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Building and Maintaining Trust in Science:

Paths Forward for Innovations by Nonprofits and
Funding Organizations

Brian Southwell, Angelique (Angel) Hedberg, Christopher Krebs, and Stephanie Zevitas, Editors



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Photos: Participants from leading nonprofit organizations, funding organizations, and other relevant groups gathered in Research Triangle Park in July 2019 to consider how to build and maintain trust in science.



Introduction

In July 2019, participants gathered in Research Triangle Park, North Carolina, for an event organized by RTI International (RTI) called Trust in Science. As an independent, nonprofit research institute celebrating 60 years of service to society itself, RTI regularly conducts scientific research and engages in efforts to encourage public support for science. A wide range of nonprofit organizations and funding organizations also support and engage with different aspects of scientific research representing myriad fields of inquiry, some involving social dynamics and others involving phenomena at a planetary scale. Despite such diversity of fields, however, the conduct and impact of most peer-reviewed scientific research is contingent on public support. Without trust between people and communities not formally connected to scientific institutions, those institutions, and the scientists who work with and for these institutions, it is difficult to imagine the publication of data remaining a vibrant force or cornerstone of societal decisionmaking. Trust, in many ways, is a precursor to and perhaps even remedy for concerns we might raise about misinformation or the use of science in policymaking.

Our goal with the Trust in Science event was to foster collaborations and strengthen connections between nonprofit and funding organizations to address trust-related challenges that are affecting science and scientists. Collaboration between professionals and organizations is easy to cite as an abstract goal but can be challenging to pursue in practice for various reasons. One intended outcome for our effort was the forging and reinforcement of professional relationships. Beyond interpersonal meeting, though, we also worked together to generate key themes and actionable ideas that will inspire future work.

Participants generated and considered both broad challenges and specific contexts in which trust has been strained. We discussed, for example, the use of wearable technologies for data collection, vaccine acceptance, biofuel research, survey research on topics such as sexual harassment monitoring, tools to help people navigate online information, and the development of physical spaces for local community discussion about science and technology. That range might suggest difficulty in reaching consensus in themes and recommendations, and yet our participants managed to develop a coherent set of suggestions.

Here we offer an overview of key themes and ideas that emerged from our interactions. We hope that readers will consider this an open-source set of suggestions for future initiatives and innovations.

—Brian Southwell, Angelique (Angel) Hedberg, Christopher Krebs, and Stephanie Zevitas



Overview of Attendee Survey Responses

Before the Trust in Science meeting, we asked attendees a series of questions about their current activities and perceived challenges related to trust in science. Several important themes emerged in their responses that offer perspective on organizational perceptions of trust in science as a concern and opportunity for action.

Micaela Brewington,
RTI International

What example initiatives could improve public trust in research?

- **Open science.** Many organizations promote “open science” by devising and disseminating best practices for reproducibility, transparency, and accessibility; by establishing standards for their staff and partners; and by sponsoring leading open science organizations.
- **Equipping audiences.** Some initiatives promote scientific literacy and equip people with the skills to engage critically with science, interpret evidence and limitations, and recognize misinformation. Examples include curricula for audiences of all backgrounds, community-based research, fact-checking, and translation of scientific topics into engaging forms of media.
- **Educating scientists.** Many initiatives aim to improve how scientists communicate their work. Such efforts help scientists to create digital presentations of their research and promote the use of clear and accessible language. Some organizations also keep internal standards for publishing their research process and communicating with policymakers.
 - As one respondent noted, “so many efforts focus on how we need to ‘fix’ the public; in lieu of re-evaluating how science interfaces with and presents itself to ‘the public.’”
- **Expert collaboration to address misinformation.** Many organizations represented here are undertaking research, strategic missions, and conferences to draw together key stakeholders from science, policy, journalism, and others to address misinformation and distrust in science.



Photo: Lee Rainie of Pew Research Center offered a [snapshot](#) of survey data on public trust in institutions suggesting scientists continue to be held in higher regard than many other professions.

Photo: Brian Southwell of RTI International moderated the Trust in Science event.



What challenges related to public trust in research are concerns for the audiences your organization serves?

- **Loss of public support.** The majority of respondents noted a loss of public trust in institutions in general, and in science specifically, which many described as a primary cause of other concerns outlined in their responses. (At the same time, recent survey evidence reported by the Pew Research Center suggests scientists are still held in relatively high regard among the general population.)
- **Politicization of science.** Many identified the politicization in reporting facts and in the media accounts as concerns. This polarization may interact with and even contribute to an erosion of trust that leads audiences to question the integrity and neutrality of research because of perceived conflicts in motivations and interests.
- **Skepticism and credibility.** A primary concern about public audiences seems to involve their discernment of the credibility of scientific endeavors. Respondents felt that low science literacy hinders people's ability to discern fact from fiction, for example, making them skeptical of evidence-based information and vulnerable to misinformation. Overall, many noted that distrust and misinformation encourage audiences to dismiss the value of science in their lives.
- **Concerns among the scientific community.** Public distrust creates challenges for researchers in establishing credibility and communicating their work, both foundational steps to build and rebuild trust, which suggests a vicious cycle. Respondents expressed the need to improve accessibility of scientific reporting and the process of science for audiences. Further, researchers and organizations that receive government support may have concerns about how to continue winning funding without compromising the goals, neutrality, or public integrity of their work.

Summary of Example Initiative Discussions at Trust in Science Event

- Defining Trust in Science
- Addressing Erosion of Trust in Survey Research (Surveys on Controversial Topics)
- Building Capacity for New Models of Place-Based Community Science
- Building Trust in the Context of Vaccine Hesitancy
- New Communication Technologies and Trust
- Ethics and Passive Data Collection



Photo above: Chris Volpe of ScienceCounts delivers lunchtime remarks during the July 2019 Trust in Science meeting.

Defining Trust in Science

Summary organizer: Sarah Ray

Discussion participants:

Jeffery Alexander, Russ Campbell,
James Hunter, Robin Mencher,
Teena Piccione, and Chris Volpe

When developing plans both to establish and to continue to build public trust in science, we should consider how trust may be defined, perceived, and understood both by scientists who are conducting research and by a broader audience who consumes and uses scientific information in a variety of ways (or does not). Although some researchers have defined trust in terms of beliefs that other people or institutions are reliable (e.g., Siegrist, Gutscher, & Earle, 2005), perceptions of what constitutes trust vary. Researchers across disciplines have noted that although “trust” is generally agreed to be important and influential in suggesting perceptions of research, especially when information is new or complex (Siegrist et al., 2005), the concept of trust in science surprisingly has not been defined or operationalized in a way that is consistent and widely accepted (Siegrist et al., 2005; Arai, 2009; Taddeo, 2009; Funk, 2017).

We also should consider the dynamic and increasingly complex environment in which information is disseminated and promoted and the ways in which the presentation of information (and misinformation) in this environment can contribute to confusion about who and what to believe, as well as how it can impact how we think about trust itself.

As our group reflected on these potential challenges, the discussion focused on how the scientific community might think about trust in a way that includes and engages the public, while maintaining respect for scientists and others who are in a position to know. This may include, for instance, positioning and viewing trust not as a singular idea (that may be oversimplified in the scientific community), but rather as a multifaceted concept with many layers that incorporate and align interests with credibility and the ability to answer questions or address concerns; as a result, just asking whether someone “trusts” science or scientists may not be sufficient. These layers hold not just rational processing but also the emotional reactions to information. Although those reactions may be borne out of excitement and hope that encourage and build trust, they may also come from a place of confusion, bad experiences (e.g., spam calls affecting survey research), suspicion, or a lack of consistent and credible information that could lead to a general erosion in trust.

Thinking about trust in this way also highlights the importance of considering trust as a process, not a state, and that trust—along with presentation of scientific results, breakthroughs, innovations—has to evolve and be framed not as a static fact, per se, but as regards membership in a shared community. Likely, it is easier to lose trust than to establish or gain trust, and so our group posed several potential solutions for overcoming these barriers, including

personalizing the scientific process (e.g., showing people where they fit in scientific data), highlighting the legitimacy and credibility of the information, understanding the value of relatable empathy in addition to expertise, providing transparency in the motivation for research, and clearly communicating uncertainty and the possibility of error as part of that process.

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Addressing Erosion of Trust in Survey Research

Summary organizer:

Christopher Krebs

Discussion participants:

Stuart Buck, Mark Canada, Sandra Cyr, Will Friedman, Jacqueline Olich, Natalie Snider, Tamara Terry, and Jamie Wood

Survey researchers are facing challenges involving at least some stakeholders' decreased trust regarding organizational motivations for research, the research process itself, and the data and information that result. Organizations conducting survey research and data collection, for example, are facing challenges in finding support from funders and partners who have an agenda that may not be supported by the resulting data. A related problem occurs when results are reported and are viewed through political lenses regardless of the scientific integrity of the underlying research. Research consumers often either discount or try to discredit research if they do not like the results or, alternately, promote results they like even when that research is not scientifically sound.

Some of our group members have identified this as largely a political problem. Stakeholders—whether they are potential supporters or funders, or consumers of the resulting knowledge and information—are going to act politically and behave according to their beliefs about the issue or problem at hand. In other words, there is not a lot that researchers themselves can do to necessarily solve this problem.

At the same time, we reached general consensus that what might help address the problem is developing objective, well-advertised benchmarks or metrics for determining when a survey or research is good or rigorous or worthy of trust—the idea being that it would be harder for politically motivated stakeholders to discredit research or deny the value of the results if the research had received some sort of objective, respected endorsement. Examples of relevant ratings or endorsements include the Good Housekeeping Seal, Consumer Reports, Underwriters Laboratories (UL), and *Washington Post's* Pinocchio Test.

Since 2009, the American Association for Public Opinion Research (AAPOR) has been developing something called the Transparency Initiative (https://www.aapor.org/Transparency_Initiative.htm) that is relevant to this discussion. AAPOR is a widely respected organization “dedicated to advancing the science and practice of survey and opinion research to give people a voice in the decisions that affect their daily lives.” AAPOR's Transparency Initiative is designed to encourage research organizations to be proactively transparent about their methods and reporting of survey-based findings. Although transparency is a good thing, AAPOR “makes no judgment about the approach, quality or rigor of the methods being disclosed.”

An example of a topical area in which public challenges to survey credibility could threaten the impact of survey work is sexual harassment and sexual assault. RTI researchers have conducted an array of studies on sexual harassment and sexual assault (e.g., Krebs et al., in press; Lindquist & Krebs, 2017). The ongoing use of such data for policy discussion and decisionmaking, however,

could be bolstered by external evaluation of survey methods or validation efforts like those proposed by our team.

In sum, we could benefit from a nonpartisan, objective assessment of the scientific rigor of survey research studies and the development of a labeling or certification system for publicly available research results. Perhaps support for, participation in, and the impact of survey research will increase if and when “good” survey research can be identified and labeled and differentiated from “bad” survey research. Such a tool could help to improve trust in scientific survey research for all parties.

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Building Capacity for New Models of Place-Based Community Science

Summary organizer:

Vanessa Boudewyns

Discussion participants:

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Ed Balleisen, Seung-Hyun Cho,
Cristin Dorgelo, Kari Fischer,
Dennis Gilmore, Erika Kimmerling,
Sameer Parvathikar, Denise
Sauerteig, and Sorien Schmidt

Building more diverse, inclusive, and equitable science-engagement, learning, and communication environments is a key component of fostering trust in science. At present, there is increasing demand from both major research initiatives and community organizations to ensure that the local context, values, and priorities of communities are integrated into research priorities and that the ensuing development benefits diverse local communities.

Our group discussed some major challenges and questions related to these goals, including:

- How do we develop and improve effectiveness of existing places for community engagement?
- Are they integrating the diversity and values of the community?

To address these questions, we identified three key steps that provide a basis for future initiatives:

1. Inventory current place-based community science approaches, strategies, target population, and location.
2. Develop assessment tools and metrics to track the impact of current strategies.
3. Conduct efficacy, effectiveness, and scale-up studies.

Our group focused on public dialog and deliberation as a method to build capacity for place-based community science, an approach long considered by science communication professionals but also a strategy inconsistently applied to date (American Academy of Arts and Sciences, 2019). We identified four disparate science challenges where such effort can be applied:

1. animal waste management,
2. artificial intelligence and the digital divide,
3. encouragement of STEM education, and
4. the opioid epidemic.

We propose to use the three-step process of inventorying, assessing, and scaling up to evaluate dialog and deliberation as a method using animal waste management in North Carolina as a first case study.

A key site for inquiry involves alternative fuel production and the swine industry. The swine industry in North Carolina is the second largest in the country and an economic driver. However, existing animal waste management practices—with their adverse effects on air and water quality, health, and property values—have led to a deep divide between farmers and neighboring communities. (For discussion, see CBS News, 2018; Hellerstein & Fine, 2017; US Department of Agriculture, 2019; and Wing et al., 2008). Scientific and

engineering solutions to these problems have been met with resistance from all parties. In these instances, dialog and deliberation are a useful means to resolve conflicts; bridge divides; foster empathy; engender trust and understanding about complex issues; inspire collective engagement, diversity, and inclusion; and increase civic capacity for processes that deal with trade-offs.

We propose inventorying North Carolina institutions suitable for engagement on these topics, outline and track key outcomes, and implement an outcome evaluation. This provides a basis for extension to the other identified challenges. North Carolina can be viewed as a microcosm of the United States and the base location for these programs, but the approach provides a template for scale-up to other geographies.

Although capacity-building efforts should certainly leverage existing infrastructure and cultural resources such as science museums, our ideas focused more on community priorities and place-based approaches for science engagement. Understanding public dialogic and deliberation will help to critically assess physical space initiatives, the role nonprofits and other research institutions should play in society and the ways in which we can develop collective capacity to deal with complex problems.

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Building Trust in the Context of Vaccine Hesitancy

Summary organizer:

Bridget Kelly

Discussion participants:

Caroline Ball, Noel Brewer, Rachel Powell Lewis, Jonathan McCall, Aaron Mertz, and Daniel Wolfson

The recent measles outbreak in the United States has brought to light once again the topic of increasing vaccine hesitancy in the United States. Although the news stories generally focus on childhood immunizations like MMR, vaccine uptake across the lifespan is a continued concern for public health. Only about 50 percent of eligible American adolescents are up to date on the HPV vaccine. Adult vaccination for diseases like pneumonia and shingles has traditionally been low (Tan, 2015), and seasonal flu vaccination has been on the decline in recent years (Centers for Disease Control and Prevention, 2018).

The acceptance and usage of vaccines can potentially be impacted when trust in science is at issue; therefore, our group discussed vaccine hesitancy as it relates to trust in science.

Those who currently have the least trust for science generally may be unlikely to change their behavior no matter what we do. But it is important to recognize that that group actually represents a very small percentage of those who are hesitant to vaccinate (Leask et al., 2012). Others may be more persuadable. We do not want to risk alienating those who are hesitant to vaccinate by grouping them in with people who are actively or vocally opposed to vaccination, lest we risk the opportunity to convince them. Labeling them can lead to polarization and undermine our efforts at building trust.

It is important to stand by the old public health approach of meeting the audience “where they’re at.” In other words, formative research (or in the case of the clinical setting, a conversation to understand what is driving the hesitancy) can help ensure delivery of the most effective messages. Those who are hesitant due to safety concerns will obviously be motivated in different ways than those who believe in natural immunity or have religious beliefs they see as conflicting with vaccination. In some cases, persuasion may involve clarification of misperceptions. In others, holding more engaged conversations between patient and provider, such as those tested in recent motivational interviewing interventions (see Brewer, Chapman, Rothman, Leask, & Kempe, 2017, for discussion), may be an effective strategy for decreasing resistance and opening lines of communication (although the jury is still out on the effects of such approaches).

Listening to patients also may lead to enhanced trust in providers and potentially science more broadly that will have an effect in the future. (See Fetters, 2019, for discussion.) Identifying and supporting those who are most commonly engaged by patients (perhaps nurses, rather than doctors) to discuss vaccination could prove fruitful and enhance trust.

When it comes to message development, narrative has been used quite frequently by antivaccine advocates, particularly via social media. Stories of children purportedly injured by vaccination can induce emotional reactions, impacting beliefs, attitudes, intentions and behaviors (Braddock & Dillard, 2016). Narratives

about the children affected by the measles outbreak, though, could be equally compelling and persuasive. That is a potential avenue for exploration although practitioners would need to avoid exploiting the sagas these families have endured.

It is also important to minimize the misinformation available to those who are attempting to make informed decisions about vaccination. One innovative approach is using cybersecurity measures to identify and hinder misinformation efforts. In a study by Broniatowsky et al. at George Washington University, researchers found that Russian trolls used a Twitter hashtag designed to “exploit vaccination as a political wedge issue.” They found that bots posted antivaccine content at a significantly higher rate than non-bots (Broniatowsky et al., 2018). If cybersecurity firms can find ways of accrediting information sources or identifying posts created by a bot, it could help to reduce the amount of antivaccine content available, or at least expose the source so information seekers could evaluate the credibility for themselves.

Policy advocates also have considered recent efforts by some states to repeal personal exemptions to school vaccination requirements (as California, New York, and others have recently done) as a path forward. As it becomes more difficult for people to opt out of routine vaccinations, evidence suggests these bills can help increase vaccination rates to levels required for herd immunity (Kaplan, 2018). As effective policy efforts begin to result in fewer actual outbreaks, we might eventually see improved trust in science follow.

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New Communication Technologies and Trust

Summary organizer:

Angelique (Angel) Hedberg

Discussion participants:

Lucas Blair, Michaela Brewington,
Michael Caulfield, Paul Cook,
Shalina Omar, Jeff Stanger,
Shane Stansbury, and
Stephanie Zevitas

The “networked society” emerged after the industrial revolution, characterized by a growing information (knowledge)–based economy. This phenomenon distinguished itself from the “pre-network society” by being fully dependent on both technological innovation and the “communication power” of networks. Castells has described a networked society as “the convergence and interaction between a new technological paradigm and a new organizational logic” (Castells, 2010, p. 69).

This convergence dictates that society relies more and more on the production of information, labor requires in-depth knowledge and understanding, and culture has turned into an ethos of media consumption, with its new meanings and values.

The current era of communication technologies allows for an outsized role for the production of information as it rewards sharing and approval of information rather than more extensive engagement. The increasing pace of technological transformation of the media and information channels amplifies this information broadcasting, including disinformation and misinformation. (Disinformation is intentionally spreading false information. Misinformation is unknowingly sharing information that is false. Disinformation leads to misinformation. See Southwell et al., 2017, for discussion.)

The future of communication technologies is directly related to the information and networks that exist right now. Focusing on the following principles can bring balance to the production, understanding and value of information:

- **Interactivity.** The interaction between users and computers will grow to the state at which users will always be connected with a system, and the capabilities of the system to react on users’ commands will advance. This will include the growth of telepresence, virtual reality, augmented reality, and other means of command systems. Also, the means of nonverbal communication or commands between user and system will grow and proliferate. This will include physical and emotional state, touch, looks, feelings, and other nonverbal communication channels. These new types of media and input methods will accommodate more natural interactions, seamlessly blending the digital and physical worlds and leading to an omnipresent technology layer. Before we reach this future state, we can look to mimic the engaged communities like those in a reddit subchannel that value and organize interaction.
- **Interconnectedness.** Interconnectedness is at the center of any network, where each member has an interest in connecting to gain access to the resources of the network. This concept is particular relevant to communication technology as many resources were previously inaccessible if they were not on a network connection. We should promote interconnectedness of members

through storytelling, relying on the social media influencers and the power of campaigns (#hashtags). The future can also be improved through bystander intervention training so as to ensure all voices are heard and interactions between contributors can be moderated from the ground up.

- **Openness.** Networks depend on accessibility and the Internet is one of the greatest examples of free access. We expect further “democratization” of network access and facilitation of better communication within networks. This may initially manifest as watchdog collective to promote reliable content, generating a seal of approval for verified information or allowing a browser plug-in to detect credibility.
- **Simultaneity.** Networks interact in real time and retrieve information. Digital media provide society not only with recent updates, but also with real-time feedback and discussion. This trend will continue to grow, allowing networks to upload and retrieve massive amounts of data in real time and make it personal and actionable
- **Hyper-collaboration.** The transfer of knowledge, advancement, and innovation through interactions within the networks will be a major force behind the advancement of future society. We expect growing collaborations between collocated and noncollocated humans, but also symbiotic collaborations between humans and systems, and collaboration of systems among each other.

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Ethics and Passive Data Collection

Summary organizer:

Joshua Richardson

Discussion participants:

Elizabeth Christopherson,

Andrea (Andy) Coravos,

Robert Furberg, Stephanie Hawkins,

Lee Rainie, and Gretchen Van Vliet

Our group comprised expertise and experience in non-profit administration and fields that included medical device development, policy making and law, data for consumer health and medical decision-making. Participants' multiple perspectives highlighted promises and pitfalls of the ever-growing amounts of electronic data derived from passive technologies such as wearable medical devices with health apps, surveillance cameras with facial recognition software, and people's internet search histories linked to their most intimate information including genetics.

While there are, and will continue to be, an abundance of technologies that produce and make linkages among passive data, the laws and discussion of norms as to how those data should be ethically used are falling behind. Our discussions highlighted initiatives that are being spurred by technologists and physicians, for example, but these discussions also could be broadened to incorporate the views, concerns, and needs of those outside of health care. (See Coravos and Goldsack, 2019, for a discussion of one effort: the Digital Medicine Society.) We agreed that education and informed dialog among multiple stakeholders including lay persons, lawmakers, technologists, and ethicists are critical for furthering the public's understanding of how passive data are being, and will be, used, and create consensus-driven frameworks for protecting individuals while promoting the public good. We need to develop spaces for that dialog and codification of emergent norms and best practices.

Given our discussions, we agreed that the non-profit sector has a key role to play by bringing together the stakeholders and fostering the necessary conversations for having the debates necessary to put forward a code of ethics for passive data collection and promote the public interest as to how such data and those that manage the data can be trusted.

Reference

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