ABSTRACT

BRAY, LAURA ANN. Mediating Risk: The Construction and Use of Uncertainty in the Elk River Chemical Spill. (Under the direction of Dr. Thomas Shriver.)

A society committed to the democratic governance of technoscience and risk must first recognize the legitimacy of lay knowledge. As an important source of science and risk information, the news media has the potential to assist in this task. However, the mainstream media tends to uphold the status quo through its heavy reliance on and legitimation of official sources – politicians, bureaucrats, and corporate representatives. The 2014 Elk River chemical spill that poisoned the tap of 300,000 West Virginians offers one example where the news media broke this pattern. During the water crisis, conflict quickly arose between officials and the public over the safety of the water and toxicity of the chemical. The local print media, by challenging official claims to knowledge, validated popular perception and assessment of risk. To explore how such coverage might contribute to the legitimation of lay knowledge, I analyze news reports on the chemical spill within two Charleston daily newspapers, focusing on sourcing and framing of official and lay knowledges. Results reveal that while coverage legitimized local knowledge, it was not through increased reliance on lay voices as sources. Instead, journalists employed several rhetorical techniques that contested the official construction of ignorance and uncertainty.
Mediating Risk: The Construction and Use of Uncertainty in the Elk River Chemical Spill

by
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INTRODUCTION

Widespread calls for greater democratic governance of technoscience and risk have largely failed to manifest in any meaningful change. Risk management and assessment remain firmly within the domain of scientific and policy experts. In order to introduce a stronger democratic element into technical decision making, society must first close the legitimacy gap between scientific and lay expertise. The news media, as an important source of science and risk information, has the potential to assist in this task, but faces structural and professional barriers. Journalists’ heavy reliance on official sources – politicians, bureaucrats, and corporate representatives – and deferential framing of scientific knowledge tends to justify expert rule and sustain the division between citizens and science. But crisis situations can break professional routines and provide an opportunity to explore alternative media rituals that give voice to nonofficial sources. A substantial body of literature has explored media risk reporting, with a subset looking at the framing of nonofficial voices within these reports. Much of this however focuses on differences between lay and expert risk perception. I build on this literature by asking how the news media represents local knowledge in risk reports. More specifically, (1) how does the news media frame lay claims to knowledge and (2) how is the knowledge itself embedded in the text?

The case of the Elk River chemical spill provides an example of news coverage that legitimized lay knowledge. On January 9, 2014, a chemical storage tank in Charleston, West Virginia leaked an estimated 10,000 gallons of the industrial chemical crude-MCHM into the Elk River just miles upstream from the region’s water intake valve. Shortly thereafter, some 300,000 West Virginians found their water supply contaminated and the area under a state of emergency. Citizens learned that their water was suddenly unsafe for drinking, cooking, bathing, and laundry – any use
other than flushing or fire extinguishing – for an indeterminate amount of time. The nine effected counties endured seven days of an active water ban and fifty days under a state of emergency while officials worked to remediate the water system. Conflict emerged around multiple aspects of the accident, including the official safety threshold for MCHM and the relative safety of the contaminated water. Officials acknowledged the dearth of information on the chemical in question, yet simultaneously assured the public of the water’s safety and chemical’s low toxicity. Much of the public contested this assessment. Citizens continued to drink bottled water long after the ban expired, insisted on further testing, and installed home systems to store and filter rainwater.

This research explores local print media framing of risk in the Elk River chemical spill. I begin by reviewing framing literature to show how the media prioritizes and elevates certain actors and truth claims over others. The next section reviews the empirical work on how the media reports on risk, and the professional values and routines that help shape news content. I then discuss the significance of risk communication frameworks for governance models. Implicit in each communication framework is an ideological context, epistemology, and policy prescription. The media’s preferred mode of risk communication then speaks to larger issues of governance of risk and techno-science. In constructing an audience, communication suggests laypersons’ appropriate role within risk governance.

The data for the project come from Charleston’s two daily newspapers, *The Charleston Gazette* and *The Charleston Daily Mail*, over the 50-day period when the area was under a state-issued emergency (N=389). Because the technical aspects of risk (quantitative assessments based on the statistical probability of future harm) are inseparable from its social, cultural, and historical dimensions, I analyze all news articles on the crisis, not just those related specifically to human and
ecological health. My analysis is primarily qualitative, but I support conclusions with quantified data as well. I find that lay persons did not find expanded access to these newspapers during the crises. Rather, their views were validated through several rhetorical techniques that worked together to frame official scientific knowledge as incomplete and open to public debate, drawing the science itself into the “sphere of legitimate controversy” (Hallin 1986). The problem then was not just in risk communication (though that too was bungled), but the inadequate production and representation of scientific knowledge at the institutional level.

FRAMING NEWS DISCOURSE

Frames symbolically and discursively construct social meaning, and in doing so provide the central organizing structure for media discourse; they are what Gamson and Modigliani (1989) call “interpretive packages.” In Entman’s widely-referenced description, framing amounts to a process of “selection” and “salience”:

To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem, definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described. (1993: 52; emphasis in original)

Media frames delimit the range of legitimate perspectives, designate authorized speakers, and suggest what issues are of cultural importance. Newsmakers do not necessarily employ frames consciously, and generally perceive their work as an accurate and unbiased reflection of reality. But through discursive and symbolic cues, media communication makes certain realities more visible and obscures others completely. As such, framing plays a significant role in policy setting and lies at the heart of claims-making activities (Benford and Snow 2000).
Frames emerge from active competition between social actors as they struggle to define meaning and/or (de)mobilize other actors. The media is a crucial site for these struggles (Gamson and Wolfsfeld 1993, Miller 1999). The institutional power of the news media then is twofold: it both communicates frames of other powerful sources, and represents a power in its own right by deciding which voices to feature, which to exclude, and which of the featured voices to validate and legitimize (Couldry and Curran 2003). However, elite news sources rather than newsmakers tend to exercise greater control in setting media frames (Miller and Riechert 2000). But these frames are also dynamic and therefore vulnerable to counterclaims. Elites have no guarantee that their frames will dominate – hence the considerable investments in public relations (Lewis, Williams and Franklin 2008). Media frames also do not determine audience interpretation or acceptance.

The preceding discussion hints at the complexity of framing; the process involves multiple actors operating across multiple sites. Entman (1993) identifies four “locations”: communicator, text, receiver, and culture. Frames shape how communicators perceive the world and decide what to say, become embedded in text, and influence how the receiver perceives and interprets these texts. At the cultural level, frames furnish the set of widely accepted, rarely questioned, and regularly invoked thematic constructs. The diversity of locations also suggests several meanings of the concept: as cognitive schemata that helps communicator and receiver organize belief systems and make sense of the world, the concrete rhetorical and symbolic devices that operate at the textual level, and the cultural milieu that shapes these cognitive and discursive structures. The strength of framing analysis then is its ability to connect the multiple sites to explore the communication text, as well as frame production and interpretation processes. The present research
focuses on the textual location, but recognizes that the frames result from and factor into these other dynamic and multiple processes.

Factors both internal and external to the newsroom shape frame building in news discourse (Vreese 2005). Internal factors include news values (newsworthiness, objectivity, facticity, etc.), professional routines, and editorial expectations. Externally, source-journalist relationships, ownership structure, and the broader political-economy factor into frame building. I elaborate on these framing influences below, but first look at the concrete textual devices that comprise frames, or the way in which these factors become embedded in texts.

Framing devices take on a variety of forms. Pan and Kosicki (1993) divide these into four categories: syntactical structure, script structure, thematic structure, and rhetorical structure. While all of these are relevant, my analysis focuses on two: syntactical and rhetorical structure. Syntactical structure refers to the typical organization of news stories (i.e., the ‘inverted pyramid’ of title, heading, lead, body, etc.) and rules of source attribution. Journalistic conventions of balance and impartiality factor into syntactical structure as well. Newsmakers claim empirical validity by sourcing experts and citing quantitative evidence; they can legitimate viewpoints by linking them to official sources or, vice versa, marginalize viewpoints by linking them to deviant sources.

Rhetorical structures result from the stylistic choices made by journalists and sources. This category includes Gamson and Modigliani’s (1989) five framing devices: metaphors, exemplars, catchphrases, depictions, and visual images. Placement, repetition, and combinations of these symbolic devices also affect frame salience. In the Elk River spill, these framing devices operated as counterrhetorics (Ibarra and Kitsuse 1993) that deconstruct and delegitimize official claims, thereby creating space for the public perspective.
REPORTING ON RISK, SCIENCE, AND UNCERTAINTY

The organizational and professional context of the media strongly influences news content. This section examines how risk is represented in the media, the professional values, routines and structures that produce risk reports, and the circumstances under which the news media deviates from these norms. Environmental risk must often be mediated by science and always contains an element of uncertainty. As such, this section incorporates research on media reporting on science and uncertainty, as well as risk.

Risk Representation in Reporting

Despite an abundance of literature on how and when the media reports on risk, drawing general conclusions can be challenging (Ashe 2013, Kitzinger 1999). Conflicting findings from case studies, and a diversity of theoretical and methodological approaches reveals multiple, complex processes at work that do not easily lend themselves to simple rules. Some tentative conclusions can nonetheless be drawn. For my purpose, the central points are that risk reporting tends to (1) present risk as episodic, (2) blames individuals or institutions rather than societal systems, and (3) favorably represents science and science purveyors. As a result, media coverage tends to obscure systemic risk and augment trust in expert management.

The long-term, chronic nature of many environmental risks excludes them from sustained media attention. Events, accidents or disaster must first occur to focus the media on environmental concerns (Lester 2010). Media accounts then tend to be episodic rather than thematic – they report on events, not long-term social issues (Dunwoody 2014). Because of this, risk events often appear isolated and disconnected. Coverage of Bhopal and Chernobyl, for example, presented the accidents
as novel, when both were, in some sense, normal and predicable (Wilkins and Patterson 1987). This shapes the way blame is attributed as well.

“Conflict” and “blame” are generic media frames found across multiple news topics (Semetko and Valkenburg 2000, Vreese 2005). The ability of the media to blame an individual or institution, and the identity of this agent then helps determine the story’s news value (Kitzinger 1999). In part because coverage is episodic, risk reports tend to blame individuals or institutions for societal/systemic problems, thus obscuring the historical context (MacKendrick 2010, Wilkins and Patterson 1987). The identity of the responsible agent may also factor into newsworthiness. Once individual consumers can be blamed, for example, risk may no longer qualify as newsworthy (Miller and Reilly 1995).

The way the news media represents science, scientists, and technology also shapes risk reporting. In general, newsmakers tend to present scientists as problem solvers (Nelkin 1995) and report favorably on technology and technological solutions (Coleman 1995). If the risk event in question resulted from a technological accident, reports will frequently point to human error or a “few bad apples,” while presenting the technology itself as generally safe (Nelkin 1995). They are able to do this in part because scientific discourse in the media rarely discusses methods or process in any detail, thus reducing scientific uncertainty (Dunwoody and Peters 1992, Dunwoody 2014). Barbara Adam (2000), for example, shows how the media avoided grappling with the uncertainties surrounding BSE (Bovine Spongiform Enzephalopathiamad, or mad cow disease) in the UK during the 1990s. The story started out framed as a health risk, but newsmakers eventually shifted to the more comfortable political frame because of the ambiguous effects on human health. The story, Adam shows, then became a matter of European politics, before stabilizing as a beef crisis rather
than environmental risk. In some instances, the media’s discomfort with uncertainty can be
overcome by their proclivity for conflict, leading them to highlight the uncertainties (Kitzinger and
Reilly 1997, Kitzinger 1999). In this case, journalists will use uncertainty for their own purpose, in
ways that fit their frame and news values, but do not necessarily align with the intent of the original
source (Stocking and Holstein 1993).

Sourcing, Balance, and Objectivity

One of the most consistent finding in studies of the news media is their heavy reliance on official
sources – politicians, bureaucrats, and corporate representatives (Curran et al. 2013). In a sense,
“the world is bureaucratically organized for journalists” (Fishman 1980: 51), a fact that privileges
official definitions of what constitutes news and its interpretation. Journalists of course maintain the
power to edit and frame official voices, but the balance of power tilts heavily toward sources in
defining the issues and maintaining control (Dunwoody 1999, Hansen 2011). Science writing in
particular tends to be highly deferential and uncritical of sources (Nelkin 1991), giving scientists
interpretive control over stories (Dunwoody 1999). Although much anecdotal evidence points
towards a more contentious relationship between mass media and scientists, empirical studies fail
to bear this out (Peters et al. 2008). Scientists now tend to recognize the value of media visibility for
communicating with the public as well as other scientists. Dunwoody (1999) suggests that scientists
and journalists may even be developing a “shared culture.” Borrowing the concept from Blumler and
Gurevitch (1981), she explains that

mutual dependence between sources and journalists encourages the growth of a working
relationship in which both sides share an understanding of the rules of the game. That
understanding evolves...to enable both sides to accomplish their respective goals and to do
so in ways that minimize uncertainty. In such a culture, for example, participants share an
understanding of what is fair. They may develop joint definitions of what is accurate. And
they come to hold the same values for what’s news. (74)

The journalist-source power imbalance is further exacerbated by the growth of the public relations industry, dwindling audiences, personnel cuts, and tight budgets in legacy media (Lewis, Williams and Franklin 2008). These pressures have led to greater dependence on wire services and press releases, and leave reporters to cover multiple beats, manage multiple media platforms, and less time to question to information that comes across their desk (Anderson 2015).

Newsmakers’ heavy reliance on official sources stems in part from their professional ideals of “objectivity” and “impartiality.” As Carlson (2009: 527) argues, “for objective journalism, sources do more than provide information; epistemologically, they serve as an essential form of evidence.” Appropriate source attribution rather than information verification enacts journalistic objectivity, and protects reporters from criticisms of bias. Journalists then may be more likely to report contentious statements when they can be attributed to official sources (Kitzinger 1999). “Balancing” viewpoints, what Gaye Tuchman (1972) calls “objectivity as strategic ritual,” accomplishes this as well. Especially when reporting on controversial topics, journalists will attempt to tell both sides of a story by pitting sources against each other. Yet this practice often remains elite-centered. Hallin (1986), for example, finds that when press coverage of the Vietnam War began questioning the war, it was through conventional sourcing methods. In this case, Hallin argues, the press’ critical stance is better understood as a reflection and amplification of inter-elite conflict, rather than discord between press and government. Similarly, media coverage of Chernobyl and Bhopal allowed for debate between officials, but did not weigh in on the merits of the arguments, either scientifically or politically (Wilkins and Patterson 1987).
When nonofficial voices are granted media access, they do not enjoy equal status or legitimacy as official sources (Coleman 1995, Hansen 2000, Taylor, Lee and Davie 2000), and generally must react to official framing rather than contributing their own (Carlson 2009). The Brent Spar controversy demonstrates this point. In 1995, Shell decided to dump the Brent Spar, an outdated oil platform, by sinking it in the North Sea. This move sparked backlash from environmentalists. Greenpeace successfully captured media attention by occupying the defunct platform and releasing photos of the ensuing conflict at sea. But this visibility did not translate into legitimacy; several of the major British newspapers disparaged Greenpeace’s position and tactics (Hansen 2000). Similarly, media framing of the nuclear freeze movement in the early 1980s cast participants as anxious, irrational, and unfit to dictate national policy – despite the fact that public opinion largely favored the freeze (Entman and Rojecki 1993).

Individual citizens probably have the least opportunities to contribute to mediated risk discourse, and are able to participate only in narrowly prescribed ways (Lester 2010). When lay voices are featured in news reports, they generally symbolize the lived experience, giving the story a “human face,” rather than representing rational voices in debates (Cottle 2000, Wilkins and Patterson 1987). However, both sourcing patterns and standards of objectivity may be upset by crisis situations, and by the presence of new digital technologies.

Crisis Reporting and Deviation from the Routine

During crisis situations, journalistic behavior may change in significant ways. In the early stages of an emergency, journalistic reliance on official sources may be exacerbated by the need for timely information (Schanne and Meier 1992), leading journalists to default to the responsible government agencies (Stallings 1990). Conversely, crises can also break normal routines, making reporters more
prone to seek out and grant legitimacy to alternative sources (especially if officials are not forthcoming with information), and question official motives (Dunwoody and Peters 1992, Eldridge and Reilly 2003, Kitzinger and Reilly 1997). Journalists may also turn to nonofficial sources in the name of timeliness. Though lacking in financial resources, less powerful actors can offer prompt responses because they also lack the political considerations and bureaucratic hurdles of larger institutions (Anderson 1997). Science reporting reveals a similar pattern. The vast majority of science articles tend to be single-source and uncritical (Stocking 1999), but the communication route and reporting style changes drastically when the science is entangled with social, political, or economic issues (Bucchi 2008).

Media coverage of Hurricane Katrina demonstrates many of these points. In the immediate aftermath of the storm, the federal government’s absence broke media rituals of objectivity and, as a result, TV broadcast produced populist coverage of the crisis (Durham 2008). Without official sources on the ground, journalists instead built reports around the interviews and experiences of affected residents. In doing so, they highlighted governmental failure and set the metanarrative of the disaster. The populist and critical tone of these early reports contrasts with the more common “consensus” coverage during emergencies, such as occurred following 9/11 (Schudson 2002). Within the “sphere of consensus,” the media can abandon objectivity in the name of unity, and speak in terms of a generalized “we” that invokes shared values and assumptions (Hallin 1986).

Transformations within the media field resulting from digital technologies may also be altering sourcing routines and the balance between official and nonofficial sources in risk reporting (Mythen 2010). The incredible mobility of digital technologies now allows almost anyone to become a citizen journalist, and potentially influence the news agenda. Citizen videos of police violence in
recent years, for example, have helped catapult the issue into the mainstream national media. Citizens may also participate in less direct, more “accidental” ways (Allan and Ewart 2015). Online microblogging on sites such as Twitter produces a continuous stream of real-time information, creating a “social awareness stream” (Naaman, Becker and Gravano 2011) or what Hermida (2010) calls “ambient journalism.” Any single tweet might prove insignificant or invalid, yet cumulatively they can accurately depict events and public opinion. This collective intelligence offers an alternate verification tool to individual expert authority. Journalistic culture rests uneasily with this idea, yet has adopted the method in limited circumstances.

Several major news events demonstrate the ways in which the media incorporates user generated content into its reporting and practices (Hermida and Thurman 2008). Twitter played a large communication role in the 2008 Chinese earthquake, 2010 Haiti earthquake, and 2011 Arab spring movement (Hermida 2010). Most examples confine this sort of citizen journalism and participatory verification to the early stages of a breaking story. The timeliness imperative in a highly competitive sphere allows journalists to compromise their usual standards when they are without traditional means of information verification. This practice is generally short-lived and ceases once reporters make it to the scene of any event (Hermida 2012). In other instances, citizen journalism has combined with citizen science to help fill holes in official knowledge (Allan and Ewart 2015). During the BP oil spill, citizens helped map areas of impact by tweeting oil sightings and other information (Aulov and Halem 2012, Starbird 2011).

In the more affluent nations, most citizens now have access to a wide variety of information sources through the internet. Yet many of the same conglomerates that control legacy media attract the largest digital audiences as well. The Pew Research Center’s 2015 State of the Media report, for
example, lists ABC, CNN, NBC, CBS, USATODAY, Fox News, and the New York Times among their top ten most visited online news entities (Olmstead and Shearer 2015). Further, a recent study by Curran and colleagues (2013: 886) found that, across nine countries, “online news actually gives less of a hearing to the political opposition, civil society and individual citizen sources than either television or newspaper.” How oppositional and nonofficial voices may find representation in news reports then remains a pertinent question. In the next section, I connect issues of media risk reporting to larger concerns about risk governance.

COMMUNICATING & GOVERNING RISK

In communicating technological hazards, the media adopts models of science communication that carry with them implicit ideologies, epistemologies, and policy prescriptions. Communication models then tell us something about theories of risk perception and risk management; how do communication patterns construct the ideal subject (i.e., the public), and how does this define the subject’s role in risk governance? These models can be broadly divided into three ideal types, based on how each constructs and incorporates the public: deficit, dialogue, and reflexive participation. Table 1 summarizes these approaches.
Table 1. Models of Risk Communication & Governance (Adapted from Bucchi 2008, Irwin 2014, Jasanoff 1998, Trench 2008)

<table>
<thead>
<tr>
<th>Comm. Model</th>
<th>Aims</th>
<th>Ideological Context</th>
<th>Epistemology</th>
<th>Policy Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficit</td>
<td>Transferring Knowledge, One-time, one-way</td>
<td>Scientism, Technocracy, Knowledge economy</td>
<td>Realist</td>
<td>Managerial Expert advice</td>
</tr>
<tr>
<td>Dialogue</td>
<td>Transparency and trust building; Consultation; Discussing implications of research; Two-way, iterative</td>
<td>Social Responsibility, Culture</td>
<td>Constructivist</td>
<td>Pluralist Public engagement</td>
</tr>
<tr>
<td>Reflexive Participation</td>
<td>Knowledge co-production; Multi-directional, open-ended; Socio-technical change</td>
<td>Civic science, Participatory democracy</td>
<td>Constructivist</td>
<td>Critical Social movement</td>
</tr>
</tbody>
</table>

The deficit model grants scientists a high degree of autonomy and seeks to impart expert knowledge on an uninformed public. In this model, information transference operates in one direction, from the top down, thus emphasizing authority and technocracy, and constructing the audience as passive, ignorant, and/or irrational. The public is deficit in understanding, the reasoning goes, which can result in its hostility and mistrust towards science. The remedy lies in more and more accurate information. Though this model has been officially abandoned since the early 2000s (Trench 2008), in many ways, it remains the de facto standard for media reporting. When news reports deviate from the deficit model, they can face criticisms of bias, sensationalism, and distortion. To give one recent example, the mainstream media was accused of sensationalism and fear mongering in its coverage of Ebola cases in the US (e.g., Linkins 2014). However, rather than
point to media failure, these accusations reveal the realist bias and embedded ideologies of the deficit model itself.

Much of the early research in media risk reporting sought to document the “failure” of newsmakers to “accurately” portray risk. News reports, according to this line of research, exaggerate the dangers of statistically small risks (as in the Ebola example), while also downplaying or ignoring more common and probable risks (e.g., traffic accidents). In misrepresenting the statistical likelihood of a risk, the media is said to help create public hysteria or indifference. But, as Dunwoody and Peters (1992) argue, these critiques often offer more insight into the accuser than accused, in revealing assumptions that the media can and should be an “objective” conduit for technical risk information, and that there is a static, uncontested reality by which to measure news stories against. The aim of deficit-style communication, to realign public opinion with expert assessment, fails to account for various ways that the public makes sense of risk and also fails to interrogate the organizing assumptions and institutional biases that structure institutional scientific knowledge.

The deficit model has been loudly and repeatedly discredited in favor of more participatory models that recognize the need to involve the public and acknowledge concerns beyond reductionist quantitative risk assessments. The new dialogic model took hold in the US and Europe in the 1990s, and became institutionalized in the 2000s. This model is best represented by the phrase “public engagement with science,” some variation of which has been adopted by the American Association for the Advancement of Science, the National Science Foundation, and European Commission (Vincent 2014). Yet the deficit model is far from dead, and continues to emerge in new forms (Bucchi 2008, Trench 2008, Wynne 2006). The latest version, Wynne (2006)
argues, engages the public but only in a down-stream, instrumental capacity, and only as moral agents without epistemic or intellectual substance. Citizen input comes at the application stage, when the public’s moral “expertise” helps to guide technology’s use. The public is allowed little, if any, involvement during the early development stages. Further, officials are generally motivated to engage the public to alleviate public mistrust, not to produce better knowledge or governance. Within these more participatory frameworks, the public remains the deficit party – the problem now a deficit of trust instead of knowledge (Wynne 2006). The scientific establishment does not come under scrutiny in either model. Irwin (2014), likewise, criticizes the dialogue model for falling short. Dialogue may reveal new issues, but stops short of allowing the public an active role in addressing these problems.

The third model seeks to move beyond the deficit-dialogue dichotomy (Trench 2008), and beyond “public engagement with science” as a sloganizing attempt to engender public trust or manage reaction (Vincent 2014). This alternative model recognizes that the process is necessarily contentious and conflict-ridden, and that official risk language produces both knowledge and power relations that will not be voluntarily relinquished (Jasanoff 1998). As Bucchi (2008) argues, the point is not to displace the other two models, but open a social conversation about which model should be enacted depending on the specific issue and circumstances. The participatory model is open-ended and allows for citizens to decide how they want to be involved, rather than institutionally pre-imposing formats. It also rejects the demarcation of expert and layperson roles present in both the deficit and dialogue models to allow for knowledge co-production between citizens and scientists (Callon 1999).
These three communication models represent ideal types that co-exist in society, and can be combined in practice. In advocating for a communication model that includes the public in knowledge co-production, I align myself with scholars who recognize that different contexts require different forms of knowledge production. Instances characterized by high uncertainty, stakes, and urgency call for new ways of doing science (Bucchi 2008, Ravetz 2004, Rosa 1998). In these cases, mainstream science, which increasingly means industry science, is no longer appropriate and does not produce the best or most socially desirable knowledge. Local knowledge, informed by scientific expertise, presents a complementary method that can enable communities to better respond to risk events. Enacting such a communication and governance framework, however, proves difficult in the face of the cultural and political dominance of science. The news media can assist in opening up this space by taking a decentered approach to sourcing and questioning the status of received scientific “facts.”

Full citizenship, Murdock (1999: 11) argues, requires “access to the relevant symbolic resources and the competence to use them effectively.” Among the dimensions of this “cultural citizenship,” he defines the right to participation and representation in a shared cultural space. Because journalism can mediate social conflicts, it has the ability to either promote or undermine cultural citizenship rights (Cottle 2001). As such, a mass media that gives voice to a wider variety of experiences and knowledges can encourage the development of civic science and democratic risk governance. This, of course, does not preclude the media from fulfilling its traditional, deficit role. The public needs access to expert knowledge as well. But by granting legitimacy, as actors with intellectual substance, the media can encourage the development of a healthy public sphere. I should also note that I do not have in mind a romanticized image on the lay public and lay
knowledge. The public too can produce knowledge that is misguided, incorrect and/or ineffectual. Creating an inclusive discursive space for local knowledge is not about equalizing all forms of knowledge, but rather asserting the publics’ capacity and right to be involved in scientific debates as citizens rather than stakeholders or consumer-audiences.

How this might be accomplished in practice, within the constraints of the media field, remains an open and empirical question. Recent changes in the mass media have demonstrated their potential for incorporating more user-generated content. Does this extend to lay knowledge? As Schudson argues, because the news media is a profoundly conservative field, the “greatest research interest lies in determining its limits and specifying what structural and cultural features of the media can work to keep news porous, open to dissident voices and encouraging of genuine debate” (Schudson 2000: 180). Environmental communication is especially in need of this type of research to determine how the public may participate in mediated environmental discourse (Hansen 2011). I contribute to this task within the area of environmental risk by exploring a case in which the news media legitimized lay knowledge and perception of risk. Through framing analysis, I investigate how newsmakers accomplished this and then discuss the implications of these specific techniques.

THE ENVIRONMENTAL DISASTER: WEST VIRGINIA CHEMICAL SPILL & WATER CRISIS

Freedom Industries owned and operated a chemical storage facility on the banks of the Elk River, and distributed industrial chemicals, primarily to the coal industry. Tank 396 stored a chemical called crude-MCHM, a coal cleaning agent consisting mostly of 4-methylcyclohexane-methanol. Freedom Industries reportedly discovered the leak on the morning of January 9th, but did not report it until later that evening, after officials responded to resident complaints of an odor. Less than two miles downstream, West Virginia American Water (WVAW) drew in the contaminated water and
distributed it throughout nine counties in the Kanawha Valley. Once informed, WVAW issued a “do-not-use” advisory and both Governor Tomblin and President Obama declared the area under a state of emergency. The ban lasted eight days, with residents unable to use tap water for any purpose other than flushing and firefighting.

Governmental officials scramble to unearth information about crude MCHM, but found the chemical grossly understudied. The limited information in existence came from two studies, neither of which was published or peer reviewed, dating back to the 1990s from the chemical’s manufacturer. These papers studied the chemical’s impact on rats, and examined only the short-term health effects. The Center for Disease Control and Prevention (CDC) nonetheless set a safety threshold of one part per million two days following the spill. Once areas tested below this threshold, the water company lifted the water ban in the area. Residents were then instructed to flush their home systems by running water, first hot then cold, for a specified length of time. These procedures were meant to ensure that the chemical concentration within home plumbing systems was within the “safe” limit. The first zone was cleared January 13th and the last on January 17th. The chemical’s odor however lingered long after flushing and many residents continued to rely on bottled water for months after officials approved tap water for all purposes.

Because of the lack of data, lingering smell, and health reactions, the official safety threshold quickly became problematic for the community. No data existed for the effects of exposure on long-term health. No data existed for the health effects of inhalation of the chemical in vapor form. Available studies applied only to MCHM, not crude MCHM which included six other chemicals. And, twelve days after the spill, Freedom Industries revealed that another chemical – “stripped PPH,” consisting primarily of polyglycol ethers – was also present in the tank. The ways in
which all of these chemicals interacted with each other and in the human body was unstudied and unknown. Officials originally declined to test water samples within homes (Boucher 2014). How the chemical acted within different types of home plumbing systems was unknown.

In spite of these unknowns the CDC’s risk threshold for the “protective level to prevent adverse health effects” remained constant (Ward and Gutman 2014). Officials from government and the water company insisted that the licorice smell did not mean the water was unsafe, that the chemical was of low toxicity, and that the hospital visits were fueled by anxiety and seasonal flu. Officials framed additional precautionary measures as a means to reestablish public trust rather than a result of uncertainty and real public health concerns. This perspective contrasted sharply with that of community members who refused to use the water long after bans were lifted, rented apartments outside the effected zone (Naylor 2014), requested schools serve bottled water through the end of the year (Mays 2014), and sought extra testing for their homes (Boucher 2014).

West Virginia has a long history of industrial accidents. However, two important characteristics of the Elk River spill combine to set it apart from prior incidents: (1) it affected a numerically large metropolitan population in a socially indiscriminant manner (which is not to say that all populations suffered equally), and (2) the physical characteristics of the chemical allowed for lay detection without technical aids. These factors ensured that the crisis remained in the media spotlight – at least at the local level – and that virtually everyone in the region had a direct sensory experience from which to build knowledge. The chemical’s distinct smell, a strong licorice-like odor, lingered long after officials declared the water safe, and at times after water tested “non-detect” for the chemical. This provided an uncontested knowledge base from which citizens could dispute official claims. In summary, I argue that the emergency context, wide-scale impact, level of scientific
uncertainty, and citizens’ sensory experiences with the chemical prompted the press to draw on public expertise where official information proved lacking. Exploring such exceptions to the norm in media reporting can elucidate the fluctuating boundaries of the field, and entry avenues for diverse perspectives.

DATA & METHODS

This study analyzes newsprint coverage of the water crisis published in *The Charleston Gazette* and *Charleston Daily Mail* between January 9th and March 1st of 2014. The dates cover the period during which the nine-county area was under a state-issued emergency. Most articles cluster in January, especially the 9th – 18th during the active water ban. Political and legal repercussions continue through the present, but the early stages of a crisis are of critical importance in defining issues and setting the discursive tone.

Both papers reported from the state’s capital, placing them in an ideal location to access sources and gather information. Because the national media tends to rely on local journalists, local framing also likely influenced wider state and national reporting. The connection of local reporters to the community is relevant to this study as well. Journalists’ geographical proximity and perceived relevance of the threat may influence how they report on risk (Kitzinger 1999). Local journalists should also be more tuned into the local political climate and public opinion – especially since they experienced the crisis along with everyone else. This could have them made more likely than distant journalists to question the official assessment of risk, and legitimize the public’s perspective. These two newspapers also published significantly more stories on the chemical spill and its aftermath than any other paper.
Until recently, Charleston was relatively unique in that it was one of few remaining two-newspaper towns – the Gazette leaned politically left and the Daily Mail right. From 1961 to 2004, the two companies had a joint operating agreement (JOA) that merged production and distribution, but maintained independent newsrooms (Charleston Gazette-Mail 2014). In 2004, the Gazette’s publisher, the Daily Gazette Company (owned and operated by a local elite family), purchased the Daily Mail (owned by MediaNews Group, one of the largest newspaper chains in the country).

Between 2009 and 2015, the two companies published jointly on weekends, the Saturday Gazette-Mail and Sunday Gazette-Mail. In 2007, the US Justice Department filed a civil antitrust suit against the Daily Gazette Co. for operating the Daily Mail in a noncompetitive manner, with plans to reduce the paper’s circulation and eventually shut it down. The Daily Gazette settled out of court in 2010, with an agreement to restructure the transaction with MediaNews Group. Under the settlement, the Daily Gazette continued ownership of the Daily Mail, but MediaNews Group resumed independent editorial control and received financial incentive to operate the paper competitively (US Department of Justice 2010). The antitrust settlement expired on July 19, 2015, and, without prior notice, the two newsrooms merged (Charleston 2015, Dickerson 2015). The Charleston Gazette-Mail is now Charleston’s only daily newspaper. According to the paper’s announcement, the merger “is not one paper gobbling up the other” and the new paper will maintain two separate editorial pages to express both the progressive views of the Gazette and conservative views of the Daily Mail (Charleston 2015). However, some contest the amicability of this merger and question the extent to which the former Daily Mail will continue to find representation in the new publication (Dickerson 2015).
Many lament the loss of competition in media markets and argue that monopoly ownership leads to less diverse perspectives. Yet it is unclear how press competition affects news content. Entman (1989), for example, finds no substantial or consistent difference between local newspapers in situations of monopoly, quasi-monopoly (JOAs), and competition. All three categories accessed a limited range of sources and displayed only minor disagreements in content. The for-profit structure of the media industry rather than noncompetitive markets limits diversity as companies seek to cut costs, appeal to a broad audience, and attract advertisers (Croteau, Hoynes and Milan 2012). Thus, while I don’t expect major differences between the two newspapers, analyzing both can suggest the limits of variation within the shared media structure.

I retrieved articles through LexisNexis using search terms Elk River, chemical spill, water crisis and Freedom Industries. This search returns 387 articles from The Gazette, including the joint weekend publications, and 271 from the Daily Mail. Next, I manually screened the documents to remove those unrelated or only marginally related to the water crisis and any with word count less than 200. The dataset also excludes editorial and opinion pieces. Though these are important sources of information, media organizations distinguish them from “factual” news reporting. I focus on what the press explicitly labels as “news” to explore what types of knowledge are allowed in this “factual” dominion. My final sample is 389 articles (see Table 2). Though I separate out the weekend publications here, throughout the remainder of the paper, I categorize them as Gazette. Authorship, content, and history all suggest that the Gazette exerted editorial control over these joint issues.

<table>
<thead>
<tr>
<th>Table 2. Data Sources and Article Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (N)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Daily Mail</td>
</tr>
<tr>
<td>Gazette</td>
</tr>
<tr>
<td>Weekend</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Codes were first identified inductively through a close reading of a sample of Gazette and weekend Gazette-Mail articles. This was followed by systematic coding of framing devices and sources in the larger corpus of articles from both newspapers based on the previously identified codes. Framing devices are coded across topics and do not pertain strictly to matters of health risk. Political critiques about lax environmental regulation and corporate capture, for example, also implicate official ability to manage risk. Both newspapers also ran a daily section giving voice to reader concerns and reactions: “Vent Line” in the Daily Mail and “Readers’ Voice” in the Gazette. These sections compile brief (generally 2-4 sentences) reactions/thoughts from readers on any topic of their choosing. I draw on these for examples of citizen experience and perspective, while acknowledging that they may not be representative of the broader public. These reader reactions support prior findings on public risk perception and knowledge production, and provide specific examples of these processes at work in the chemical spill.

COMPETING RISK KNOWLEDGE & PERSPECTIVES

Sourcing

Table 3 below shows the breakdown of official and nonofficial sources by newspaper. The counts indicate the number of articles within each newspaper that cite at least one source within the category. Official and nonofficial are further divided into subtypes, which also show the percentage out of total articles in each newspaper (categories are not mutually exclusive and sum to over 100%). Lay persons include private citizens, community organizers, and activists. Locally affiliated
refers to small business owners, local professionals, and school personnel. Alternative sources refer to non-profit organizations, academics, and independent consultants.

Table 3. Article Sourcing by Newspaper (number and percent of articles containing at least one source within each category)

<table>
<thead>
<tr>
<th>Source</th>
<th>Daily Mail (N=169)</th>
<th>Gazette (N=220)</th>
<th>Total (N=389)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official</td>
<td>149</td>
<td>193</td>
<td>342</td>
</tr>
<tr>
<td>Governmental Representative</td>
<td>129</td>
<td>174</td>
<td>303</td>
</tr>
<tr>
<td>Industry Representative</td>
<td>60</td>
<td>70</td>
<td>130</td>
</tr>
<tr>
<td>Lawyer</td>
<td>12</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>7.1%</td>
<td>6.36%</td>
<td>6.68%</td>
</tr>
<tr>
<td>Nonofficial</td>
<td>57</td>
<td>104</td>
<td>161</td>
</tr>
<tr>
<td>Layperson</td>
<td>23</td>
<td>35</td>
<td>59</td>
</tr>
<tr>
<td>Locally Affiliated</td>
<td>19</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Alternative</td>
<td>30</td>
<td>62</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>17.75%</td>
<td>28.18%</td>
<td>23.65%</td>
</tr>
<tr>
<td>Official &amp; Nonofficial</td>
<td>38</td>
<td>78</td>
<td>116</td>
</tr>
<tr>
<td>Official</td>
<td>22.49%</td>
<td>35.45%</td>
<td>29.82%</td>
</tr>
</tbody>
</table>

This table makes apparent both papers’ heavy reliance on official sources. Close to 90% of all articles draw on official sources, compared to 41% that cite nonofficial sources. But there are also salient differences between the newspapers’ sourcing patterns. First, about 14% more Gazette articles contain at least one nonofficial source than the Daily Mail. Alternative sources seem to account for much of this gap. Second, there’s a similar gap, 13%, between the two newspapers in the number of
articles citing both official and non-official voices. This suggests that more articles within the Gazette represent diverse perspectives.

Heavy reliance on official sources can thus conceal other relevant differences in sourcing. Alone, these numbers say nothing about how sources are framed, and little about how they’re used in combination (e.g., pitting voices against each other or offering additional support for the same perspective). Nonetheless, these patterns suggest that the Gazette may be more likely than the Daily Mail to challenge official perspectives. To give these numbers more meaning and context, I next explore the different methods and logics that officials and citizens used to assess risk.

Official Risk Assessment
Numerous federal, state and local governmental agencies responded to the emergency in varying capacities. Most officials acknowledged the uncertainties involved and a need for more information, but overall their approach to the crisis illustrates the disconnect between citizens and officials. For example, several governmental and industry representatives publicly expressed their comfort drinking the water once it tested below 1ppm – some going so far as to do so on camera. This contrasted with residents’ persistent distrust of both the safety threshold and officials’ ability to manage the crisis. The difference between these two mindsets is evident in several aspects of the official response: their (1) reliance on and defense of the safety threshold and non-detect numbers, (2) choice of individual, medical, and economic frames, and (3) resistance to expand or revise procedures in response to public concern.

At primary issue was the official safety threshold for MCHM, set at one part per million on January 10th and used as the official standard throughout the duration of the crisis. Officials originally presented the number as “extremely conservative and protective of public health,” and
encouraged the public to trust the CDC on the matter (Ward 2014i). Though most understood the need to set standards and act quickly to restore the region’s water supply, the contention continued well after much of the immediacy of the crisis had dissipated. Criticism centered on the lack of transparency in the official response and their presentation of 1ppm as a “bright line” between safe and unsafe levels of exposure (Ward 2014g). One official, a doctor with the West Virginia Poison Center, expressed her comfort with the CDCs calculation despite the opacity, saying: “We're not, from a toxicological aspect, overly concerned at this point...There are processes and decision algorithms that are used based on all of the data that is known” (Ward 2014i). On a number of other occasions, officials dismissed public concern with the chemical’s lingering smell. The president of the water utility, for example claimed that “This is an aesthetic issue below 1 part per million. It's not a health-based issue” (Murphy 2014). Officials then prioritized scientific methods and results over the known uncertainties in the case.

The logic and use of “non-detect” levels proved problematic for the public as well. The chemical’s odor and side-effects persisted after water tested non-detect, yet officials dismissed resident concerns in light of the test results. The president of WVAW exemplified this narrow “scientific rationality” in his response to alleged reactions to chemical exposure at a school:

I'm a fact-based guy, I'm a numbers guy. I know that the school was non-detect...I can't talk about health-based effect and people's effect on themselves or what they may feel or what they may go to the hospital for. I can't connect the two - I have no facts to connect them. (Gutman and Mays 2014)

Because the school tested at the “non-detect” level – which does not indicate the chemicals absence, only that its concentration is lower than tests can detect – he was unwilling to validate causal claims. This quote also shows the official tendency to make light of citizens’ claims of health reactions.
Government and health officials continuously downplayed both the real and potential side effects of chemical exposure, even while admitting the extent of the uncertainties. Side effects were characterized as short-term and mild, and the chemical of low-toxicity. After the water ban had begun to be lifted, and 150,000 residents were informed that their water was safe to drink again, the CDC added an exemption to the official threshold: pregnant women should avoid drinking the water until it tested non-detect. But this was added only out of “an abundance of caution,” and officials continued to insist that adverse effects were highly unlikely. On several occasions, in response to public health concerns, officials placed the responsibility back on the public by making the issue a matter of personal choice. At a news conference, for example, Governor Tomblin announced: "It's your decision...If you do not feel comfortable drinking or cooking with this water, then use bottled water" (Ward 2014f). Similarly, the commissioner of the state Bureau for Public Health responded to a question about the water’s safety by saying:

That's in a way a difficult thing to say, because everybody has a different definition of safe...As I've used the example before, some people think it's safe to jump off the bridge on Bridge Day. I don't think that's safe. So everybody has a different definition. (Ward 2014e)

Rather than accommodate social concern into official response, authorities attempted to transform a public health matter into a personal judgment call.

Scientific rationality was also apparent in the medical and economic frames of officials. An individual-based medical approach, for example, led government officials to cite public anxiety, flu season, and the inability of residents to wash their hands as potential causes of hospital visits. These are reasonable interpretations of patients’ symptoms if they are evaluated individually, independent of the broader context. Regardless of the veracity of such an assessment, it delegitimizes the public’s health concerns by interpreting away the uncertainties involved. Conflict surrounding home
testing and flushing procedures offers an example of officials’ economic approach superseding health-based concerns. Home testing commenced only after prolonged public pressure. Even then, official sources cited public anxiety and the need to reassure potential tourists rather than a response to real health concerns. The problem was not of actual safety, but perceived safety and its effect on governance, business, reputation, and tourism.

*Lay Perception & Local Knowledge*

While some citizens possessed greater resources to respond to the crisis, few were able to completely escape its impact. Businesses, hospitals, schools, young, and old all found themselves contending with water restrictions. All had to formulate plans to obtain safe water and decide when and for what purposes they would begin using the water again. Newspaper coverage frequently used lay voices to represent these experiences. Following the findings of prior research, news coverage largely confined lay voices to the symbolic representation of citizens’ everyday experiences and struggles (Cottle 2000, Wilkins and Patterson 1987). The papers framed these voices credibly and favorably, but did not give them equal representation with official sources, nor were they able to develop an argument to counter the official perspective. The tone and themes of lay voices do however juxtapose with those of authoritative voices, highlighting the distance between the two.

The public often voiced concern about the effects of the unknown and a distrust of governmental claims of safety. One woman echoed the worries of many mothers, saying "I have a 1-year-old at home, and I don’t want her in 20 years to not be able to have children, because of these chemicals" (Molenda 2014a). Another citizen voiced a common sentiment, saying that “he doesn’t trust health officials and politicians who say it's OK to drink the tap water. ‘I’m not going to believe it until I get a reading of zero parts per million from my own tap’” (Crum 2014). The trust in scientific
algorithms and established processes is absent from this public perspective. The long-range perspective expressed by citizens also rarely appeared within official framing. On the contrary, neither state nor federal government initially indicated any plan to track or study the long-term health effects of the chemical.

Within the editorial pages of the paper, the public sometimes achieved less restricted access and was able to more fully develop their views. These pieces were often penned by elite members of society, who could claim some expertise on the topic. For example, a contributing columnist and retired economics professor authored a piece that articulated the social perspective succinctly: “Commonly used MCHM and PPH should not be mysterious chemicals. When authorities argue about its health effects, people in coal producing counties already know” (David 2014). As this quote suggests, the disagreements between citizens and experts were not merely a matter of perceptual differences based on divergent values. Rather, the public had first-hand knowledge about the chemicals that conflicted with what they were hearing from officials.

The water crisis provided ample opportunity for lay people to engage in citizen science and develop knowledge about crude-MCHM. Non-experts used at least two different empirically-based modes of discovery: one based on direct sensory experience with the chemical (odor, taste, color, consistency, etc.), and the other based on experimentation. These combined with their assessment of official response and credibility to produce a picture very different from that painted by officials. The color and smell of the tainted water provided the first source of information for many people. One Gazette reader, for example, contested official knowledge for the chemical industry based on their experience:
Eastman’s Material safety data sheet for crude MCHM describes the product as colorless and having an odor typical of an alcohol. No mention there of the green tint seen in our drinking water or to the licorice odor in our kitchens and our air. (Charleston Gazette 2014)

Official knowledge failed to account for, and in many cases, directly contradicted local knowledge generated through sensory experience.

Experimentation also provided valuable information for the public. Some of this knowledge emerged accidentally, when citizens unknowingly ingested or otherwise used the water before they knew about the contamination. One resident and her 7-month old son both experienced symptoms after using the water on January 9th before the issuance of the water ban. The Gazette shared their story:

Elliott bathed her son, Justin, in the water and also used it in his formula. She said Justin immediately developed a rash and has had diarrhea since then. “Every time I put a diaper on him, it was full,” Elliott said... “I had been drinking the heck out of the water,” she said. “I didn't know.” Elliott said that, on Thursday, she'd noticed that, the more water she drank, the thirstier she got. Her stomach and head hurt after drinking it, she said. While the symptoms have diminished, she still has them, she said. (Kersey 2014)

This mother’s knowledge challenged what officials “knew” and was therefore dismissed by medical officials. When she took her son to the hospital, the pediatrician attributed his symptoms to hot bath water rather than chemical exposure.

Other residents experimented in more deliberate ways to inform their decisions about water use. The owner of a local sausage company, for example, hired an independent contractor to test the water at her plant. Results came back non-detect, but after her own experimentation, she determined that the water was unfit for production purposes:

We cooked and experimented with a pot of potatoes yesterday...Starch always rises to the top, but it was almost a jelly-like substance. I did one experiment with a pot of potatoes and I threw it in the dumpster. (Constantino 2014b)
Another form of experimentation involved observing the waters’ effect on nonhuman lifeforms. Some interpreted their pets’ refusal to ingest the water or its effects on house plants as a sign that it was unsafe for humans:

- I've been watering my houseplants with West Virginia American water, and they are all turning brown. (Daily Mail 2014)
- I have two potbelly pigs named Delbert and Elbert. They still will not drink this contaminated water. I'm still giving them bottled water. (Saturday Gazette-Mail 2014)

Citizen science then produced knowledge independent from official sources. A few officials granted such knowledge legitimacy, but as indicated above, it was overwhelmingly dismissed or ignored.

The public, of course, did not speak with a single voice. Many readers also expressed skepticism and annoyance at what they saw as excessive complaining, inspired by greed or politics. But survey data suggests that this was a minority perspective. A survey conducted by the CDC and West Virginia Bureau for Public Health (WVBPH) during April 8-10, a full three months after the chemical tank began leaking, found that, of household affected by the “do-not-use” order, only 34% were drinking water from their tap and 36% believed that the water was safe (CDC 2014). The same report estimated that 22% of affected households reported health symptoms related to the chemical spill.

Although officials dismissed popular knowledge, it found support in the print media. The question then becomes, if the print media did not give the public expanded access to voice their perspective, how was it incorporated into risk reporting?

FRAMING UNCERTAINTY

The Daily Mail and The Gazette employed four methods to challenge official claims to certainty and knowledge: (1) reminding readers of the unknowns, (2) highlighting the divergent and changing
information coming from officials, (3) explaining and questioning the methods behind scientific claims, and (4) locating alternative sources of information. Both newspapers made use of these techniques, though to differing degrees, resulting in different overall framing of the risk presented by the spill. Table 4 shows the breakdown of devices by newspaper.

Table 4. Framing Devices by Newspaper (number and percent of articles containing at least one example of the device)

<table>
<thead>
<tr>
<th>Device</th>
<th>Daily Mail (N=169)</th>
<th>Gazette (N=220)</th>
<th>Total (N=389)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Device</td>
<td>44</td>
<td>81</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>26.04%</td>
<td>36.82%</td>
<td>32.13%</td>
</tr>
<tr>
<td>Unknowns</td>
<td>33</td>
<td>53</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>19.53%</td>
<td>24.09%</td>
<td>22.11%</td>
</tr>
<tr>
<td>Changing Facts</td>
<td>17</td>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>10.06%</td>
<td>14.09%</td>
<td>12.34%</td>
</tr>
<tr>
<td>Debating Science</td>
<td>8</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>4.73%</td>
<td>15.00%</td>
<td>10.54%</td>
</tr>
<tr>
<td>Alternative Expert</td>
<td>12</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>7.10%</td>
<td>16.36%</td>
<td>12.34%</td>
</tr>
</tbody>
</table>

In total, 125 or 32% of the 389 articles displayed at least one framing device that challenged either official assessment or management of risk. In all categories, The Gazette exhibited greater frequencies, with the largest difference in debating science and alternative sources. This section discusses the newspapers collectively to demonstrate these techniques, but the conclusion will expound on these differences and their meaning.

Highlighted the Unknowns

When reporting on the crisis, both newspapers ensured that they informed readers of the extent of the “unknowns.” The emergency provided ample opportunities for the media to point out holes in information to counter expert and authoritative claims to knowledge. As the water company lifted
the “do-not-use” advisory zone by zone, indicating the water was safe, the public questioned official logic, especially given the pungent smell that lingered long after flushing home systems. The media coverage reflected this concern. This was crucial especially early in the emergency when officials were withholding information, and presenting the acceptable threshold as a magical safety level. For example, on January 11, one journalist writes: “Carcinogenic effects? No information available. Mutagenic effects? No information available. Developmental toxicity? No information available” (Ward 2014h). This effectively undermined any authoritative assertions about levels of the chemical which may or may not be safe. Journalists also enjoined disclaimers of this sort while relaying official statements:

Kapil said the CDC stands by its initial recommendation - made in the absence of any regulatory standards or established public-health guidance - but that the agency is searching for additional information that might help scientists refine their work. (Gutman and Ward 2014, emphasis added)

Their focus on the uncertainties directly contradicted officials who sought to alleviate public anxiety and assert control over the situation. Again, this was easily accomplished given the overwhelming quantity and quality of the unknowns.

The composition of the chemical was another topic that the media focused on long after official sources had moved on to other subjects. As the newspaper pointed out, “the CDC's standard comes, in part, from a study done on MCHM, not Crude MCHM, a composite of MCHM and six other ingredients. Crude MCHM is the substance that leaked into the Elk River” (Ward 2014a). Almost two weeks after the spill, Freedom Industries also revealed the presence of a previously undisclosed chemical, PPH. These introduced an additional element of uncertainty. Testing detected only MCHM and the studies on which the threshold was based did not account for interactions between component chemicals.
The papers frequently employed scare quotes to highlight the unknowns. These reminded readers of the arbitrary nature of the line drawn between “safe” and “unsafe” levels, and were commonly used with words such as “safe” and “non-detect.” This method is exemplified by an article that reported: “Officials said that more than 90 percent of tests show the MCHM levels are now ‘well below the health risk level’” (Molenda and Mays 2014). Here, the addition of quotation marks signals to the audience that the health-risk level is not an objective fact, but a number based on a dearth of information.

*Changing & Conflicting “Facts”*

The holes in official knowledge alone may have been sufficient to elicit public disquiet – however, the “facts” of the case also changed throughout the course of events, with conflicting information emanating from the various actors. This is perhaps unsurprising given the contested nature of many “facts” involved. Early in the crisis, for example, the Department of Environmental Protection (DEP) “told the public the chemical wasn’t ‘hazardous,’ [based on] a U.S. Department of Transportation regulation... [T]he chemical was hazardous under U.S. Occupational Safety and Health Administration standards...” (Ward 2014b). The inconsistencies in the chemical’s classification both reinforced the lack of information and illustrated that concepts such as “hazardous” and “safe” reflected a social rather than objective reality.

The definition of “non-detect” fluctuated during the crisis as well. Governmental agencies employed several different labs to assist in testing, and researchers were rapidly developing more sophisticated and sensitive testing techniques. In late February, after pressing the state government to release test results for two weeks, The Gazette discovered that “state officials [told] the public they had not detected the chemical, where the same samples showed some level of the substance
when tested using the lower detection limit” (Ward 2014c). The government had posted the 10ppb “non-detect” test results and withheld the fact that another lab detected trace amounts of MCHM with their lower 2ppb “non-detect” level.

Official disagreement and lack of transparency undermined any credibility and public trust authorities might have otherwise had in handling the uncertainties. Conflicting information ranged in subject and importance, from the amount and composition of the chemical that leaked, to which agencies were responsible for the regulation and oversight of the outdated storage facility. Many of these discrepancies were revealed by persistent newspaper inquiry. Official flushing procedures, for example, instructed residents to run hot water for fifteen minutes to rid their plumbing of contaminants. But an email exchange between the U.S Agency for Toxic Substances and Disease Registry and the state Department of Health and Human Resources suggested that homeowners flush the system for a more extended time period, until the licorice odor dissipated (Ward 2014j). This information was obtained under the West Virginia Freedom of Information Act.

Issues of this sort arose partially as a result of overlapping jurisdiction and responsibilities of companies and the different levels of government involved. Reporter inquiries often bounced from agency to agency with representatives deflecting responsibly by indicating that they were simply following guidelines established by other organizations. Teasing out the actual origin of claims and guidelines proved a difficult and time consuming task for the journalists. Their persistence and refusal to accept official statements at face value likely came from both the scale and duration of the crisis, but also the fact that residents had firsthand knowledge that contradicted that of the authorities.
Debating the Science

The highly technical nature of science and its lack of a human element can clash with the stylistic form of media storytelling. Reducing scientific complexities to fit within journalistic formats can be difficult. Significantly then, in the case of the Elk River spill, the media incorporated science into its reporting and sought to educate readers on some of the more technical issues involved. As soon as the CDC released the safety threshold, *The Gazette* began pressing for the details of how the number was calculated, and questioning the logic behind each step. For example, though officials reassured the public that, based on the median lethal dose (LD50) of the chemical, a person would have to ingest a large amount of the substance for it to kill them, the newspaper was quick to point out that this number “doesn't tell you anything about what levels would make people sick - only what levels would immediately kill a rat” (Ward 2014h). Rather than avoiding the complexities, the paper actively sought them out and demanded explanations for each step in the process.

This technique often came in the form of simply informing readers of the meaning behind technical language on a sustained basis. For example, pointing out that “non-detect” did not indicate the absence of the chemical, or reminding readers that much of the testing did not account for all of the chemicals contained in Crude-MCHM. These efforts become all the more telling when contrasted with the water utility’s response to inquiries about the safety threshold:

*This is a fairly sophisticated process...We certainly don't expect customers to fully understand the process, but just know there is a strict reason for why we are lifting everything in the order that we are.* (Molenda 2014b)

Though this technique is not entirely absent from the *Daily Mail*, their efforts were much more sporadic and less extensive than *The Gazette*. This can be explained in part by differences in the
frequency that the two sought out alternative experts to counter the official science, as these two techniques frequently co-occurred.

**Alternative Experts**

Newsmakers pushed for more thorough explanations of official science, but needed their own experts to truly challenge it. One of papers’ earliest alternative sources was the Environmental Defense Fund’s online blog. A Ph.D. chemist with the organization charged state officials with “trusting ‘shaky science’ in their ‘rush to restore water service’ to 300,000 residents in a nine-county region” (Ward 2014d). Though not traditionally considered a source on par with officials, this blog was presented as a legitimate challenge to official authority. Academic sources served this purpose as well. The dean of the School of Public Health and Health Services with George Washington University agreed that officials lacked adequate information to establish drinking water standards:

> What is the actual concentration of the pure chemical in the technical grade, and then what are the other things in the technical grade and are they in the technical grade in high enough concentrations to be a concern…Question mark, question mark, question mark. (Ward 2014a)

By introducing these alternative experts, the media validated public knowledge and concerns. This likely also helped pressure the government into funding and conducting additional studies.

Another expert who came to play a large role in studying the chemical and its effects was Andrew Whelton, an environmental engineer from the University of South Alabama. Whelton drove to WV with his research team after the leak and began collaborating independently with residents to test samples and flush homes following a different set of guidelines. He spoke out for the need for in-home testing, and eventually won a National Science Foundation grant to study the chemicals’ interaction with home plumbing systems. Governor Tomblin, after first insisting that in-home testing
was unnecessary, also agreed to fund a study of the chemicals’ long-term effects and brought Whelton on to lead the investigation.

DISCUSSION & CONCLUSION

These four framing devices – reminding readers of the unknowns, highlighting the changing information, debating science, and relying on alternative experts – worked together to counter official claims. Differences between the two newspapers suggest how various combinations of these techniques can result in subtle differences in risk framing. *Daily Mail* articles displayed relatively few instances of explaining/questioning scientific details or drawing on alternative experts. This suggests that it was less concerned than the *Gazette* with the status of risk knowledge, yet similarly critical of official risk communication. The first two devices, pointing out the unknowns and changing facts, were both areas of general agreement. Most officials agreed that there were not enough studies on the chemical, and jurisdictional overlap created confusion about what, if any, laws Freedom Industries violated and who was responsible for regulating the site. Both papers made these issues more salient than in official framing and criticized governmental agencies for regulatory failure. The interpretation and application of this information is where framing between the two papers most diverged.

The *Gazette*, by questioning scientific claims, both with and without the support of alternative experts, challenged official claims to knowledge. However, it was not scientific knowledge per se, but the meaning and application of scientific ignorance that became the central point of contention within media discourse. Following Smithson (1989), I use ignorance to encompass all types of “non-knowledge.” Ignorance, like knowledge, is socially constructed and a claims-making activity (Aronson 1984, Stocking and Holstein 1993). More than simply the absence or
distortion of truth, ignorance represents a distinct field that takes on a variety of forms (e.g., bias, error, irrelevance, incomplete data, etc.) and uses (Smithson 1989). During the water crisis, officials sought to legitimize their claims to knowledge through their construction of ignorance.

In the Elk River case, ignorance provided an institutional resource for authorities (McGoey 2012). Officials constructed ignorance in a specific way as to reassure the public, bolster safety claims, and uphold “organized irresponsibility” (Beck 1992) – what Stocking and Holstein call the “politicization of ignorance” (1993: 197). The most apparent area of ignorance concerned the “safe” concentration of the chemical. To set this screening level, ignorance was quantified and then factored into an algorithm. This method constructed ignorance as scientific caveat that could then be discounted (Stocking and Holstein 1993). Knowledge gaps could then be downplayed in officials’ interpretive claims and management decisions because they had been acknowledged and accounted for in the algorithm.

Citizens critically reinterpreted these claims and expanded the areas of relevant ignorance. Their lived experience suggested that the ignorance was more problematic than scientific caveat. What was not accounted for within the official assessment also presented issues. Many citizens suffered health effects after inhaling vapors during flushing procedures or showering, yet nothing in the official assessment accounted for this type of exposure. Concern about chemicals lingering in home plumbing systems also originated in lay knowledge. The public constructed these as areas of relevant ignorance, despite initial official failure to recognize them as such. These claims then made their way into media coverage and, through the framing devices outlined above, challenged official risk assessments. That is, rather than directly incorporating lay knowledge in risk reporting, newsmakers drew on lay interpretation and construction of ignorance.
Understanding the newspapers’ framing from this perspective, as a site of contested ignorance claims, offers insight into what types of lay claims may find representation in the mass media. Ignorance claims generally require less support than knowledge claims, which could make them a better fit with journalistic values and routines. But this tacit embrace of lay knowledge via ignorance construction offers an incomplete picture of public risk evaluation. It necessarily glosses over heterogeneity in social experience, limiting representation to a select population – marginalized voices were absent from even symbolic representation. For example, inmates at Charleston’s South Central Regional Jail reported that the jail continued using tap water for a full two days after the do-not-use advisory was issued, and that they were denied access to sufficient water during the ban (Stories from South Central 2014). The only newspaper article published on the subject reported that the “jail protected inmates during water crisis” (Constantino 2014a). Contesting official ignorance claims proved an effective counterrhetoric precisely because it did not advance any specific knowledge claims, and because the counterclaims had backing from the middle and upper classes.

Researchers have recently urged scientists, policymakers, and the public to pay greater attention to ignorance in science and risk communication (Hoffmann-Riem and Wynne 2002, Nielsen and Sørensen 2015). As the Elk River case shows, this can be an effective counterrhetorical strategy through which the news media can question received scientific “fact.” News coverage of West Virginia’s water crisis broke many of the general patterns in risk reporting, but in other ways upheld traditional media conventions. Journalists became advocates for the public’s understanding of risk, but with a specific public in mind and without allowing citizens direct participation in the discourse. The media then embraced the idea of knowledge co-production while maintaining its
gatekeeping function. That is, newsmakers exerted control over who among the public could produce legitimate knowledge in mediated discourse. This case then demonstrates a partial opening of media space, but an opening nonetheless.
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