

Engineers' imaginaries of "the public": Content analysis of reader reactions to an environmental injustice controversy

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Abstract— This full research paper presents an analysis of 43 engineers' responses to a 2015 newspaper article about a conflict in St. Rose, LA between affected residents, governmental agencies, and industry representatives concerning potential environmental contamination from a local chemical plant. The article contains conflicting points of view about the facts of the case, leaving readers with no clear sense for which party might be "right." In reading it, research participants were faced with contradictory information about air monitoring data and the potential health risks involved. While residents reported that data showed clear exceedance of federal air quality standards and that toxic air emissions were causing them widespread and severe health problems, governmental agencies and industry representatives argued that federal limits were being met and that data confirmed the absence of a public health concern.

Interview participants included first-year and senior undergraduate students, engineering faculty, and engineering professionals with at least five years of work experience outside academia. Each participant was asked to read the article, share their initial reactions, and discuss what they would recommend as "next steps" in the conflict. Interview recordings were transcribed and analyzed by two reviewers, using emergent thematic coding.

Analysis of participant responses showed two main reactions. The first was that residents' reported health experiences must have been true and that the community's association of these experiences with industrial air emissions, at the very least, deserved attention. This position tended to be accompanied by efforts on the part of participants to reconcile conflicting information from governmental agencies and industry representatives. The second was that the governmental and industry interpretations of the monitoring data must have been correct and that the community's reported experiences and/or interpretations must have been at least to some degree invalid. This position tended to be accompanied by efforts on the part of participants to reconcile conflicting information from the residents.

Participants' responses to the article required at least partial reliance on their 'gut feeling' about the likely intent, mindset, and conduct of affected communities in environmental injustice controversies. We thus treated their responses as a 'window' into engineers' imaginaries of "the public" and drew on the theoretical lens of 'social imaginaries' to analyze dominant emergent themes. The paper closes with a discussion about the

potential implications of our findings for engineers as well as for the diverse publics that engineers aim to serve.

Keywords—*social imaginary, ethics, social justice*

I. INTRODUCTION

The tools and knowledge that engineers possess can play a pivotal role in shaping the outcome of complex socio-technical matters, especially where community member knowledge and experiences are in conflict with the views or aspirations of authoritative entities like industry or government. As technology rapidly progresses and infuses almost every aspect of daily life, concerns about the consequences of these advances also increase. Some examples of socio-technical issues at the forefront of our society include the promise and risks associated with hydraulic fracturing, GMO foods, and nuclear power as well as the role of renewable energy, today and in the future. Despite the multidisciplinary and extra-disciplinary dimensions of these issues, the production and interpretation of data and the development of technologies related to them fall largely under the purview of engineers. Naturally, any views that engineers hold relating to the issues they are involved in can have immense impacts on the ways in which they design their research, develop their innovations, and implement their creations. This is especially true when it comes to engineers' views of "the public."

This paper seeks to better understand those views by analyzing engineers' responses to a 2015 newspaper article about a community's environmental health concerns vis-à-vis a local chemical plant. The article contains conflicting information, leaving readers with no clear sense for which side might be right. The paper's focus is on the ways in which participants fill in the gaps in the narrative by drawing on preexisting presumptions about "the public," its capacity to hold valid knowledge claims, and its relationship to technical experts.

A. Theoretical Grounding

Participant responses are analyzed through a theoretical lens of 'social imaginaries,' which are the formal and informal ways in which social groups "make sense of" themselves in relation to one another [1, 2]. This lens emphasizes the oftentimes unspoken and unconscious perceptions that shape a group's understanding of the social structures that exist (or

“ought” to exist) and the boundaries that separate the group from other groups. The concept of social imaginaries was used to guide the selection of the newspaper article provided to participants, for this article displayed a clear tension between “the public” and technical experts represented by government and industry. The same concept also guided the data collection and analysis by allowing us to focus on participant perceptions of “the public,” as those perceptions were employed to fill in gaps in the narrative and allow participants to provide recommendations for future action.

This paper is one part of a larger study focused on engineers’ social imaginaries of “the public.” In addition to interviews with engineers about their perceptions, the study also incorporated content analysis of 14 foundational documents for common characterizations of “the public.”. Analysis showed prominent messaging about engineers benefitting “the public,” being problem solvers, and needing to enhance their own image in the public eye [3]. Dominant characterizations of “the public” included a lack of—and therefore a need and desire for—technology, and inadequate understanding among members of “the public” about engineers and engineering. In sum, “the public” was depicted largely through a deficit lens. The third part of the study included interviews with community members who have participated in environmental controversies involving engineers. The analysis of these interviews focuses on interviewees’ impressions of how they were viewed by engineers and is forthcoming.

II. METHODS

The following sections describe the data used in this analysis, including the sample population, data collection and data analysis methods.

A. Data Collection

The data used in this analysis came from semi-structured interviews with 43 engineers, including first-year ($n=14$) and senior ($n=10$) undergraduate students, engineering faculty ($n=10$), and professional engineers with at least five years of work experience ($n=9$). All participants, with the exception of three professional engineers, were predominately from two institutions – one a small, private, urban, religiously affiliated liberal arts school on the west coast (Small Liberal U) and the other a large, public, rural, technical institution on the east coast (Large Tech U). The sample population represented a variety of engineering disciplines (civil, mechanical, electrical and computer) and, among the engineering professionals, represented both public and private sector experiences. Women ($n=19$), underrepresented minorities (URM; $n=12$) and participants with experience in Learning Through Service (LTS; $n=9$) were oversampled compared to the general engineering population [4] to try to capture diverse perspectives through maximum variation sampling [5].

Departmental email lists were used to send solicitations to first-year and senior engineering students at both institutions. Participants were selected to meet the desired demographic distributions and scheduling availability. Faculty participants were approached directly based upon the authors’ knowledge of them or through colleague recommendations. Professionals were selected through a combination of recommendations from

colleagues or the authors’ knowledge of them. Snowball sampling led to several more professionals who also participated in the study. All participants signed informed consent forms in adherence with Institutional Review Board policy and were paid \$50 for their participation.

All of the student and faculty interviews were conducted in person by one or both of the authors in April and May of 2016 and lasted up to 90 minutes. Interviews with professionals took place between January and August of 2017. A consistent interview protocol was used for all participants and included open-ended questions focused on participant views of the role of engineers in society, the role of “the public” in engineering decision making, past experiences interacting with “the public,” influential sources for their views of “the public,” descriptions of the ideal relationship between engineers and “the public,” and descriptions of how this ideal may differ from the current reality. Participants were also asked to define four terms that pertain to the relationship between engineers and “the public” and discuss how they understand them. Although responses to these other questions are not included in this analysis, preliminary results are provided in [6]. This preliminary analysis showed similar deficit perspectives of “the public” as was found in foundational documents, thought with greater acknowledgment of “the public’s” contextual knowledge as a critical element in engineering decision making. Similar narratives about the engineers’ role in society also emerged from these interviews where engineers ‘benefit society’, solve problems and improve individual’s quality of life.

This paper focuses on only one part of the interview process, which asked participants to read and react to a 2015 newspaper article that was published online by a regional news station in Louisiana [7]. The article focused on a conflict between residents, governmental agencies, and industry in the town of St. Rose, Louisiana around potential environmental contamination from local chemical plants. The article depicts community members claiming that the air was causing them health harm, based on their perceptions of higher-than-average illness rates and Environmental Protection Agency (EPA) air quality data, which they interpreted as exceeding safety standards. The governmental agencies involved – EPA and the Louisiana Department of Environmental Quality (LDEQ) – are described as having analyzed separate sets of air samples and having found in both sets all air quality standards to be met. The companies in the case – IMTT and Shell – are quoted echoing the governmental agencies’ message and reinforcing their commitment to public health and the environment.

Participants were asked to read the article and share their initial thoughts and reactions. Follow-up questions were used to probe deeper into their responses and to clarify their perspectives. Finally, participants were invited to provide recommendations on “next steps,” if the parties involved (i.e., residents, government, and industry) were to come to them for advice.

B. Data Analysis

Each interview was recorded and later transcribed for analysis. Emergent thematic coding [5] was used to develop a

set of codes focused on participant reactions to the article, their perspectives on the different stakeholders involved, and their proposals for next steps. A preliminary code book was developed by one of the authors and was then expanded upon by the other author who coded all responses. In general, paragraphs were used as the unit of analysis. Results are presented based on the total number of participants who gave responses matching each code.

III. RESULTS

Participants' reactions will be discussed in thematic groups based on the subject of the reaction. There are five subjects in total: 1) the community, 2) the government, 3) industry, 4) engineers, and 5) the data/evidence mentioned in the article. Participants' suggestions for "next steps" were clustered into one thematic group and will be discussed together.

A. Participant reactions to the community

Seven codes emerged that pertained to participant reactions to the community of St. Rose, Louisiana residents. The most common code pertained to participants expressing belief in the truth of the community's health claims or the community's interpretation of the data (n=27). Sometimes belief in the community's health claims or data interpretation was stated explicitly (*"I would always trust the community; the complaints are legit."*), while other times it was implied, like when a participant would jump to discussions about holding the chemical plant responsible or implementing remediation measures. A minority of participants (n=11) questioned the community health claims, either in terms of their validity or in terms of the probability that they were statistically different from the health experiences of residents in other communities. One participant, for example, said *"Part of me is, people do get sick and I mean it's pretty sad - it's a pretty small community so I think that maybe they're looking for causation for so many of them getting sick, but even in big communities there's people that... end up vomiting. Children get sick. Vomiting is not something that doesn't happen to children..."*

The next most common reaction was that the community was likely scapegoating the chemical plant for their health issues when the health issues could be from any number of sources. Ten participants expressed this belief, eight of which overlapped with the previous code questioning the community's health claims or statistical uniqueness. An example quote of this position was *"I don't know if they're an outlier or not, but they seem to be blaming this chemical plant and all of the monitoring data shows that it was operating within the limits."*

The fourth most common code pertaining to views of the community was that the community (or non-experts in general) was irrational, overreacting, or that they would stubbornly hold onto their views despite evidence to the contrary (n=9). Five of these responses came from respondents other than those who questioned the community's health claims or felt that the community was scapegoating the chemical plant. Three responses came from participants who also expressed belief in the community's health claims or data interpretation. This highlights just one way in which participant responses could be

in conflict, showcasing, perhaps, conflict within the participants themselves about how to resolve the gaps in information. An example quote characterizing the community as stubbornly holding onto their views was *"There's just kind of [a] sense that maybe it's like potential fear mongering, like not on purpose, but just people kind of getting behind a movement that they don't 100% understand."* Another participant said *"...I think that it's almost like an emotional decision that the public is making which tends to happen with the public. But again, even though in my opinion the public is wrong because they don't have any hard evidence, as opposed to the federal agencies."*

Seven participants expressed sympathy for the community's position (the fifth most common code), saying things like, *"...at first you're sympathetic to the people in St. Rose because they obviously have some health issues"* and *"I think that's pretty unfortunate for the residents - that they have that issue to deal with."* Paralleling the notion of sympathy, 15 participants drew from personal experiences or other stories they had heard about in the news to relate to the article or to the community. Several participants spoke about how the situation in St. Rose seemed to mirror the drinking water contamination in Flint, Michigan, which was prominent in the news at the time.

Comparing participant reactions to the community by demographic group showed that more participants from the Small Liberal U (39%, n=7) than Large Tech U (10%, n=2) characterized the community as irrational, overreacting, or stubborn. Similar results were seen by gender (Male - 29%, n=7; Female - 11%, n=2) and LTS vs. non-LTS (LTS - 44%, n=4; Non-LTS - 15%, n=5). Faculty and URM participants were most likely to express sympathy in reaction to the community (Faculty - 50%, n=5; Professional - 11%, n=1; 1st-year - 7%, n=1; Sr. - 0%; URM - 33%, n=4; Non-URM - 10%, n=4). The largest difference between demographic groups was with respect to expressions of belief in the community's health claims or data interpretation where a vast majority of senior undergraduate students (90%, n=9) expressed this view compared to first-year students (79%, n=11), faculty, (50%, n=5) and professionals (33%, n=3).

B. Participant reactions to the government

Four codes emerged with respect to the government in general or the EPA specifically, which was named in the article as conducting the air quality tests. They included: that the government is corrupt or untrustworthy (n=11), is trustworthy (n=7), distorted data or is prone to distorting data (n=5), and is limited in its ability to enforce environmental issues (n=3). One quote from a participant who felt that the government (and industry) is prone to corruption was *"...you got to kind of look at [the industry's position] with skepticism... [it's] not unheard of - there are many examples where those numbers are bent to benefit the industry because they've got the money and that money can be fed to corrupt organizations and politicians to look the other way so... (laughs)." Most of the participants who expressed skepticism about the EPA or the government in general spoke about historical instances of corruption, bribery, and coverups as reason to distrust the test results.*

Seven participants expressed belief in the government's interpretation of the data. Their reactions centered on a belief that government agencies tend to be free of bias or are committed to their mission to protect public health. *"I believe the EPA - the national agency probably isn't going to have much of a stake in this town in Louisiana that, when they test, they are probably coming up with the air is in compliance... but if there is a problem, I think the EPA has an obligation to find it."*

Only female (26%) and non-LTS (15%) participants expressed beliefs that the government distorts data or is prone to distorting data. Senior undergraduate students were most likely to express belief in the government's interpretation of the data or general statements of trust for the government and no faculty participants expressed this view (Senior – 43%, n=4; 1st-year – 14%, n=2; Professional – 11%, n=1; Faculty – 0%). Other demographic groups had similar distributions of views of the government between groups.

C. Participant reaction to industry

Participant responses to the chemical plant owner in this story (or industry in general) were similar to participant reactions toward the government, though a larger percentage of participants expressed the belief that industry is corrupt, untrustworthy or greedy (n=18). One participant said *"...it wouldn't be a bad public policy to require third-party testing because the bad guys, Shell (laughs), you really can't believe anything they're telling you, I mean, at face value... these are one data point people, right?"* Five participants believed that the industry was doing the right thing by monitoring their own emission (though the test results highlighted in the article were all conducted by the government) and that they were *"playing by the rules."* Two participants talked about the importance of the industry to the community in terms of jobs, and one participant explicitly expressed trust in industry, pointing to industry motivation to be accountable at the risk of *"go[ing] bankrupt if they really mess up."* Participant reactions to industry were similarly distributed across demographic groups.

D. Participant reaction to engineers

Few participants talked specifically about engineers in response to this case. No engineers were mentioned directly in the article, though it is likely that engineers are a part of the chemical plant and the governmental agencies who did the testing, and community members may also be engineers who work for this plant or other industry in the region. Four participants talked about engineers as separate entities from the company and the government. One participant, in talking about the potential source of the pollution, said *"it could be that the facilities are so old that they're not up to par anymore and the businesses, or the user, needs to replace them and it's not necessarily the engineer's responsibility to hold them to that."* In the quote, this participant creates separation between the engineer and the business who is using the facility that, presumably, the engineer designed and operates. One participant talked about the bind that engineers can find themselves in when working for a company where they know something is wrong - to either tow the company line or be a whistleblower and risk their job. Because of the few number of

participants who even discussed engineers in response to the article, comparisons between demographic groups were not meaningful.

E. Participant reaction to the data/evidence

All 43 participants commented on the data or evidence of pollution in their reaction to the article. Nine codes emerged regarding responses to the data, shown in TABLE I. The most common reaction was positing that the public's health issues may have been caused by a source other than air pollution from the chemical plant. Participants pointed to possible water contamination, pollution from other facilities, or other environmental conditions. The second most common reaction was belief in the test results. Eighteen participants felt that the data showed contamination levels below the legal limit and, thus, that the pollution problem perceived by the residents could not exist. Some participants pointed to the below-the-legal-limit test results as justification to look at other potential sources (e.g. *"I mean it sounds like they've checked through the EPA and other aspects that I mean the fact that people are in general really sick just sounds really... I don't know how interrelated those are so it could potentially be something else"*) and others used the test results as justification to say that there is no contamination at all and that the community's health issues are unrelated to industrial emissions (e.g. *"they did extensive testing and the data showed no public health concerns and it's always about the data rather than what the people said in the first place"*).

Other common reactions included questioning the data-gathering protocols or interpretation of the results, or casting doubt on the legal limits for the target pollutant. Specifically, some participants posited that perhaps these limits are too high (and there could be health ramifications at lower levels or prolonged exposure). In several responses a differentiation was made between the notion of *"anecdotal evidence"* provided by the community (n=8) and *"defensible data"* or scientifically based evidence provided by the government (n=15). One participant contrasted these two types of knowledge saying *"there's a lot of numbers to back up the statements by the industry. There's very few numbers or actual data to back up the statements of the community group,"* but then went on to admit that numbers can be manipulated. Some participants talked about the need for the community to develop scientifically based data to bolster their argument while others talked about their health issues and documented medical records as appropriate data in themselves (n=4).

TABLE I. PARTICIPANT RESPONSE FREQUENCY WITH RESPECT TO THE DATA OR EVIDENCE OF POLLUTION PROVIDED IN THE ARTICLE

Code	# of participants (n of 43)
Contamination could be from elsewhere or health issues could be from a different factor	24
Test data shows that contaminants are below legal limits and therefore everything is ok	18
Questioning the data gathering or interpretation	18
Recognition that the evidence provided in the article is inconsistent	17
The acceptable legal limits for the pollutant may be wrong	16

Code	# of participants (n of 43)
Emphasizing statistics or defensible data	15
Referring to the community evidence as anecdotal	8
Referring to health claims or medical records as evidence	4
Evidence that quality of life is negatively impacted	4

With respect to the likelihood of air pollution being an issue in this case, nine participants stated that they believed it was an issue, 17 were uncertain, and two did not believe that pollution was an issue. The rest of the participants did not address this matter directly.

The largest differences in responses by demographic among all codes were by rank with 1st-year students as the least likely to question the data gathering or interpretation (Faculty – 70%, n=7; Professional – 56%, n=5; Sr.– 50%, n=5; 1st-year – 7%, n=1). No faculty participants discussed the inconsistency of the evidence presented in the article, compared to about 50% of participants in all other groups. Male participants were more likely to discuss statistical significance or “*defensible data*” than female participants (Male – 50%, n=12; Female – 16%, n=3) or to characterize the community’s evidence as anecdotal (Male – 29%, n=7; Female – 5%, n=1). Similarly, LTS participants were more likely to discuss statistical significance or “*defensible data*” than non-LTS participants (LTS – 56%, n=5; Non-LTS – 30%, n= 10).

F. Participant suggestions for “next steps”

Once participants gave their initial reactions, they were asked to recommend next steps for the parties involved. Most participants (n=36) suggested additional environmental testing to better understand the situation. Seventeen of those participants thought that the additional testing should be carried out by a third party to try and curb any competing interests that may have existed in previous testing. In addition to environmental testing, 22 participants suggested deeper studies into the health claims of the community. Thirteen of these participants expressed concerns, however, about the financial burden of conducting more tests and varied in their opinions of who should cover the costs – the community, the government or the industry. Thirteen participants suggested that studies be conducted on the appropriateness of the legal limits or regulations pertaining to the pollutants in this case. Finally, some participants suggested providing further education to empower the community (n=9), conducting broad investigations beyond the specified air pollution or health issues (n=8), or implementing a technical solution to stop the chemical plant from emitting potentially harmful pollutants (n=3).

The largest difference in suggestions for “next steps” by gender was that female participants were more likely to recommend that an independent third party be used to conduct further testing (Female – 58%, n=11; Male – 25%, n=6). No faculty respondents discussed a need to reexamine the federal regulated levels for the pollutant discussed in this case, compared to 30% to 44% for other groups by rank. Faculty, however, were more likely to discuss the need to conduct a

broader investigation beyond just technical elements (Faculty – 40%, n=4; Senior – 20%, n=2; Professionals – 11%, n=1; 1st Year – 7%, n=1). Finally, URM participants were more likely that non-URM participants to express concerns over the financial burden of conducting further tests as a “next step” solution (URM – 50%, n=6; Non-URM – 23%, n=7).

IV. DISCUSSION

Responses to an open-ended, vague and conflicting article about environmental contamination and health harm created a unique opportunity to examine how participants filled in gaps that required them to draw on their social imaginaries of “the public” (i.e., community members, government, and industry). The ways in which the participants reacted to the article gives insight in their conscious and unconscious views of social order, the validity of information, and perhaps the roles of “the public” vis-a-vis authoritative institutions like industry or the government, of which engineers are key players. In the negotiation of the different actors in this article (the community, industry, government and data/evidence) and the ways in which they fill in gaps, participants begin to give texture to their social imaginaries.

The most common reaction to any element of this article was participant belief in the health claims of the community (n=28). From this position, participants seemed to develop further narratives to help explain the possible causes of the health claims and reasons for the dispute between, on the one hand, residents and, on the other hand, the government and industry. The ways in which participants worked to reconcile these incongruencies including positing other sources of contamination that could cause the health issues, insufficient limits for testing to protect public health, questioning the data gathering or interpretation, or corruption among the industry or government to cover up known contamination issues. Some participants also drew from their own personal experiences or sentiments in order to relate to the situation depicted in St. Rose. Twenty-one of the 28 participants who expressed belief in the community’s health claims also expressed distrust of either industry or the government, perhaps reflecting a broader social climate of skepticism about government [8] and corporations.

These perspectives may be expressions of a social imaginary that both differentiates engineers from industry or the government and aligns engineers with a professional duty to benefit society [3] and to “hold paramount the safety, health, and welfare of the public” [9]. The implicit and sometimes explicit differentiation between engineers and industry or government is worth noting since, largely, it is engineers who play significant roles with respect to environmental testing and enforcement in both parties. Historical examples like the lead in water contamination in Flint, Michigan or the Volkswagen emissions manipulations were primarily facilitated by engineers within these organizations.

A quarter of the participants (n=11), took the opposite stance and questioned the community’s health claims (four of the 11 also expressed statements of belief in the community’s health claims showcasing conflicting perspectives even within the same participant). Primarily, the results from the

environmental tests seemed to be the basis for this perspective (10 of 11). Thirteen participants who explicitly characterized the community's reactions as anecdotal or commenting on the scientific nature of the test results as "*defensible data*" also characterized the community as emotional, overacting, unwilling to change or as scapegoating the chemical plant (compared to 9 of the 28 who believed the community's health claims).

These 11 reactions showcase a social imaginary that prioritizes scientifically produced data over other forms of knowledge or evidence. Moreover, the primacy of scientific data as the foundation of a point of view is leveraged to make broader characterizations of the opposing view – in this case by attaching negative attributes or motivations to the community. This social imaginary could be dangerous for engineers who, as the authors of the scientific data, can also hold the authority to determine how other perspectives or information that is not data based should factor into explanations of "reality." Perspectives that discount non-data based claims have led to engineers ignoring community claims of health concerns that later turn out to be valid (e.g. lead-in-water contamination in Washington D.C. and Flint, MI).

The largest differences by demographic group existed by rank (1st Year, Senior, Faculty, Professionals). If we use rank as a proxy for duration in the engineering profession with students on the lower and faculty and professionals at the upper end then, perhaps, this could evidence a deepening alignment with the profession's social imaginaries. There seemed to be a general downward trend in participants willingness to believe the community's health claims and/or interpretation of the data with first-year students most likely to agree and professionals least likely. Inversely, faculty and professionals were more likely to characterize "the public" as irrational, emotional or prone to stubbornly holding onto their position. Additionally, students were less likely to be sympathetic to the community or to draw upon personal experiences to relate to the community's position than faculty or professionals. If these trends are representative of "indoctrination" into the engineering profession, then a general movement away from advocating for the community seems to be present (less belief in health claims and characterizations as irrational, emotional, etc.) but also a willingness to draw from, presumably, more life experience to relate to the community members' experience. One hypothesis may be that the additional life experience of the faculty and professional participants, particularly negative experiences interacting with "the public" through their careers, may foster a shift in the social imaginary toward seeing engineers as the ultimate authority based upon their technical expertise.

Interestingly, however, the dominant social imaginary expressed through this article interpretation – where the health claims of the community are believed - does not appear to fit with historical examples where citizen's concerns or complaints are largely ignored by engineers until something dramatic "blows the lid off" of the issue and brings public scrutiny to the harms caused. Water contamination in Flint, Michigan and Washington, DC, defective General Motors vehicles which killed 30 people and injured 31 more despite over 260 consumer complaints [10] or the 2014 air pollution case in Tonowanda, NY, brought about largely by citizen

activism, and resulting in \$12.5 million fine to the foundry coke plant and a one-year sentence in prison to the plant's engineer and environmental controls manager [11] all point to a different expression of the engineers' social imaginary that does not prioritize the views of "the public." Positive response bias or the largely academic setting of these interviews may be contributing to the differences between the interview results and historical (and current) experiences in engineering practice. It may also be the case that the historical instances highlighted by the media are outliers and are not representative of the larger engineering professions social imaginary. Future work should explore these differences.

V. LIMITATIONS

One element of these data that should be acknowledged is that participant reactions to the article came near the end of the interview, with all of the open-ended questions about the role of engineers in society, the role of "the public" in engineering and views of "the public" coming beforehand. It is likely that participants were influenced by these questions and their responses to these questions, flavoring their reaction to the article. Several participants commented directly about the relationship between the article and the previous interview questions. Another limitation is the relatively small number of participants and that they were primarily from two institutions and may reflect institutional cultures as much as engineering cultural perspectives. Finally, these interviews were conducted at the same time as the Flint, Michigan water contamination issues was prominent in the national news. Participant exposure to this topic could have also influenced their views of "the public", engineers, industry and government as interpreted through the article in this case.

VI. CONCLUSION

From this analysis, a majority of participants believed the community's health claims and sought to reconcile the conflicting information between these claims and the test results. Largely participants separated themselves (and engineers as a whole) from the industrial and governmental entities in the newspaper article through expressions of distrust in these institutions. A minority of participants chose to believe the test data as presented by industry and government, leveraging that to question the community's health claims and, further, to characterize the community through a negative lens.

Situated within a larger study of engineers' conceptions of "the public" through a theoretical lens of 'social imaginaries,' this work facilitates the exploration of engineers' undefined and unarticulated perceptions of "the public," including their 'making sense' of their real and ideal relationship with society. The article, which involves a community's challenge to the authority of technical and non-technical professionals, served as a vehicle through which to throw into relief participants' assumptions about different members of "the public," perceptions of real and ideal boundaries between engineers and "the public," and visions of the "proper" order of knowledge, voice, access, and power in relation to engineers and "the public." Responses to the article are viewed as articulations of engineers' imaginaries of "the public" as well as the perceived boundary that separates or "ought" to separate the engineering

profession from different sectors of society. This work has provided characteristics of engineers' social imaginaries including the value of scientifically-based evidence, artificial separations between views of industry/government and engineers, and how belief or disbelief in the community's health claims created a foundation for broader judgements about "the public" and the value of other knowledges. This work highlights a portion of the biases and predispositions that engineers bring when evaluating complex situations and how those biases and predispositions play a key role in filling in gaps in knowledge and drawing significant conclusions that can have profound effects on people's lives. Recognition and awareness of those biases and predispositions are critical if engineer desire to serve "the public" and "hold paramount the safety, health, and welfare of the public."

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