evaluate new information about vaccine risks.

As I write this manuscript, mainstream news media are widely reporting on how deceptive sales tactics employed by a pharmaceutical company allegedly led to the current opioid crisis (Martin 2019). Just two months earlier, the International Consortium of Investigative Journalists (ICIJ) published “The Implant Files,” the results of a global investigation undertaken by 250 journalists in 36 countries into lax regulation of medical devices (Shiel 2018); those devices have caused devastating harm to patients and many deaths worldwide (ICIJ 2018).<sup>15</sup> While these alarming issues do not tie directly to vaccines, consumers do not know whether the next scandal *will* make that connection. Faced with unknowns and uncertainty, trust and mistrust tend to travel (Grasswick 2018).

Some might object that following the consensus view is not about trust. It’s a numbers game: if you follow the majority view, you are more likely to get the right advice. But the number in the numbers game is only given weight if the majority represents a convergence from multiple sources. Those numbers would not add any epistemic weight to the claim if they represented crowds of scientists slavishly repeating the same dogma. The numbers would not be directive in knowing what to believe (Goldman 2001). This caveat reveals that trust is *not* avoided by following the numbers.<sup>16</sup> Again, that is because those of us standing outside of the community of experts do not have a clear view of how impartially the consensus was negotiated. At best we have a partial view gained by our varying immersion in the effort to read the document, check the supporting literature, analyze media reports, and make freedom of information requests. Most of us will not dive deep, due to lack of time, skill, and energy. Instead we fill the gaps in with trusting leaps or distrusting refusal.

Both vaccine advocates and critics can claim to meet Goldman’s stipulations for whether or not to follow expert advice. Vaccine advocates can make a case for going by the numbers: they can point to the robustness of the weight of evidence coming from a diversity of research teams from different countries supporting the consensus that vaccines are safe, effective, and that there is no correlation to autism or mercury poisoning.

Vaccine critics interpret the weight of evidence and the consensus differently. With strong ties to industry, the “scientific consensus” does *not* meet the requirement of plural and independent sources. If all vaccine science communicators are complicit with vaccine manufacturers, or silenced into submission by their medical boards and health authorities, then health care consumers ought not to be swayed by the numbers. The point here is that it is poor trust that keeps some of the public from accepting the consensus view, that is, from reasonably “going by the numbers.” The trust issue remains even in the presence of a strong consensus.

The current climate of parental decision-making on vaccines is difficult. Many parents say they don’t know which side to believe. It is due to poor trust that the institutions tasked with protecting the public good are not able to carry out their mandate by offering the definitive voice of reason. The consensus does not fulfill its public function of guiding parents regarding childhood vaccines.

### **Poor Public Trust: Implications for Medico-Scientific Institutions**

There is general agreement that the public need science, but the point being made here is that science needs the public too. The fulfillment of many institutional mandates hinges on positive public relations. Science strives to create universally applicable knowledge, and this knowledge is universal only insofar as it is accepted by a variety of stakeholders. This places a demand on scientific communities to earn and maintain the trust of the public.

Research institutes and agencies rely on stable relations with the outside, at minimum to ensure access to public research funds and to enjoy little interference with their work. When that minimal level of public trust is in place, science can operate smoothly.

In policy-relevant science—research motivated by practical goals like furthering human, animal, and environmental welfare—there are more elaborate ties to the public. These practical goals require scientific claims to be accepted by stakeholders outside of its specialized epistemic communities (Scheman 2001; Wilholt 2009; Whyte and Crease 2010). Policy-relevant science can only provide those public benefits if its institutions are regarded as trustworthy by members of the public.

Public health science, for example, can only improve population health if the general public largely accept and follow its recommendations. Health recommendations and consensus statements bank on the public’s trust in these institutions’ conscientious and honest efforts to inform and protect. Earning and maintaining the public trust are crucial for fulfilling public health mandates. Offering the best science and the most carefully considered action-directives is not enough. The science must be trustworthy but also trusted by all public health stakeholders. Persistent vaccine hesitancy indicates institutional failure to engender public trust. This warrants self-reflection about institutional trust-building practices.

### **Conclusions and How to Build Trust**

The evidence most of the public accept on vaccines turns crucially on epistemic trust. It is poor trust in the expert sources that gives rise to vaccine hesitancy and refusal. Consensus claims will not convince anyone if the source(s) is not perceived as trustworthy. To confront public resistance of scientific claims, what if we focused on building that trust rather than educating the misinformed public or puzzling over their moral and epistemic failings?

Doing this does not discount that public health agencies have the science on their sides. It *does* mean that we have to recognize that the best science is not enough. This is not a war with the public or a war over science. I have offered a different picture of science in relation to the public than science as the firm anchor mooring liberal democratic political organization. Science should still be understood to hold firm ground (i.e. this is not a case for evidentiary relativism), but the idea

that the *evidence speaks*, or dictates right policy, is a fiction. All evidence is subject to interpretation, and political and policy decision-making requires numerous extra-scientific considerations. The language of “evidence based” is misleading in that respect. Scientific evidence operates within a constellation of social influences that guide personal decision-making and policy formation. Good trust relations between scientific institutions and the public ensure that science stands prominently within social policy frameworks. The current tendency to criticize and publicly shame the skeptical public for failing to appreciate the primacy of scientific reasoning and the authority of experts does not address the problem of public mistrust of scientific institutions. If anything, it exacerbates the mistrust by entrenching a polarizing us vs them mentality.

Trust is built and maintained in relationships that are respectful, open, and honest (Peters, Covello, and McCallum 1997). Primary care providers need the time to respond patiently and non-judgmentally to parents’ questions, and to build on shared goals like ensuring children’s health and safety. Listening to parents’ concerns will lead to more effective responses. For instance, the many parents who think vaccines are generally safe but may not be safe for their *own* child will not have their fears allayed when well-meaning health care providers point to the latest epidemiological study demonstrating vaccines to be safe at the population level (Goldenberg 2016). Patients also want honest information, which may require admitting to gaps in the research, for instance, regarding what causes serious adverse events. Admitting to uncertainty does not undermine trust, as patients look for providers who have their interests at heart, and communicate honestly, more than they look for unequivocal scientific pronouncements (Larson, Cooper, Eskola, Katz, and Ratzan 2011). Public health organizations can also remedy perceptions of dishonest advice by addressing seeming contradictions in public health messaging to parents. With the advancement of precision medicine comes the promise of no more “one size fits all” medicine in treatment and prevention (Health 2.0 2018). Parents see it as justified to ask why this isn’t the same for vaccines. Also, breastfeeding promotion valorizes the natural and conveys the message that immunity is conferred to the child through breast milk. It is hardly surprising to hear parents disparaging vaccines as “unnatural” and unnecessary when coupled with prolonged breastfeeding strategies (Dubé et al. 2015; Reich 2016).

The best way to counter mistrust is to find and remedy its sources. Industry influence on health care is ubiquitous and harmful to public trust. This makes reconfiguring industry ties to health care both stubbornly difficult and urgently necessary. Empirical research shows lower public trust in scientists and physicians perceived to suffer from financial conflicts of interests or loss of independence (Hargreaves et al. 2013). Feminist analyses have further shown commercialization and an inattentiveness to the needs and interests of certain groups to be damaging to public perception of science and health care (Intemann and De Melo-Martin 2014; Jukola 2019). Current mild remedies such as disclosure statements and sunshine lists are not enough to ensure the levels of public confidence needed to stave persistent vaccine hesitancy. For those who think curtailed industry ties and longer appointment times to talk to patients are impossible demands on health care systems, consider that so too is the public health burden of vaccine hesitancy and refusal.

Related chapters: 9, 12, 15, 17, 19, 33.

## Notes

- 1 Communications studies scholars prefer the term “the publics” instead of “the public” or “public sphere” in order to disabuse the notion that there is a unified body of lay people that interact with expert science in the same way. Instead there are a plurality of non-expert modes of engaging with science. I support this pluralist interpretation but still employ the singular “public” that is familiar to philosophy audiences.
- 2 Clinton had likely taken cue from Barak Obama, who had promised in his 2009 inaugural speech as 44th President of the United States to “restore science to its rightful place” (Cohlan 2009).
- 3 This terminology can be traced back to classic contributions by Georg Simmel, and is still being used contemporaneously by Mollering (2006) and others.



- 4 The expectation of moral integrity is less demanding because there is no requirement that the trustee have positive feelings toward the trustor in particular. This seems better suited for trust in the collective enterprises of science or in any institution, rather than trust in a particular individual. Baier's (1986) and Jones's (1996, 1999) focus on goodwill might be because they, as moral theorists, focused on interpersonal relationships rather than relations with institutions.
- 5 The scientific consensus is the collective judgment or opinion of a community of scientists. While "medical consensus conferences" are no longer widely used to establish collective expert opinion, consensus claims can still be inferred from other aggregating practices used in health research such as position statements from professional groups, and meta-analyses and systematic reviews of the relevant evidence. Regarding childhood vaccines, a consensus can be inferred from the wide endorsement of vaccines by numerous professional scientific, medical, and health bodies, including the American Academy of Pediatrics, Centers for Disease Control and Prevention, National Institutes of Health, National Academy of Sciences, and World Health Organization. .
- 6 This "trilogy of mind" was well represented in the cognitive psychology literature at the time of Baier's moral theory research into trust. See Hilgard (1980).
- 7 Luhmann (1979) adds that we benefit more over time as less vigilance is required.
- 8 The epistemic and moral qualities that we look for in a trustworthy expert have been detailed by Hardwig (1994), Elliott (2010), De Melo Martin and Intemann (2018), and others.
- 9 Kristina Rolin (2002) made the important distinction between trustworthiness and credibility (the perception of trustworthiness by others) in an important feminist corrective to Hardwig on epistemic trust.
- 10 De Melo Martin and Intemann (2018) still insist that because it can be extremely difficult to distinguish between normatively appropriate dissent and normatively inappropriate dissent, a more productive route is focusing on the social conditions that lead to unhelpful forms of dissent such as lack of trust in scientific institutions and their personnel.
- 11 Used as the contrast class to "sound science," "junk science" refers to scientific data, research, or analysis considered to be inaccurate or fraudulent. The term also points to research being driven by ideological motives, whether political, financial, or anything unscientific. Charges of "junk science" are often made in political and legal contexts where facts and scientific results have a great amount of weight in making a determination. See, for example, Brandt (2007) and chapter 1 of Douglas (2009) for a philosophical analysis of sound vs. junk science.
- 12 Post-truth is defined as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief." Discussion of post-truth is usually in the context of "post-truth politics," where lies and deception are used to promote political agendas—notably the Brexit "leave" campaign and the election of Trump as president of the United States, both in 2016. The term "post-truth" therefore signals two unsavory issues: the diminished epistemic status of truth and factuality, and the moral issue of speaking truthfully and lying. This two-part distinction was offered by Lynch (2017).
- 13 By virtue of being a new and popular word, the meaning of the word "post-truth" is still evolving. Furthermore, because the word has the demanding task of summing up an in-the-moment cultural preoccupation, it runs into other new terminology similarly tasked such as Collins English Dictionary's 2017 word of the year, "fake news," as well as "post-fact," "anti-expertise," and "anti-intellectualism." These latter terms are also still evolving in their meaning and use.
- 14 Social constructivism is often misread as relativizing factuality and truth by pointing to the active and human construction of our strongly held facts, doctrines, and theories. This charge led to the heated Science Wars of the 90s (Segerstrale 2000) and underpins the more recent disciplinary dispute within STS over the discipline's alleged responsibility for post-truth (Collins, Evans, and Weinel 2017; Lynch 2017; Sismondo 2017).
- 15 In the United States alone, 10 years of injury reports to US regulators potentially link more than 1.7 million injuries and nearly 83,000 deaths to medical devices (ICIJ 2018).
- 16 For more extensive argumentation on why the mere majority agreement is not sufficient for trust or an epistemically reliable consensus, see Beatty (2006), Miller (2013), and Intemann (2017).

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