Women, men, and the face of a Colorado Frack Disaster: From gender-specific risks to gender-inclusive solutions

On September 19, 2011, the United Nations General Assembly described environmental damage from hydraulic fracturing[1]—which entails injecting shale with a pressurized fluid to extract natural gas—as "a new threat to human rights" (Environment and Human Rights Advisory [EHRA] 2011 p. 3, Weinstein and Partridge 2011). The EHRA assessment indicated that fracking creates concern over 26 human rights norms, most notably; "the right to security of person and bodily integrity, the family's right to protection, the right of motherhood and childhood to special care and protections, [and] the right of the child to the highest standard of health" (2011 p. 4). These human rights concerns likely materialize differently for men and women, whom often still carry different traditional familial burdens such as protector and caregiver, respectfully.

The violations outlined by the U.N. General Assembly have received little acknowledgement in the U.S. Specifically, there has been little to no examination of the gendered aspects of risks, resistance, and collaborative solutions in the context of hydraulic fracturing. The purpose of this paper is to unpack the gendered dynamics surrounding fracking in Colorado, while framing the technical process itself as one which possesses the potentiality of triggering a technological disaster.

First, I address the way hydraulic fracturing presents an ongoing threat of evolving into a technological disaster. I follow with an examination of the literature on the potential gendered health risks that accompany fracking. This will lead to a methodological overview of my research, highlighting my construction of a relevant literature and source database, my observations of local and state legislative meetings

[1] For an overview of hydraulic fracturing, see Weinstein and Partridge 2011.

and processes, and the four semi-structured interviews I conducted with individuals in either the government or activist sectors in two Northern Colorado cities. After describing my methodological approach, I explore how men and women have worked together and have also engaged in conflicts across different organizations as localities attempt to mitigate the risks of a potential fracking disaster. I conclude by encouraging increasing gender-inclusive collaboration as a means to minimizing health and safety risks and mitigating a frack-related technological disaster in the future.

Hydraulic Fracturing and the Technological Disaster Framework

Perrow (1984) describes technological disasters as those that result from technological or human error. Freudenberg (1997) expands on this definition by pointing to the origin of a disaster, so that, if the event was triggered by an act that "inherently required human action" it should be considered a technological disaster (p. 24-25). In addition, Ritchie (2004) highlights the differences between natural and technological disasters in regard to: etiology, physical damage characteristics, disaster phases, community impacts, human impacts, and event interpretation. Of particular importance in this context is Ritchie's assertion that technological disasters have no consistent pattern of disaster phases, no clear beginning or end, and have ambiguous, but often long-lasting impacts on human health and community solidarity.

The concept of 'disaster' has more recently been expanded to include the anticipation of a technological disaster (Ritchie 2004). In addition, Tierney (2007) calls for a shift within disaster research, which in recent years has meant a moving focus emergency response and post-disaster recovery to pre-disaster mitigation and resilience efforts. Given this new direction of the discipline, it follows that we should

examine the consequences of a preventable technological disaster *prior* to the onset of a disaster (however ambiguous its "onset" may be). This allows efforts to be focused on preparedness for, or more optimistically, avoidance of a potential tech-disaster. Like other forms of resource extraction, hydraulic fracturing has warranted concerns about the impacts of a technological disaster. In addition, the rapid growth of the practice has heightened these concerns. The role of this process of extraction in the U.S. is significant because shale gas is projected to be the biggest contributor to growth in natural gas production between 2008 and 2035 (EIA 2012). Given the extent to which we are and will continue to increase our reliance on natural shale gas acquired through hydraulic fracturing, we must consider the potential gendered risks and appropriate safety practices necessary to avoid the hazardous consequences we have seen in resource extraction and energy production in the past.

The classic case wherein social and psychosocial problems developed as a result of human-enhanced disaster is demonstrated by Erikson's (1978) account of the Buffalo Creek flood that occurred in Logan County, West Virginia. Since then, a host of research has tied social, psychosocial, and physical health problems in the wake of a technological disaster (see Tierney 2012; Levine 1982; Goodman and Vaughan 1988; Goldman et al. 1985; Collins et al 1983; Wing et al. 1997; Dohrenwend et al. 1984; Malin and Petrzelka 2008; and Malin and Petrzelka 2012). In most of this literature, various types of energy production processes continue to share one common bottom line—they all have the capability of directly or indirectly producing disasters that ambiguously impact the health and safety of men, women and communities following a triggered disaster event. As a technological process that involves the use of toxic

chemicals and produces a toxic liquid, hydraulic fracturing creates what is described by Freudenberg (1997) as the "ambiguity of harm," wherein it is not necessarily clear the type and extent to which harm will be caused in the wake of this type of technological disaster. Despite this ambiguity, there are some health risks and concerns that are being identified in relation to the known toxins and carcinogens used in the process, as well as the process itself. These risks pose different issues for men and women's health that are equally important to address.

The Gendered Risks of Hydraulic Fracturing

While community risk is shared, there are important differences that make men and women predisposed for experiencing health problems related to hydraulic fracturing in very different ways.[2] Between 1937 and 1971, testicular cancer rates among White men in the U.S. doubled (Mills, Newell, and Johnson 1984). The increase in testicular peaked research interests in causality. In 1984, Mills et al. determined that (among other occupations in the U.S.) "work in the petroleum and natural gas industries significantly increases the risk of testicular cancer" (p. 209). The issue has resurfaced, as a recent study in Chatauqua, Cattaraugus, and Allegany counties in New York (where natural gas extraction is historically intensive) revealed that compared to national averages, men "were statistically in the highest bracket for deaths cause by bladder, prostate, rectum, stomach, and thyroid cancers" (Bishop 2011 p. 19). While a discussion of gendered employment and economic tensions in the natural gas industry

[2] This argument does not aim to reinforce the construction of a dominant/subordinate gendered dichotomy. Discussing risks and vulnerabilities in terms of gender as a population subgroup moves the discussion in a multifaceted direction that does not exclude considerations of intersectionality. Despite constructionist arguments, there are real biological differences on the physical sex continuum that while may be altered and are not always clear cut, do undeniably lead to different consequences for men and women in the wake of disaster (see Jencik 2010).

are beyond the scope of this paper,[3] the fact that as of December 2011, roughly 77% of all workers in the oil and gas extraction industry and 90% of those who work in support positions for oil and gas operations were men[4] indicates that males are likely to be more at-risk for immediate exposure to hazardous chemicals linked to serious health problems. Thus, a revival of the analysis of the relationship between work in the natural gas industry and men's health seems more than appropriate.

Chemical exposure also poses unique risks to women's health and safety. An Institute of Medicine of the National Academies' report (IOM 2/7/2011), evidenced that exposure to benzene (which is used in fracking) may lead to increased breast cancer risk. In Texas, where breast cancer rates are historically lower than national averages, a 2011 report by the Centers for Disease Control and Prevention determined that invasive breast cancer has risen across six counties since 2005 (Heinkel-Wolfe 2011). While studies have yet to link the two, it is important to note that the same six counties which have seen invasive breast cancer rates rise are also have the highest levels of production equipment of all counties on the Barnett shale (Heinkel-Wolfe 2011). Hosting the most intense drilling, these counties are at risk of being exposed to higher emissions from production equipment (Heinkel-Wolfe 2011). In addition, the same tri-county study in New York addressing men's health revealed that compared to national averages, women living in the same counties consistently fell in the top bracket for deaths resulting from "cancer of breast, cervix, colon, endocrine glands, larynx, ovary, rectum, uterus, and vagina" (Bishop 2011 p. 19). Finally, there are also increased risks for

[3] This is unfortunate as gender and employment within the natural gas industry is tragically understudied (O'Shaughnessy and Krogman 2011), and studies of gendered employment in terms of hydraulic fracturing is nonexistent.

[4] These percentages were taken from the 2012 Bureau of Labor Statistics establishment data on employment of women, and do not distinguish between employment positions within the industry. While data is not readily available, the likelihood is that the percentage of males that are field workers are even higher than what is suggested here.

pregnant women, such as birth defects or spontaneous abortions (see EHRA 2011, Colborn et al. 2011, Lupo 2011, and EPA 2012).

Beyond immediate gendered health concerns, the human rights violations the U.N. tied to fracking suggests that vulnerable populations such as “infants, children, the elderly, cancer survivors [and] those with compromised immune response are at increased risk” while “socially and economically disadvantaged populations may also be at increased risk” (EHRA 2011 p. 9). Based on previous natural disaster research regarding the caretaking role of women (see Enarson 2012, Enarson and Morrow 1998; Fothergill 1996, Richter 2007, Richter 2011, World Health Organization 2002), increased risks for vulnerable populations means an increased risk for caretakers, a role that remains primarily delegated to women. Additionally concerning is that over the last few decades, prominent gender and disaster scholars demonstrated that women (and children) experience higher levels of vulnerability (and experience it in a multitude of ways) during all stages of a disaster. (see Blaikie et al, 1994, Fothergill 1996; Morrow and Phillips 1999; Enarson and Morrow 1998; Enarson, Fothergill and Peek 2007; Enarson and Morrow 1997; Peek 2008). Finally, women and girls more often face the denial of basic human rights during times of crises (Enarson, Fothergill and Peek 2007), and violence as a violation of human rights is a concern for women and girls during disasters. In North America, “violence against women, especially intimate partner violence, tends to increase in disaster periods (Dobson 1994; Enarson 1999; Honeycombe 1994 as cited by Enarson Fothergill and Peek 2007 p. 135). Recently, instances in towns that have experienced fracking booms reflect increased rates of violence against women, and in at least once case domestic violence increases are

occurring predominantly in families employed in the industry (see AWID 2012). Hence women also faced increase risks associated with their male counterparts, though these sometimes manifest in quite different ways.

Despite these differences, men and women may also be similarly impacted by exposure to chemicals used in hydraulic fracturing. Disruptions to the endocrine system—which according to Colborn this capability is found in 47% of products used in natural gas drilling and fracturing—could result in reproduction issues in terms of sperm production, infertility, hormone imbalances, and beyond (Colborn et al. 2011). How then, are men and women recognizing and addressing these concerns? To better understand the complexities of gendered risks in the context of a frack-disaster, this study utilizes four qualitative data collection methods, which I turn to now.

Methodology

Accompanying the issue of gendered 'ambiguity of harm,' is a concern for social relations within a community experiencing drilling activity. Technological disasters often create conflict within a community (see Kroll-Smith 1990), on top of health risks following toxin exposure. To better understand the way fracking-related threats have fostered both solidarity and conflict between men and women in Colorado, I undertook a preliminary research effort wherein I have created and continue to maintain a resource database of qualitative documents, I have observed local and state legislative meetings and processes, and I have conducted four informal, semi-structured interviews with individuals in either the government or activist sectors in two Northern Colorado cities.

Article Database of Qualitative Documents

Meyer and Avery (2008) conceptualize the tracking of data as a hurdle in qualitative data analysis, and suggest that researchers performing both qualitative and quantitative data analysis should consider incorporating the use of Microsoft Excel as a methodological tool given its ability to "handle large amounts of data, provide multiple attributes, and allow for a variety of display techniques" (p. 92). In this case, archiving documents (especially from media sources) on hydraulic fracturing created a seemingly endless supply of data. To better organize and track patterns within the data, I created an archival database of qualitative documents, which consisted primarily of published news articles and publications[5], public legislative and regulatory documents[6], and the few academic pieces of literature on fracking that I have identified to date.

Besides identifying basic information such as author and source type, the database delineates whether or not each article addresses potential concerns about the environmental degradation, disasters, and/or public health concerns. Perhaps most importantly, the database identifies the region, country, state, city, and active shale bed that each article focuses on. So, for the purposes of this paper, I was able to easily examine review, compare, and contrast the content of articles relevant to the topic at hand, meaning they were (a) focused within Colorado, and (b) addressed concerns over health and disaster risks. The use of this methodological tool will extend beyond this paper and far into the future—particularly as I plan to make the database publicly available and turn to GIS as a tool for conducting and supplementing future comparative case studies.

[5] News articles encompassed within the database ranges from local (i.e. The Coloradoan) to national publications (i.e. The New York Times). For this research paper, I focused primarily on Colorado publications, most frequently, The Denver Post, The Coloradoan, The Denver Business Journal, and the Northern Colorado Business Report.
[6] Examples of Colorado legislative and regulatory documents included in the database are Boulder County's oil and gas regulations and City Council Minutes from the two primary cities of focus. Relevant documents from outside of Colorado are also included in this database but not in the context of this research.

The 'Participant as Observer' Role

In addition to tracking qualitative documents, my capacity as a City employee[7] lends me the privilege of being a limited participant-observer in the legislative process of regulating hydraulic fracturing. For the purpose of this study, I took on what Creswell (2009) describes as a "participant as observer," wherein my observational role was considered to be secondary to my role as a participant. In my professional capacity, I attended meetings which entailed decisions about how the City would move forward with addressing concerns, regulations, and inter-organizational relationships via legislation. This methodological technique was useful in that I was able to witness the way in which decision makers' concerns about the practice of hydraulic fracturing evolved through negotiation processes over time. This demonstrates a benefit of the 'participant as observer' role, in that I had access to unique aspects of the ongoing inter-organizational cooperation process and its impact on both male and female participants.

Audio/Visual Materials

In addition to day-to-day observations as a City employee, I relied on real-time and recorded audio and video recordings of legislative meetings at both the state and local level[8] to further inform my understanding of the social aspects of fracking across three topics: (1) the existing practical and legal dilemmas, (2) public participation and concern, and (3) the balance of power across different types of governing bodies. For example, utilizing this unobtrusive methodology, I was able to document the rulings of

[7] To be clear, I am an employee at one of the two focal cities wherein I conducted interviews and reviewed City Council audio/visual materials. Due to my professional employment with one of these cities, they have in this paper remained unnamed. However, the interviews in these cities provide deeper insight into the gendered dynamics of fracking, which as my qualitative document analysis methods demonstrate, have been affecting communities in Northern Colorado and around the state as a whole.

[8] At the local level, City Council meetings were reviewed for two neighboring cities, the same two cities wherein interviews were conducted with activists and city employees.

the Colorado Oil and Gas Conservation Commission's (COGCC) that led to the enhancement of existing health and safety regulations, and was able to identify the existence of a pro-industry organization of mothers, "Mothers Who Love Fracking," at a local City Council meeting. The ability to listen to and view these meetings supplements the use of qualitative documents and observations, and provided me the opportunity to listen to individuals "directly share their reality" (Creswell 2009 p. 181).

Preliminary Interviews

To further triangulate my methodology, I conducted four informal, semi-structured interviews with members of local governing and activist bodies. As this is an exploratory phase of research, I used a convenience sample across two Northern Colorado communities to minimize research costs and time (Creswell 1998). The purpose of conducting interviews was to gain a better understanding of people's experiences who have been directly involved in shaping the conversation about safety and the threat of a hydraulic fracturing disaster in Colorado. The purpose was also to develop a better understanding of what key aspects of gender and community relations may be of importance in future research as communities evaluate potential health risks and the possibility of a frack-tech disaster. For these reasons, a convenience sample was appropriate for this study.

Two interviews were conducted with men working for different government entities. The remaining two interviews were with female members of the same anti-fracking activist group within one community. Given the different roles that these individuals have in the fracking conversation, the interviews were not structured identically. Typically there were three to four questions that I addressed with all

individuals, and based on their area of expertise each conversation took a different course. In these interviews, I was primarily interested in collecting information about their personal and gendered experiences, while also understanding what, if any, concerns they had about the risks associated with hydraulic fracturing. In addition, I inquired how they have been involved in the community conversation, and in what ways they feel that steps have or have not been taken to address any of their concerns. Given the informality of the interviews, an audio recording device was not used. Instead, I relied on recording notes throughout the entirety of each interview. After an initial reading of these recorded notes, I used open coding to "form initial categories of information" about interviewee experiences and concerns (Creswell 1998). Finally, these emergent themes were analyzed in the context of the information I have gathered via qualitative documents, observations, and audio/visual materials.

General Public Concerns and Contentions

Throughout all data sources, concerns for human health and safety were paramount for both the men and women I observed and interviewed. As previously discussed, the literature indicates that these health concerns are tied to the release of toxic chemicals into the air, water, and soil. These fears were voiced by journalists, activists, and city and state actors, and were elaborated on within interviews. As one female interviewee put it:

"Toxic emissions—it's too close. Several other neighbors were concerned about it, they organized a small group of homeowners most likely to be impacted, and everyone came with their own concerns. For me it was health and safety, evacuations, much less soil and water contamination and the everyday issues…40% of wells in Weld County have been contaminated."

This quote is indicative of concerns that were widespread across the sources I analyzed covering the state of Colorado in general and particularly in Northern Colorado communities. In addition, the audio/visual material review demonstrated that over the last year, addressing the potential health risks of a hydraulic fracturing disaster has dominated legislative proceedings at the local and state level, and within the COGCC. My observations and review of the audio/video of Council and Commission meetings revealed that, primarily, legislators have conflicting views on the level of toxins being emitted, the safest way to regulate these emissions, and the distances that wells must be from inhabited structures, referred to as setback distances.

Setback distances are perhaps the most highly contested topic when it comes to mitigating gendered health risks through the regulation of hydraulic fracturing. While the COGCC recently instated an enhanced set of setback regulations, contentions continue to surround setback distances. This is in part because different rules were put in place for rural and urban areas, which further burdens the vulnerability bundles of both male and female rural dwellers. At present, the Colorado State Congress is in the process of voting on bills that will further regulate oil and gas operations and may in fact overrule the COGCC's differential application of setback regulations.

Setback distances are part of the larger conflict between stakeholders involving local zoning and land use regulations. Drilling for oil and gas is the only industrial activity that is not required to comply with local zoning regulations. Hence, oil and gas exploration has occurred in residential community areas. Residents are therefore more exposed to this particular type of industrial activity, which has in some cases lead to an

uprising of gendered activism. [9] In fact, one of the driving forces behind the development of "Erie Rising"—a well-known mom-powered activist group formed in Erie, Colorado—was the close proximity to an elementary school in which an operator wanted to drill. The group was established by an Erie mom who found herself fighting to keep oil and gas activity from developing adjacent to the school that her son attended.

The concern over drilling activity near residential areas has manifested as a resounding question from men and women across local activist and governance circles: Why should oil and gas be an exception to local industrial land use regulations? One city staff member expresses the common thread of frustration he sees at the local level:

"In the City Code, we have standards for development. In industrial zones and industrial developments, problems are in that industrial development. Outside of oil and gas, industrial development is limited to industrial zones only. The impacts must be lowered if they are near residential zones. But oil and gas has to be allowed outside of the zoning district, so now we have to try to mitigate from residential zoning areas. It [oil and gas activity] shouldn't be exempt from zoning, but because the state regulations deal with this, we get undermined…This is all because of the mineral rights. The development of oil and gas has been elevated to a state level concern, so it overrides the local ability to regulate it."

While this explains local concern, it also highlights the state's argument that oil and gas is of state interest and therefore the state holds the power to regulate the practice. Furthermore, the COGCC (2013) states that Colorado law recognizes split estate law, which cements their rights as the appropriate entity for controlling mineral property rights and drilling activity. These decision-making power grabs between the state of Colorado and local municipalities are in many cases ongoing.

Though stories of conflicts over fracking bans dominate headlines, other collaborative approaches to safety assurance are also underway. Cooperative, multi-party agreements are taking place behind the scenes. For example, one city that serves

[9] This tie between motherhood and gendered activism will be further explored below.

as a focal point of this research has chosen to work within the state's regulations. By negotiating with one operator, the city has created "enhanced user agreements" that include added community protections that are within the rights of the City and the constraints of the state's current regulation laws. The benefit for the city is an enhanced set of regulations that are stricter than the state's minimum standards, giving the city more control over mitigation impacts under current state laws.

From a gendered perspective, however, both the cooperative, multiparty agreements and the decision-making power grabs are problematic. This is because both approaches lacked women's involvement and participation. Essentially, little space exists within industry operations and state and local governing bodies for women to either contribute to compromise or lobby for the existing, highly-contested control. In contrast, however, activist circles have not produced the same male exclusive arenas, and women are creating spaces (which may or may not be shared with men) to allow their voices and opinions on the issue to be heard. This brings us to a discussion of community recreancy, activism, and the gendered dynamics of each in relation to fracking operations.

Activists' expressions of mistrust: A matter of recreancy?

Time and time again, skepticism about industry intentions made its way into news articles, activist discussions, and interviews. Activists expressed their personal experiences that have deepened their mistrust in hydraulic fracturing operations:

"A COGA representative spoke to the Chamber of Commerce here, saying that 95% of the wells in Weld County are being treated for toxic emissions, either with vapor reduction units or vent scrubbers. If this is true, this is responsible drilling. But most wells in Weld County are not well-protected from casual visitors. I went and saw over 400 wells, none of which had a vapor reduction unit on it. If the claim were true, I would have seen at least one. This is the kind of statement, that when the industry

representatives make it, it is a great disservice, because it isn't true, and those who check come away with an absolute mistrust in just about anything the industry is claiming at that point. It behooves them to say 'That is our goal, but we aren't there yet.'"

And the industry as a whole:

"I have been to the commission meetings; the new rules are too loose for groundwater testing. At first, there was a very good rule written, but then it disappeared and a watered down version appeared. It has been tweaked by so many people, companies, and businesses on both sides, the rules we ended up with are pretty lukewarm."

"They could drill more carefully, find energy substitutes, but they want to take the cheapest route, do it sloppily."

"They don't want to spend the money for pre-testing [to assure safety]; they want to be believed because they are the experts."

"There are groups who fund disinformation campaigns, so if you can keep enough of the people duped through misinformation, this puts the country at a standstill."

Particularly industry studies and their research agenda:

"COGA [Colorado Oil and Gas Association] is funding studies, but it is hard for them to be neutral."

These feelings expressed in public meetings and interviews indicate the relevance of the notion of recreancy, which oil and gas representatives tend to recognize yet struggle to address. Typically, it is in the event of a technological disaster that recreancy results in a loss of institutional trust and enhances corrosion and division within a community (Freudenberg 1991). In natural resource extraction processes, the public must place their trust in industry organizations and operators, whom are charged with managing risk. In the event of a technological disaster a loss of this institutional trust occurs (Kroll Smith and Couch 1993, Ritchie 2004). In turn, feelings of recreancy can generate organized social activity, such as protests or social movements in opposition to "technologies that are defined as dangerous," (Tierney 2012 p. 61). This

lack of trust may also explain the link between the existence of toxins in an environment, and stress (Tierney 2012).

While there has yet to be a large-scale catastrophic hydraulic fracking accident, I posit the idea of recreancy is connected to public mistrust and organizing in the context of hydraulic fracturing, because of the potential for threats to recreancy to be *transferable*—from one technological disaster to the next—and *pre-existing*—that is, the fear of a potential frack-tech disaster has been enough to create pre-disaster corrosive communities. From Exxon-Valdez to Deepwater Horizon, from Chernobyl to Three Mile Island, and from Centralia to the Upper Big Branch Mine, the American public has learned that energy extraction and production is dangerous. Whether fair or not, high profile cases such as these paint energy production, and specifically oil and gas companies, in a negative light when it comes to health and safety. Coupled with exemptions from health and safety requirements[10], the mistrust of operators grows even deeper. So deep, in fact, that in the case of hydraulic fracturing, it appears that feelings of recreancy exist prior to any widespread disastrous event or experiences of victimhood. If this is the case, it is possible the negative impacts of recreancy (i.e. stress and community corrosiveness) may already be occurring in Colorado communities.

Yet despite these expressions, not all Coloradoans express skepticism of hydraulic fracturing and oil and gas production. In fact, in areas where production has been underway for more than two decades, many residents lack feelings of recreancy because of perceptions of responsible practices. This brings us back to a discussion of the gendered aspects of health and safety concerns in the context of a frack-disaster, as these patterns of recreancy in this context are unclear. While both men and women

[10] Hydraulic fracturing is not required to comply with the Federal Clean Air and Water Act.

may be exposed to different types of community health risks, it is unclear whether or not their *perceived* risk levels are similar. The concept of the "white male effect," is used in part to understand variation in gendered risk perception. The theory contends that "white males perceive a variety of risks as less serious than white women and non-white men and women, and they also place more trust in technologies and the institutions that manage them," (Tierney 2012 p. 60). It is not currently known if there is a differentiation of risk perception between men and women when it comes to risks related to hydraulic fracturing, however, we can examine the activist roles that both sexes have played in Colorado as a starting point for deconstructing gendered risk perception in this context.

Roles in Activism: Gendered Space and Reflections on Perceived Risk

If men and women place different levels of trust in the oil and gas industry, it would follow that between the sexes different levels of recreancy would also exist, potentially leading to gendered differences in activism. Across the interviews, there were feelings that men and women were working together and participating in activist circles quite frequently within gender-inclusive organizations. In addition, both men and women involved in activism efforts utilize cross-city communication to strengthen cross-community communication, networking, and solidarity. However, in addition to gender-inclusive groups—there are also gender-exclusive groups that have lobbied on both sides of the fracking issue in Colorado. While there are countless local entities, three gender-exclusive organizations came up in the interviews, all of which began as women-only organizations, and two of which were centered on the role of being a mother.

Discussed above, Erie Rising depicts itself as a “mom powered organization” seeking to “help protect and advocate for the wellbeing of the families in communities affected by natural gas operations [and to] take actions and seek governmental support to keep our children safe and healthy, if and when necessary” (Erie Rising (3/6/13). This is reflective of a global pattern linking motherhood and energy resistance—The Mother’s Project—which aims to protect children worldwide from the negative impacts of energy extraction. On the flip side, a second group of women, identified as “Mothers in Love with Fracking” appeared at a Council meeting in one of my focus cities, demonstrating support for the industry, deeming fracking practices safe and economically desirable. Finally, the League of Women Voters of Colorado were mentioned in most interviews as hosting informative events and roundtable discussions on fracking over the last year.

While I am not aware of any fracking activist groups exclusive to dads or men, this does not indicate that there are no male activists. In fact, late last year an organization primarily consisting of ranchers and sportsmen were expending fundraising efforts to buy back leases from energy companies and protect the Thompson Divide (The Denver Post 11/15/12). This demonstrates that in activist circles, men and women may be successfully integrating gender-inclusive and gender-exclusive efforts in their push for safety regulations and standards—and their role within their own family may be impacting participation. While there are points of conflict between organizations on this issue, it also remains unclear if men and women are “doing” activism in the same way.

Gendered Roles in Industry, Governance, and Land and Resource Ownership

Despite the appearance of a fairly even playing field on activist fronts, questions of gender roles in industry, governance, and land and resource ownership demonstrate

that overwhelmingly, women's inputs are lacking in decision making rules, and thus they are having less influence on the way in which the state of Colorado moves forward with mitigating health risks associated with hydraulic fracturing. As mentioned previously, the oil and gas industry employs an overwhelming majority of men. However, within these companies, there are certain positions where women appear frequently—which tend to consist of high visibility positions, as public relation workers or company representatives. In doing this, it not only disguises the fact that women are an overwhelming minority employee in the industry; it makes women appear as the 'face' of the industry. By cloaking a company in this femininity, it appears an attempt to soften or mask industry toughness and masculinity, perhaps even reflecting an attempt to make companies appear less threatening. While it is unclear if this is intentional or not, one female activist also picked up on this discrepancy:

"The industry has made women spokespeople…it is very clever to have women do this. At a Planning Commission meeting, their attorney walked in, in an Armani suit, with a Coach bag, and I started talking to her. The first thing that she said was that she was a mother. It made me wonder, what sort of training do they have?"

If intentional, this type of action could be considered an extension of female exploitation, and perhaps even the exploitation of motherhood, which further obfuscates the role that motherhood plays in this context. While it is important to have women involved in the industry, it is potentially more important to have women represented across a variety of positions within an industry, including in top-decision making circles.

A lack of women in governance rules is also reflected in this preliminary research, as women were minorities in City Council meetings observed across both Northern Colorado communities. The lone female COGCC Commissioner further illustrates this point. Finally, studies have shown that societal power dynamics typically

leave women with less access to resources (Enarson and Morrow 1998). In a practice where decision making powers and opportunities for economic improvements are based on the ownership of mineral rights, it is plausible that the gendered resources gap again creates an unequal voice in decision making about what risks are deemed acceptable throughout fracking process. These equity imbalances hinder gender-inclusive collaboration, and are rarely scrutinized. In fact, gendered analyses are lacking across disaster, energy, and natural resource extraction literature as a whole (see Enarson and Morrow 1998; Faulkner 2008; O'Shaughnessy and Krogman 2011).

Conclusion

Here, I have tried to situate the practice of hydraulic fracturing in Colorado within the context of technological disasters. I have examined the way in which fracking can be considered a technological disaster, and I have attempted to create a less ambiguous understanding of the gendered "ambiguity of harm" that so often characterizes technological disasters. In addition, I have highlighted points of conflict and compromise over fracking practices, while recognizing that the way forward in addressing health concerns and mitigating a frack-tech disaster must include gender inclusive solutions.

Methodologically speaking, this paper advances the base of our social science knowledge on fracking via the database I created, which fuses the current and available fracking literature across educational, governance, and media sectors. Theoretically, my analysis draws attention to three important theoretical needs: (1) to frame the practice of hydraulic fracturing as capable of producing a new type of technological disaster, (2) to encourage a focus on gender-inclusive, collaborative mitigation strategies in the anticipation of a frack-tech disaster, and (2) to further address the gendered dynamics

of risks, vulnerabilities, and roles in relation to fracking, and technological disasters as a whole.

In addition, this paper advances gender and disaster studies by focusing on the way men and women are both impacted by, and can have influence on the process of fracking and its potential for hazardous consequences. In this way, my paper is a truly gender inclusive analysis within disaster research—characteristic of the call for gender studies to move beyond the study of women. By emphasizing the necessary, gender-inclusive pre-disaster work that might mitigate a fracking disaster or reduce the growth of a corrosive community, I also align my focus with current mitigation and resilience trends in the general disaster literature. I posit that this type of gender and disaster research is an imperative piece of identifying and forging a path forward that circumvents community recreancy, stress, and corrosiveness in a pre-disaster setting, and avoiding a disastrous event altogether. By addressing these issues, researchers and stakeholders can better identify models through which communities, industry, and government entities can accelerate a gender-equitable, collaborative approach to ensure safety, mitigate risk, and avoid a fracking-induced disaster in the future.

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