The Extractive Industries and Society xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

The Extractive Industries and Society

journal homepage: www.elsevier.com/locate/exis

Original article

Hydraulic fracturing: Assessing self-reported familiarity and the contributions of selected sources to self-reported knowledge

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ARTICLE INFO

Article history:
Received 19 June 2016
Received in revised form 9 November 2016
Accepted 10 November 2016
Available online xxx

Keywords:
Hydraulic fracturing
Eagle Ford shale
Survey research

ABSTRACT

Data collected from a random sample of individuals in two counties in the Eagle Ford Shale region of South Texas to examine (a) respondents' self-reported familiarity with the process of hydraulic fracturing and (b) the associations between the contributions of information sources to self-reported knowledge about hydraulic fracturing and self-reported levels of familiarity with the process of hydraulic fracturing. The results of this study revealed that survey respondents in the Eagle Ford Shale region of Texas are more familiar with the process of hydraulic fracturing than has been reported in other studies. Moreover, the findings indicated that self-reported levels of familiarity with the process of hydraulic fracturing were positively associated with certain sources of information. Among those sources that reached statistical significance, the strongest contributor to respondents' self-reported familiarity with hydraulic fracturing was information from the oil/natural gas industry.

1. Introduction

The industrial process of hydraulic fracturing—frequently referred to as *fracking* in the media, public discourse, peer-reviewed articles, and popular press writings—has been, and remains, a highly controversial topic in domestic and international discussions regarding shale energy development. The controversies surrounding hydraulic fracturing have sparked the conduct of timely and salient research studies in the United States and abroad by social, behavioral, and environmental scientists interested in investigating the pros and cons of shale oil and gas development. A rapidly growing body of domestic and international scientific literature has contributed to increased understandings of the multitude of objective and perceived issues associated with shale development and hydraulic fracturing, including economic issues (Considine et al., 2010; Kinnaman, 2011; Kelsey et al., 2011; Mason et al., 2015), public health issues (Colborn et al., 2011; Finkel and Law, 2011; Osborn et al., 2011; Schmidt, 2011; Shonkoff et al., 2014), environmental issues (Macey et al., 2014; Qingmin, 2015; Qingmin and Ashby, 2014; Olmstead et al., 2013; Jeff, 2012), and sociological issues (Anderson and Theodori, 2009; Crowe et al., 2015a,b; Davis and Fisk, 2014; Ellis et al., 2016; Hudgins, 2013; Kreuze et al., 2016; Ladd, 2013; Perry, 2012; Theodori, 2009, 2013; Weigle, 2011; Willits et al., 2013; Willow and Keefer, 2015).

Largely absent from the social scientific research conducted thus far are empirical studies directed toward assessing stakeholders' knowledge and understanding of shale development and the process of hydraulic fracturing itself. Of late, a small number of researchers have begun to measure perceived familiarity—also referred to "self-reported knowledge" or "perceived knowledge"(-Ladwig et al., 2012:762)—with shale development in general (Stedman et al., 2012, 2016; Willits et al., 2013) and hydraulic fracturing in particular (Boudet et al., 2014; Theodori et al., 2014; Willits et al., 2016a,b). Less empirical work has examined the sources of information that individuals use to become educated about shale development and hydraulic fracturing (Theodori et al., 2014). Despite these studies, perceived familiarity with shale development and hydraulic fracturing and the sources that contribute to self-reported knowledge of these topics remain underinvestigated (cf. Stedman et al., 2016). Paraphrasing recent assertions by Stedman et al. (2016), additional research is warranted to more fully comprehend the sources and processes by which members of the general public do, in fact, become informed. Robust research on such issues will result in an improved understanding of individuals' attitudes, behaviors, and behavioral intentions with respect to shale development and hydraulic fracturing. Moreover, the findings from such work has

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http://dx.doi.org/10.1016/j.exis.2016.11.003
2214-790X/

Table 1
Contributions made by fifteen sources of information to self-reported knowledge about hydraulic fracturing.

Sources of Information	n	Contributions to Self-Reported Knowledge of Hydraulic Fracturing	
		None/Very Little Percentage	Some/A Great Deal
Newspapers	107	35	65
Oil/natural gas industry	106	36	64
Internet websites	104	39	61
Neighbors	104	42	58
Friends in community	106	43	57
Landowner groups/coalitions	106	53	47
Social media	106	60	40
Conservation/environmental groups	106	61	39
Regulatory agencies	104	64	36
Texas A&M AgriLife Extension	105	72	28
University professors	106	74	26
Elected county officials	104	74	26
Gasland and/or *Gasland 2* (the films by Josh Fox)	104	77	23
Elected city officials	105	80	20
Religious leaders	107	85	15

the potential to affect energy policy, which has, and continues to be, influenced by public opinion.

The purpose of this paper is to add to the social scientific literature on shale development and hydraulic fracturing. Here, building upon previous research in the Marcellus Shale (Theodori et al., 2014; Willits et al., 2016a,b), we use data collected from a random sample of individuals in two counties in the Eagle Ford Shale region of South Texas to examine (a) respondents' self-reported familiarity with the process of hydraulic fracturing and (b) the associations between the contributions of information sources to self-reported knowledge about hydraulic fracturing and self-reported levels of familiarity with the process of hydraulic fracturing. Before describing the data, measurement, and findings, previous studies investigating individuals' familiarity with hydraulic fracturing are summarized.

2. Previous studies

Boudet et al. (2014) used data collected from a sample of United States citizens to explore several issues associated with hydraulic fracturing. These issues included: 'top of mind' associations, familiarity with hydraulic fracturing, levels of support/opposition for hydraulic fracturing, and possible factors that may be predictors of support for hydraulic fracturing. In their study, Boudet et al. (2014) measured familiarity with hydraulic fracturing with a single question. The question asked: How much have you ever heard or read about fracking? Response categories (as reported in Table 1 in their manuscript, p. 62) included: (1) not at all, (2) a little, (3) some, and (4) a lot. In the Findings section, Boudet et al. (2014:63) reported that "13% did not know how much they had heard; 39% had heard nothing at all; 16% heard 'a little'; 22% heard 'some'; and 9% heard 'a lot.'"[1] The results of their hierarchical multiple regression analysis relating demographics, geographic location, worldviews, political ideology, media use frequency, familiarity with fracking, and 'top of mind' associations to support/opposition for hydraulic fracturing revealed that individuals who were more familiar with hydraulic fracturing were more likely than their counterparts to oppose hydraulic fracturing. Furthermore, their results illustrated that women, individuals holding egalitarian worldviews, individuals who read newspapers more than once a week, and individuals who associate hydraulic fracturing with environmental impacts were more likely than their counterparts to oppose fracking. Concomitantly, they found that older individuals, those with a bachelor's degree or higher, those who are politically conservative, those who watch TV news more than once a week, and those who associate hydraulic fracturing with positive economic or energy supply outcomes were more likely than their counterparts to support the process.

Theodori et al. (2014) used survey data gathered in Pennsylvania's Marcellus Shale region to investigate individuals' levels of familiarity with: (1) the process of hydraulic fracturing; (2) the management and disposal of frac flowback wastewater; and (3) frac flowback wastewater treatment technology. In doing so, they examined the contribution made to self-reported knowledge of hydraulic fracturing by eight different sources and the amount of trust in each of the same sources to deliver unbiased, factual knowledge about the topic. Then, building upon previous research on the public's perception of produced water (Theodori et al., 2009, 2011), Theodori et al. (2014) assessed individuals' level of agreement that treated wastewater from hydraulic fracturing operations could safely be used for eight selected purposes. Theodori et al. (2014) also evaluated the associations between level of familiarity with frac flowback wastewater treatment technology and the proposed potential uses of treated wastewater. Differences in the information reported by survey respondents living in high well-density counties (20 or more wells per 100 square miles) and their counterparts living in low well-density counties (fewer than 20 wells per 100 square miles) were examined.

In the Theodori et al. (2014) study, familiarity with the process of hydraulic fracturing was assessed using a single survey item that ranged from 1 (extremely unfamiliar) to 7 (extremely familiar). Findings revealed the overall mean level of familiarity with the process of hydraulic fracturing was 3.73 (SD = 1.91). Their descriptive results indicated a more or less symmetrical distribution – 40% of respondents indicated having some level of familiarity with the process of hydraulic fracturing (scores 5 through 7 on the 7-point familiarity scale); 43% of respondents reported being unfamiliar with the process (scores 1 through 3 on the7-point familiarity scale). Although they did not state a formal hypothesis, Theodori et al. (2014) assumed there would be a difference in the level of familiarity between residents in areas with low and high levels of natural gas drilling activity. Such was the case. As reflected by the results of an analysis of covariance, individuals living in the high well-density counties were significantly more familiar with the process than their counterparts living in low well-density counties, net of control factors (high well-density counties M = 3.90, SD = 1.89; low well-density counties M = 3.55, SD = 1.92 ($p < 0.05$)).

[1] A discrepancy exists between the response categories listed in Boudet et al.'s (2014) Table 1 and their Findings section.

Please cite this article in press as: G.L. Theodori, C. Ellis, Hydraulic fracturing: Assessing self-reported familiarity and the contributions of selected sources to self-reported knowledge, Extr. Ind. Soc. (2016), http://dx.doi.org/10.1016/j.exis.2016.11.003