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A Tale of Two Vaccines—and Their Science Communication Environments

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Abstract and Keywords

This chapter examines the difference in the US public's reactions to proposals for universal administration of two adolescent immunizations: the human papillomavirus (HPV) vaccine, which provoked a firestorm of political controversy, and the Hepatitis B (HBV) vaccine, which aroused no such opposition. This chapter argues that the reason for this was that the public became familiar with the latter (but not the former) in a polluted science communication environment. It identifies decisions made by the vaccine's manufacturer that drove the HPV vaccine off the nonpoliticized administrative-approval path followed by the HBV vaccine and every other mandated childhood vaccine and onto a highly politicized, highly partisan legislative one that predictably provoked identity-protective cognition. The chapter argues that such controversy will likely recur unless protection of the science communication environment is itself made a self-conscious object of the institutions, governmental and nongovernmental, that play a role in the dissemination of decision-relevant science.

Keywords: human papillomavirus, HPV vaccine, Hepatitis B, HBV vaccine, science communication environment, protective cognition

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This chapter tries to sharpen the focus of two of this book's general themes by using them to make sense of a particular science communication failure. The first is the contribution that science communication environments that are "polluted" increase the likelihood of controversy over decision-relevant science. Specifically, when the social processes that normally align diverse citizens with what is known from science are disrupted by antagonistic social meanings or other potentially contaminating influences, persistent, group-based conflict over risk and related facts arises. For that reason, an earlier chapter (Chapter 3) referred to their creation as a form of "pollution" in the "science communication environment." The second theme is the value of comparing cases in which science communication fails with examples when it succeeds (or at least no obvious failure exists) in order to make sense of such disruptions. Understanding what typically enables diverse citizens to converge on the best available evidence helps us understand—and ultimately manage—the conditions that account for the atypical situations in which citizens are not using the knowledge proffered by science (see Chapter 3). The particular science communication problem that is the focus of our exploration of these themes is the continuing state of controversy over the adolescent human papillomavirus (HPV) vaccine in the United States.

HPV is the most common sexually transmitted infection, currently infecting an estimated 79 million Americans, according to the Centers for Disease Control and Prevention (CDC; www.cdc.gov). It is also the principal cause of cervical cancer, which takes the lives of 3,000 women a year in the United States. In 2006, the Food and Drug Administration (FDA) completed fast-track approval of Gardasil, a vaccine that confers (near-perfect) immunity to most strains of HPV. It was the potential lethality of infection by HPV that accounted for the FDA's expedited review, which, as a result, was confined to (p. 166) establishing the efficacy and safety of the vaccine for women only (Tomljenovic and Shaw 2012).

Almost immediately after FDA approval, the CDC added the HPV vaccine to the agency's recommended schedule of universal immunizations. Because it confers no benefit once a person has been exposed to the virus, the CDC proposed that the HPV vaccine series be administered to girls at eleven to twelve years of age, before the likely onset of sexual activity (CDC 2006).

Unlike immunizations previously identified as appropriate for universal administration, however, the HPV vaccine provoked a firestorm of controversy. In the years immediately following the CDC's recommendation, legislative proposals to add the vaccine to mandatory school-enrollment schedules were defeated in all but one of the dozens of states that entertained them. Deep public ambivalence about the vaccine persists (Calo et al. 2016): in the years since, the vaccine has been added to the schedule of only one (National Conference of State Legislatures [NCSL] 2016), and US vaccination rates continue to lag behind public health targets—another factor that sets HPV apart from other recommended universal vaccinations (CDC 2015).

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What happened? Many things no doubt. However, using what we know from science communication research, we can infer that a series of decisions made by the vaccine manufacturer likely interacted in such a way that triggered the type of pollution to a science communication environment that has a destructive impact on the public's capacity to appraise the best available evidence on the risk and benefits of the HPV vaccine.

Before discussing the decisions that together likely polluted the vaccine science communication environment, it is important to explain one of the mechanisms that accounts for such group-related conflict over risks and related facts, *cultural cognition*. Cultural cognition refers to the tendency of members of close-knit social groups to conform their assessments of evidence on disputed risks to the positions that predominate among their peers. When opposing positions on risk become perceptibly associated with such groups, individuals will have a stake in using their reason to form beliefs that effectively signal their membership in and loyalty to their group. Indeed, the more proficient at reasoning they are, the more systematically they can be expected to process information in this way; on issues affected by this dynamic, the individuals who are highest in science comprehension are likely to be the most polarized. Cultural cognition has been shown to be one of the principal sources of persistent public conflict over societal risks—from climate change to fracking, from nuclear waste disposal to gun control (Kahan 2015a).

That cultural cognition played a role in the conflict over the HPV vaccine is supported by research. Individuals of opposing cultural outlooks, such research suggests, were predisposed to form opposing stances. Those who prize both traditional gender roles and also the autonomy of individuals to make their decisions about how to provide for the well-being of themselves and their families, tended to perceive that the vaccine's risks outweighed its benefits. In contrast, individuals subscribing to more egalitarian norms, and favoring collective attention over individual needs, concluded the opposite. Even more significantly, when furnished with balanced, accurate scientific information, members of these groups did not converge in their assessment: instead, they formed impressions that were even more divergent. Outside the lab, political battle lines reflected these divisions (Kahan et al. 2010).

It is not surprising, then, that citizens with these commitments would divide over a proposal to require parents to obtain a sexually transmitted disease (STD) vaccination for their adolescent children as a condition for enrolling in public school. Nevertheless, this outcome was not inevitable. In fact, just a few years earlier, a near-identical proposal excited *no* meaningful opposition. In the late 1990s, the FDA approved the HBV vaccine for Hepatitis B. Hepatitis B, like HPV, is a STD that causes cancer (in this case, cancer of the liver). Following a CDC recommendation for universal administration of the HBV vaccine, the shot was added—without controversy—to the schedule of mandatory school-enrollment immunizations in states across the nation (Kahan 2013). Indeed, at the very time that the HPV-mandate controversy was raging, the nationwide HBV vaccination rate

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for thirteen- to fourteen-year-old boys and girls (the shot is now administered to infants) was over 90% (CDC 2007, 2008).

Research suggests that *no* societal risk, no matter its characteristics, is necessarily destined to trigger the polarizing forms of information-processing that are the signature of cultural cognition (Kahan 2015b). The specific ones that do vary tremendously across place and time. An important focus of science communication research, then, is to identify the influences that make particular societal risks susceptible to this problematic dynamic. Indeed, by comparing the critical decisions made (p. 167) by Merck & Co.—the manufacturer of the HPV vaccine Gardasil—as part of its strategy to market the vaccine in the United States to the rollout of the HBV vaccine, we can gain insight into why controversy erupted around the former but not the latter (Herper 2012; Beil 2008).

The first decision made by Merck was to seek fast-track approval by the FDA. Fast-tracking the vaccine required that the shot administration, initially, be limited to females, because only women were known to face a risk serious enough to warrant expedited approval—in this case, cervical cancer. Understandably, an STD shot created only for adolescent girls, a novel concept, generated political controversy and garnered significant media attention in the United States and abroad (Gollust et al. 2016) with headlines such as “Cancer Sluts: Does the HPV Vaccine ‘Promote’ Promiscuity?” in *Slate Magazine* (O’Rourke 2007), “Defusing the War over the ‘Promiscuity’ Vaccine” in *Time Magazine* (Gibbs 2006), “Catholic Schools Debating Moral Issue of HPV Shot” in *The Toronto Star* (Ogilvie 2007), and “The Slut Shot” in *The Village Voice* (Taormino 2006). See Figure 17.1. Such rhetoric associating the shot with loose sexual morals likely triggered emotional reactions from more conservative cultural groups, specifically religious ones that value abstinence and oppose contraceptives (e.g., BBC 2008). Moreover, such rhetoric that sounds like it specifically shames girls for sexual behavior is likely to upset liberal cultural groups, specifically those concerned with gender equality.



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Figure 17.1 Media anticipation of “girls only” STD shot, early 2006. Because it was limited to females only, Merck’s fast-track review request for Gardasil excited an anticipatory media narrative of cultural conflict over vaccinating preteen girls against contracting a venereal disease.

The second potentially problematic decision Merck made was to sponsor a nationwide legislative campaign to seek rapid approval of school mandates for the vaccine. Merck enlisted and paid for the lobbying efforts of Women in Government, an interest group dedicated to “women’s health issues” that was well-known for its advocacy of sexual education in schools and

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for opposition to restrictions on abortion (Mello et al. 2012; Peterson 2007). Although this decision was reasonable given the relevance of cervical cancer to women's issues, sponsorship from this particularly group predictably provoked resistance from religious conservatives, further fueling a high-profile political debate over the vaccine across the country (Gostin and DeAngelis 2007).

In addition to recruiting a divisive interest group, Merck agreed to make large campaign contributions to Texas Governor Rick Perry, a Republican figure (p. 168) who at the time enjoyed high stature within the US religious right. Perry obligingly issued an executive order that temporarily made Texas the first state to require HPV vaccination for school enrollment. It is possible that Merck thought that the conservative governor could have leveraged his credibility among the religious right to garner support among this particular cultural group, canceling out any potential negative effects of associating with Women in Government. Before even a single shot was administered, however, Perry's order was repealed by the Texas state legislature. The vote came after contributions to Perry were ferreted out by the media, a development that quickly led to discovery of Merck's sponsorship of the Women in Government's legislative campaign. Merck thereafter terminated the legislative drive for Gardasil mandates, and all activity to add the vaccine to the states' lists of required school-admission schedules ceased (Carreyrou and Rubenstein 2007).

It is an open question whether any of Merck's decisions were essential to protecting the health of the American public and women in particular. Had the company not sought fast-track approval, there was every reason to assume the vaccine would have been approved for both boys and girls within three years. Indeed, the FDA completed the normal review process and approved the vaccine for males in 2009 (FDA 2009).

Even more important, without the campaign for legislative mandates, the CDC proposal for universal vaccination would have initiated the typical administrative process for adding vaccines to the schedule of immunizations required for school enrollment. The determination to update these lists has historically been made by public-health boards exercising authority delegated to them by state legislatures, which do not otherwise play a role in approving such additions (Jackson 1969).¹ Because these boards are effectively insulated from politics, interest groups have little opportunity to influence their decisions and hence little incentive to make their activities the focus of public attention. Although the approval process is not instantaneous, in the interim between CDC certification and the addition of a vaccine to any state's mandatory schedule, universal access is incentivized by insurance coverage backed up by federally funded immunization programs for uninsured children (Kahan 2013).

This was the path the HBV vaccine uneventfully traveled to its destination on state universal immunization lists across the United States, and the one that Gardasil would have likely taken if Merck had not sought fast-track FDA approval and coordinated a (potentially unintentional) high-profile, highly politicized legislative campaign. Groups representing the religious right had, in fact, publicly promised not to oppose approval of

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the vaccine in the absence of *legislative* mandates (Colgrove 2006). Not surprisingly, several years later, in July 2015, it was through the typical administrative process that Rhode Island put in place an HPV vaccine requirement for seventh-graders that started in September 2015 (NCSL, 2016), making Rhode Island only the second state to require the HPV vaccine for school attendance. The first was Virginia, which enacted its statutory mandate after Merck agreed to open a Gardasil manufacturing facility in the state (Kahan et al. 2011).² Letting the HPV vaccine follow this path, however, may not have been in Merck's economic interest in 2006. Gardasil is one of two HPV vaccines; the other, Cervarix, is manufactured by GlaxoSmithKline. Some have suggested that Merck's application for fast-track review of Gardasil for women only, and the company's orchestrated campaign for rapidly enacted legislative mandates, were parts of a financially motivated strategy to gain a dominant position in the US market before Cervarix was approved for use in the United States (Allen 2007).

However much or little sense it made for Merck, this series of decisions ended up being problematic for the vaccine science communication environment. The dominant message of media coverage of the Merck legislative campaign was that the risks and benefits of the vaccine were matters of dispute between *culturally identifiable groups*—indeed, the very ones divided over climate change, nuclear power, gun control, and other highly polarizing issues (Gollust et al. 2016).

These are the conditions, the study of cultural cognition implies, that entangle competing positions on risk with antagonistic cultural meanings, turning the positions into badges of membership in competing groups. It is under those conditions that individuals use their reason *not* to align their actions with the best available evidence but instead to form beliefs that reliably express their commitment to identity-defining affinity groups.

Another chapter in this volume (Chapter 4) describes the role that cultural affinities normally play in ordinary people's science communication environment. Because people must often make use of much more science than anyone can possibly make sense of, individuals ought to become experts at figuring out who knows what about what (p. 169) (Landrum et al. 2015). They do this, primarily, inside affinity groups, whose members they trust and understand. These affinity groups, amply stocked with members of varying expertise, some who possess scientific knowledge and are equipped with intact mechanisms for transmitting what is known, *are* people's "science communication environment."

One of the pieces of information that such groups enable their individual members to discern is what *experts* believe. Individuals of all cultural outlooks hold that the advice of scientific experts *should* guide collective decision-making. But individuals are no better situated to determine, on their own, what *the weight of scientific opinion is* on whether the earth is heating up and whether humans are causing it, for example, than they are to figure out on their own whether the earth *is* heating up and whether humans *are* causing that. Either way, individuals have to rely on the representations of others to figure that

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out, and they naturally rely more decisively on those whose values and outlooks they share (Kahan et al. 2011).

Individuals do the same, moreover, when they have to assess the competence and trustworthiness of science-trained professionals to provide advice relevant to individuals' decisions about their own well-being. Had Merck not diverted the HPV vaccine from the conventional path that the HBV vaccine and others traveled on their way to being added to state school-enrollment immunization schedules, parents likely would have learned about the HPV shot from their pediatricians. These are experts whom the parents themselves selected to advise them on their children's health because they trust these specific individuals (the pediatricians) to convey to them what science knows. No doubt cultural affinities played a role in helping those parents to identify those physicians as *trustworthy*. But because professionals of diverse cultural outlooks generally agree on what science knows—and in this case agreed on the benefits of the HPV vaccine—there is every reason to have believed that parents from culturally diverse groups would have converged in their understandings about the HPV vaccine, just as they did in their understandings of the HBV vaccine.

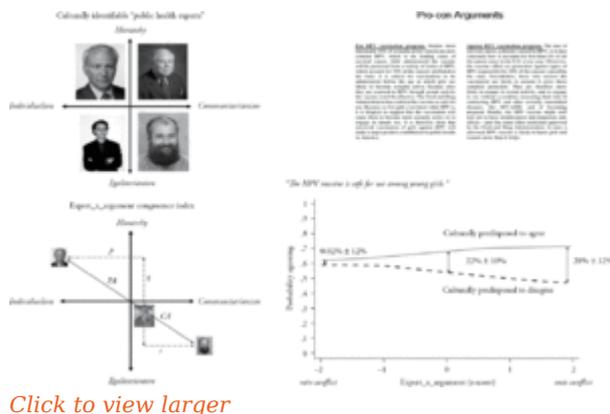
The culturally antagonistic meanings that transform positions on societal risks into symbols of group allegiance *disable* the faculties ordinary individuals normally use to discern what is known by science and thus pollute the science communication environment. Merck's strategy for the vaccine's release arguably ended up contaminating the science communication environment in which ordinary American parents learned about the HPV vaccine in exactly this way. What it disabled the public from doing effectively was discerning what *experts* believed about the vaccine's risks and benefits. Rather than judging whether the HPV vaccine was safe and effective based on the views of trusted experts, individuals used the conformity of their pediatricians' views with the ones identified with their cultural groups to decide whether they could trust their pediatricians (Helmy 2008). Indeed, the very same studies that showed that individuals of opposing cultural outlooks were predisposed to polarize on the HPV vaccine also demonstrated that such individuals were inclined to invest decisive weight in the views of public health experts. This shared tendency canceled out any predisposition on the part of individuals with opposing identities to disagree when members of those groups formed the same impression of what public experts were saying (Kahan et al. 2010, Figure 17.2). This process of convergence is what likely occurred in the case of the HBV vaccine.

Members of diverse groups could be expected to polarize on the HPV vaccine, the studies showed, *only* when individuals were primed to see the vaccine as a matter of cultural dispute, in which case they selectively credited and discredited expert views in patterns that amplified their opposing predispositions (Gollust et al. 2016; Kahan et al. 2011). This is the outcome that presumably occurred in the polluted science communication environment in which individuals learned of the HPV vaccine (Gollust et al. 2016; Fowler and Gollust 2015).

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This account of what happened to the HPV vaccine is not a product of 20/20 hindsight. Many public health experts and other commentators were concerned *at the time* that the means by which the vaccine was being introduced likely were thrusting it, needlessly and perilously, into a political maelstrom (Gostin and DeAngelis 2007; Colgrove 2006). The studies that simulated the outcomes that motivated these concerns occurred early on, when there was still time to alter the course by which the vaccine was being introduced to the public (Cultural Cognition Project 2007).

It was not the case that these concerns and this evidence did not avert the HPV disaster because they were dismissed as “unpersuasive.” Instead, it is likely that there was no one in a position to act on them. The FDA, for example, is not currently charged with taking the science communication impact of “fast-tracking” vaccines into account, nor is the CDC or any other agency charged with a role in overseeing how proposals to add vaccines (p. 170) (p. 171) to the states’ mandatory school-admission lists is administered. Nor has the medical profession organized itself in a manner to play this role. There simply is not *any* mechanism currently in the public health system designated to protecting the science communication environment in which the public comes to know and make use of the scientific knowledge on which public health depends. We argue that this is itself a deficit in our public health system that could very well put the public well-being at risk.



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Figure 17.2 Impact of perceived conflict on assessments of expert opinion on HPV vaccine.

Experiment subjects and fictional “public health experts” are located on a “cultural worldview” grid, the former based on their own responses to survey items and the latter by the responses other subjects predict the featured experts would give. To simulate science communication environments varying in cues of cultural conflict, culturally diverse subjects were exposed to arguments from fictional experts with values varying in proximity to their own. Tacit perceptions of societal conflict are deemed “maximized” when subjects view the position they are culturally predisposed to accept being advanced by an expert with cultural outlooks highly proximate to their own and the position they are culturally predisposed to reject being advanced by an expert whose cultural outlooks are highly remote from their own; conflict is “minimized” when they see instead that experts whose cultural values are proximate to their own are willing to take the position that subjects were predisposed to reject. The “maximum conflict” environment in fact amplifies polarization, which disappears in the “minimum conflict” environment.

Source: Kahan et al. (2010).

Unless what we know from the science of science communication is taken into account, what happened with the HPV vaccine will probably happen again. But what *should* be done to fix this problem? Other chapters in this book focus on this issue, including Chapter 44, which addresses the ways in which failing to attend to the science communication environment puts at risk the public’s understanding of what science knows about childhood vaccinations generally.

But the most fundamental point can be succinctly stated: *all* institutions, governmental and civil, that contribute to the dissemination of science ought themselves be structured to operate in a manner that protects the social processes that shape citizens’ capacity to recognize what science knows. Just as the physical well-being of human beings (and other living creatures) depends on the quality of their natural environment, so the prospect for enlightened self-government depends on the quality of a society’s science communication environment. Moreover, like the quality of the natural environment, the quality of the science communication environment is a public good: uncoordinated individual actions will not only fail to adequately protect it from harm but will predictably expose it to insults that compromise the stake all have in its vitality.

Insofar as the science communication itself takes many forms and occurs in many discrete settings, it would be a mistake to describe the “science of science communication” as being about only *one* thing. But because all of the things that count as science communication are put in jeopardy when people are misled by the very processes that normally enable them to recognize who knows what is known to science, it is no exaggeration to say that protecting the science communication environment should be one of the science of science communication’s critical aims.

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Notes:

(1.) Section 9a-75 of Connecticut General Statutes is typical:

The Commissioner of Public Health shall determine the standard of care for immunization for the children of this state. The standard of care for immunization shall be based on the recommended schedules for active immunization for normal infants and children published by the National Centers for Disease Control and Prevention Advisory Committee on Immunization Practices, the American Academy of Pediatrics and the American Academy of Family Physicians.

(2.) Washington, D.C., also has a mandatory HPV vaccine requirement for school entry, but both D.C. and Virginia have broad exemptions, making it easier for children to still attend school even if their parents choose not to have them vaccinated (Ramsey 2015). As of August 2016, at least ten more states have proposed legislation for HPV vaccines for the 2015-2016 session (NCSL 2016).

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