

How Do Environmental News and the *Under the Dome* Documentary Influence Air-Pollution Knowledge and Risk Perception Among Beijing Residents?

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Abstract

To examine Beijing residents' risk perception of contracting smog-related diseases, we proposed a model in which air-pollution knowledge is a theoretical mechanism accounting for the influence on risk perception of exposure to environmental news and exposure to *Under the Dome*, an environmental documentary about smog in China, which has been censored. Data ($N = 523$) were collected from Beijing residents from February to March in 2017. We analyzed the data using Hayes' PROCESS macro. Findings revealed that environmental-news exposure is positively associated with both air-pollution knowledge and risk perception. Exposure to environmental news has an indirect effect on risk perception through air-pollution knowledge. Exposure to *Under the Dome* is positively related to risk perception but is not related to air-pollution knowledge. We contributed to the literature by empirically testing the impact of *Under the Dome*, which has been largely studied via the critical theory approach. Implications included that *Under the Dome* is a successful risk communication model and that its impact goes beyond increasing public risk perception of smog.

Keywords

air pollution, smog, media exposure, knowledge, risk perception, *Under the Dome*

In recent years, severe smog has become a major threat to public health in many large cities in China, including Beijing (Berlinger et al., 2017), and “one of the most urgent issues on China's public agenda” (S. Chen, 2018, p. 1). While residents in China may count on the Chinese government for implementing policies and regulations to reduce the smog, they can also engage in protective behaviors on their own to alleviate the health threat that it represents. Among possible psychological constructs motivating people to take individual actions to reduce the threat of a hazard, risk perception of that hazard has been consistently found as a significant predictor of behavioral outcomes (e.g., Flanquart et al., 2013; Zhou et al., 2016). Risk perception refers to the product of the *perceived probability* of occurrence of a threat (i.e., harm, hazard) and *perceived severity* of that threat (Kasperson et al., 1988). One possible way to increase individuals' risk perception of a hazard is through delivering environmental news or environmental campaigns to the public (Wu & Li, 2017).

Among all environmental campaigns, *Under the Dome* stands out as the most influential documentary in China about environmental protection (Han, 2016). *Under the Dome* is a multimedia documentary about smog in China produced by Chai Jing, a well-known former newscaster for

China Central Television (Chai, 2015; Kuhn, 2015). The documentary was released online on February 28, 2015, and immediately went viral: Within 24 hr of its release, it received 117 million views and 280 million online comments on various websites (“Translation: Why Chai Jing Got the Chop,” 2015). Despite its strong resonance with the public, it was censored within a week of its launch in China (Wong, 2015), although it is still available on YouTube. As a result, there are many Chinese residents who have never seen it.

To date, no scientific study has empirically examined the potential impacts of environmental-news exposure, as well as *Under the Dome* exposure, on Chinese people's air-pollution knowledge and risk perception of smog, which are important constructs predicting protective responses to environmental threats (Shi et al., 2016; Wu & Li, 2017). The present study has two major goals. The first is to test the effects of exposure to environmental news or *Under the*

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Dome on air-pollution knowledge and risk perception. The second is to examine whether air-pollution knowledge serves as a mechanism linking environmental-news exposure or *Under the Dome* exposure to risk perception. Below, we first review social cognitive theory (SCT) as a theoretical framework for this study; then we discuss empirical findings related to mass media exposure, knowledge, and risk perception; finally, we propose a theoretical model to guide our data collection.

Social Cognitive Theory

In the SCT model of triadic reciprocal causation, the three factors—personal factors (e.g., cognition, feelings), environmental factors, and behavior—are constantly influencing each other bi-directionally (Bandura, 1986). SCT has been recommended as a framework for studying the effects of mass media on human cognitions, affect, and behaviors (Bandura, 2001). We identify media exposure as an environmental factor and knowledge and risk perception as cognitive factors. According to the SCT framework, media exposure can influence both knowledge and risk perception (Bandura, 1986). In other words, SCT suggests a general main effect of media exposure on subjective risk knowledge and risk perception. Applying SCT in the context of environmental media covering air pollution/smog, individuals who have more exposure to such media, either ordinary news or special documentaries, are likely to have increased air-pollution knowledge and heightened risk perception of air pollution. SCT has been used in studies involving media exposure and risk perception (e.g., X. Li, 2018; Y. Li et al., 2014), which have proposed a positive relationship between these two. For example, X. Li (2018) demonstrated that exposure to media coverage of the 2014 Ebola epidemic (a public health emergency at that time) is positively associated with risk perception of the epidemic. Y. Li et al. (2014) suggested that individuals' extent of exposure to media positively influences their risk perceptions of various environmental hazards. To our knowledge, the present research is the first to apply the SCT in the context of smog.

Potential Impacts of Exposure to Environmental News

Scholars on media and risk propose that media play an important role in providing risk knowledge to the public and influencing their risk perceptions (e.g., Bakir, 2010; Henderson et al., 2014), which is in line with the theoretical argument of SCT (Bandura, 1986). Early research shows that traditional media are able to enhance factual knowledge and public awareness of health issues (Rogers & Storey, 1987). For example, Chew et al. (2002) found that exposure to a health-promoting television series increased both health knowledge and health risk perception of program viewers. Recent research also confirms the impacts of social media on

cognitive responses to specific threats. For instance, Y. Chen (2018) reported that exposure to prevention messages from both traditional and social media increased risk perceptions of binge drinking among college students. In the context of air pollution, Wu and Li (2017) found that haze risk perception is predicted by both mass-media exposure and social-network site involvement related to haze, though the latter had a stronger effect on risk perception. Q. Huang's (2018) study showed that the use of news media or social media has a positive impact on risk perception of air pollution in China. In sum, these findings have generally supported SCT (Bandura, 1986) in terms of the impact of environmental-news exposure on air-pollution knowledge or risk perception. Based on SCT and the empirical findings reviewed above, we pose the following two hypotheses:

Hypothesis 1 (H1): Exposure to environmental news is positively related to air-pollution knowledge.

Hypothesis 2 (H2): Exposure to environmental news is positively related to risk perception.

Potential Impacts of Exposure to *Under the Dome*

We decided to explore the influence on knowledge/risk perception of *Under the Dome* separate from environmental news, as the former is a TED (Technology, Entertainment, Design)-talk-style educational campaign, while the latter belongs to mainstream media. Moreover, environmental news represents daily ordinary presentations of information; in contrast, *Under the Dome* represents much more concentrated, in-depth, and specialized presentations of information, and these presentations have constituted what Dayan and Katz (1992) referred to as a media event. Much like a national holiday, a media event demands that the public stop other activities to celebrate the event; this celebration makes it possible to radically transform public opinion on a major social issue. Thus, *Under the Dome* may have a more profound social impact than environmental news from mainstream media.

In the *Under the Dome* documentary, Chai (2015) sought to answer three questions: "What is smog? Where does it come from? What can we do about this?" In response to these questions, she cited data provided by researchers, utilized images, charts, and historical clips, as well as drawing upon interviews with government officials and site visits to cities experiencing air pollution (Chai, 2015). The documentary also gives the audience a crash course on the harms caused by tiny particles of smog, including damaging the lungs, the immune system, and the heart (Chai, 2015). Powers (2016), in her review of the documentary, suggested that it satisfied Chinese people's need for understanding the smog phenomenon and obtaining knowledge about air pollution. Deng (2016) praised the documentary for striking a balance between, on one hand, scientific rigor in its extensive use of technical terminology and data and, on the other,

accessibility to a lay audience through the use of animation and other graphics. Therefore, it is likely that individuals who have watched the documentary possess more air-pollution knowledge than those who have not.

Some critical-study scholars have argued that the documentary has had significant social impacts. For example, Han (2016) studied it as a communication practice through the perspective of media activism, arguing that the documentary has attracted extensive public attention and generated profound public resonance and social impact, and that its ability to raise public awareness of and promote collective action against the smog problem has *outperformed* the mainstream media in China. Similarly, F. Yang (2016), in an analysis of the documentary as a viral media event, argued that the rapid and widespread distribution of the documentary made it “a significant event in alerting the public to the severity of the issue of smog” (p. 235) and verified its effect in “raising the public awareness of China’s impending ‘air-pocalypse’” (p. 236). Thus, the *Under the Dome* documentary might carry a significant impact on viewers’ risk perception related to air pollution/smog, beyond the influence of mainstream media in China, due to its rapid distribution on various websites, including social media, after it was launched and before it was censored (“Translation: Why Chai Jing Got the Chop,” 2015).

There have been some empirical data supporting the above arguments by media scholars using critical approaches, who usually study communication phenomena through specific cases (e.g., Deng, 2016; Han, 2016; F. Yang, 2016). For example, according to survey data collected by Zol Data Center (2015), an internet consumer research center in China, 67.9% of people who have watched the documentary commented that it provided them a comprehensive and in-depth understanding of smog, indicating the documentary’s influence on knowledge. In addition, J. Huang and Yang (2020) reported that exposure to *Under the Dome* is positively related to Chinese citizens’ risk perception about air pollution. In light of the critical analyses and empirical findings reviewed above, we pose the following two hypotheses:

Hypothesis 3 (H3): Individuals who have had *Exposure to Under the Dome* have more *air-pollution knowledge* than those who have not.

Hypothesis 4 (H4): Individuals who have had *Exposure to Under the Dome* have higher *risk perception* than those who have not.

Air-Pollution Knowledge and Perceived Risk

According to the Oxford English Dictionary, knowledge refers to “facts, information, and skills acquired through experience or education” and “the theoretical or practical understanding of a subject” (Oxford Languages, 2020). We

define air-pollution knowledge as the theoretical or practical understanding of air pollution, which includes knowing how to judge air quality and knowing the causes and consequences of air pollution and ways to reduce it. “Knowledge is and should be important in risk perception” (Johnson, 1993, p. 189). An individual’s level of knowledge regarding a hazard is a micro-level factor affecting risk perception (Campbell Institute, 2015).

There are multiple conceptions of risk in the extant literature. Risk has been understood as a hazard, as probability, as a consequence, or as potential adversity or threat (Slovic & Weber, 2011). In the area of risk communication, risk often refers to the probability/likelihood of a harm’s or hazard’s occurrence; accordingly, risk perception is often defined as subjective judgments about risks—perceived probability of negative consequences (e.g., injury, illness, disease, and death; Paek & Hove, 2017). On the other hand, risk has been defined as a joint function of the probability of occurrence of a threat (i.e., harm, hazard) and the severity of that threat (Kasperson et al., 1988). Specifically, risk is the product of these two factors and can be computed by the formula $\text{Risk} = \text{Probability} \times \text{Severity}$. Hence, risk perception is conceptualized as a two-dimensional construct: the product of perceived probability of a negative event and perceived severity of that event. We adopted this definition of risk because both theoretical reasoning and empirical data support the notion of risk perception as a product term (Weinstein, 2000).

The important role of hazard knowledge in risk perception has been recognized in the literature. Chew et al. (2002) found that, among viewers of a health series, those with more health knowledge also believed that they were more susceptible to a medical condition, suggesting a positive association between knowledge and risk perception. Mou and Lin (2014) found that the Chinese public’s use of Weibo (a microblog platform) contributes to food-safety knowledge, which increases food-safety risk perception. Shi et al. (2016) reported that higher levels of knowledge about the causes of climate change were associated with a heightened risk perception regarding climate change, arguing that attempts to improve public knowledge are a vital part of the effort to combat climate change. Specifically to the context of air pollution, Z. Li et al. (2016) found that environmental knowledge had a positive impact on risk perception of air pollution among Chinese residents living in a mining area. In addition, J. Z. Yang and Huang’s (2019) study on Chinese citizens’ information seeking about air pollution indicated that there is a positive correlation between subjective knowledge about air pollution and risk perception of air pollution, but the study did not examine whether the former is predictive of the latter. In sum, it appears that more knowledge of air pollution will lead to a higher risk perception of air pollution. Thus, we pose the following hypothesis:

Hypothesis 5 (H5): Air-pollution knowledge is positively related to risk perception.

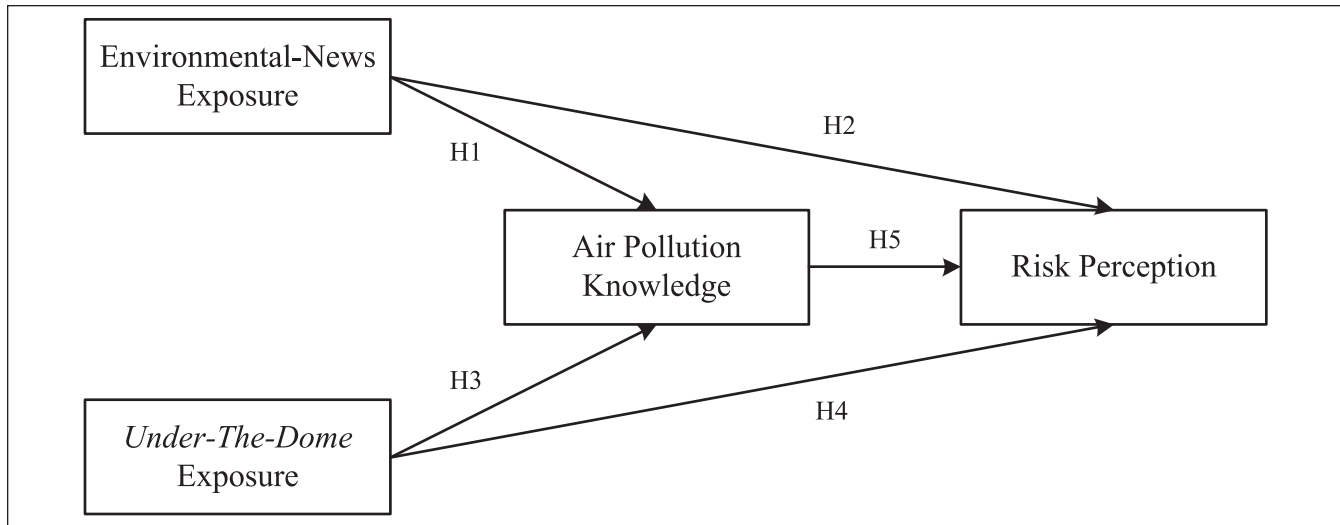


Figure 1. Hypothesized conceptual model.

Note. Risk perception = risk perception of contracting smog-related diseases.

The Mediating Role of Air-Pollution Knowledge

Risk perception can be influenced by numerous factors, which can function at a macro-level (i.e., structural or institutional level) or a micro-level (i.e., individual psychological level; Campbell Institute, 2015). Media exposure (e.g., exposure to environmental news or *Under the Dome*) is a macro-level factor of risk perception, as “media have emerged as a social institution” (Silverblatt, 2004, p. 35). By contrast, an individual’s knowledge of a particular hazard (e.g., air-pollution) is a micro-level factor. It is probable that media exposure exerts its influence on risk perception by changing individuals’ risk knowledge. In the context of air pollution, media exposure may facilitate the formation of risk perception through providing air-pollution knowledge to the public.

To our knowledge, no research to date has tested the above mechanism in the context of smog. However, a few studies have indicated the potential mediating role of air-pollution knowledge. For example, Z. Li et al. (2016) proposed environmental knowledge as a mediator between a series of exogenous variables (e.g., age, work environment) and risk perception of air pollution, though they did not include media exposure as an exogenous variable in their study. Wu and Li (2017), in discussing their study’s limitations, suggested that future researchers should take into consideration the mediating role of knowledge about haze when examining the influence of media exposure on risk perception. They also suggested asking participants, “what media contents they were actually exposed to” as a practical approach to improve their study (p. 3991). Due to the lack of empirical studies testing this mechanism, and in response to Wu and Li’s (2017) recommendations, we pose the following research questions:

Research Question 1 (RQ1): Does air-pollution knowledge mediate the relationship between exposure to environmental news and risk perception?

Research Question 2 (RQ2): Does air-pollution knowledge mediate the relationship between exposure to *Under the Dome* and risk perception?

Figure 1 shows a conceptual model predicting *risk perception* with *environmental-news exposure* and *Under the Dome exposure* as the independent variables and *air-pollution knowledge* as the mediator.

Method

Survey Design and Procedure

The present study’s data collection was part of a large online survey that included measures of all variables in the hypothesized model, as well as demographic factors (i.e., gender, age, ethnicity, education, income, marital status, and health status). We first designed the survey in English and then translated it into Chinese using the back-translation method (Brislin, 1970), which ensured accuracy and clarity in the translation. The measures of major variables were taken or adapted from established scales in English.

After the study received institutional review board (IRB) approval, we used one of the largest online survey platforms in China to host the final Chinese version of the survey and to collect data. The online survey platform has users from various provinces/municipalities in China. Each user registers for a unique account with the platform website and participates in online surveys in exchange for credits from various websites which can be used for various expenses including shopping, gaming, and watching online movies/TV.

Participants

We decided to survey residents in Beijing, one of the largest cities in China that have experienced severe smog in recent years (Berlinger et al., 2017). Beijing's population at the end of 2016 was 21.729 million, with 51.2% male (Beijing Municipal Bureau of Statistics, 2017). We used convenience sampling, because it has several key advantages, including being "cheap, efficient, and simple to implement," although "the sample lacks clear generalizability" (Jager et al., 2017, p. 15). We used the online platform mentioned above to send the Chinese survey, we designed to users who were registered as Beijing residents, during a period from February to March in 2017, a time when Beijing had experienced severe smog several times, with more occasions of severe smog anticipated in the next couple of months. A total of 523 Beijing users participated in our survey and provided valid responses.

Measures

Individual characteristics including gender, age, ethnicity, education, income, marital status, and health status were measured. Health status was assessed by a single question: How would you describe your health status? The response scale ranged from 1 = *very poor* to 7 = *excellent*. Education was measured by a single question: What is the highest level of education you have completed? The response scale ranged from 1 = *junior high school*, 2 = *senior high school*, 3 = *college and bachelor's degree*, to 4 = *master's degree and above*.

Exposure to environmental news was measured by a stem item "In the past 6 months, how often have you watched environmental news on smog in the following media?" followed by: (a) print media; (b) electronic media; (c) internet, excluding social media; (d) social media (e.g., Weibo, WeChat). This measure was adapted from Z. J. Yang (2015). The response scales ranged from 1 = *never* to 7 = *all the time*. Items were averaged to create this measure. Cronbach's alpha, which assesses reliability of this measure, is .71.

Exposure to Under the Dome was measured by one item: "Have you ever watched the *Under the Dome* documentary of Chai Jing?" The response scales ranged from 1 = *no* to 2 = *yes*. Items were recoded so that 0 = *no* to 1 = *yes*. Similar items have been used by previous studies to measure exposure to prevention messages (e.g., Y. Chen & Feeley, 2018; Z. J. Yang, 2015).

Air-pollution knowledge was operationalized as subjective air-pollution knowledge and was assessed by the self-reporting technique. Specifically, it was measured by five items: (a) I know the meaning of PM2.5; (b) I know how to judge air quality; (c) I know what causes smog; (d) I know the possible consequences of smog on human health; (e) I know the potential ways to reduce the frequency of smog. This measure was adapted from Qian et al. (2016). The

response scales ranged from 1 = *strongly disagree* to 7 = *strongly agree*. Items were averaged to create this measure. Cronbach's alpha is .82 for this measure.

Risk perception consists of two dimensions: perceived susceptibility and perceived severity. *Perceived susceptibility* was measured by the three items below: (a) I am at risk of contracting smog-related diseases (Witte et al., 1996); (b) It is likely that I will contract smog-related diseases (Umphrey, 2003); (c) I am susceptible to smog-related diseases (Umphrey, 2003). The response scales ranged from 1 = *strongly disagree* to 7 = *strongly agree*. Items were averaged to create this measure. Cronbach's alpha is .86 for this measure. *Perceived severity* was measured by a stem item "If I caught smog-related diseases, for me this would be a . . ." followed by: (a) scary thing; (b) severe thing; (c) bad thing. These items were adapted from Witte et al. (1996). The response scales ranged from 1 = *strongly disagree* to 7 = *strongly agree*. Items were averaged to create this measure. Cronbach's alpha is .91 for this measure. A new variable was calculated by multiplying *perceived susceptibility* and *perceived Severity*; then a square root transformation was performed on this new variable that resulted in a measure of *risk perception* of contracting smog-related diseases on a scale from 1 = *low* to 7 = *high*. This procedure has been applied and recommended by previous researchers (e.g., de Zwart et al., 2009).

Analysis Plan

We used Hayes' (2013) PROCESS macro to test the hypotheses and answer research questions. We planned to run two mediation models (Model 4 in PROCESS): The first is with *risk perception* as the outcome variable, *environmental-news exposure* as the independent variable, *air-pollution knowledge* as the mediator, and demographic factors and *Under the Dome exposure* as the control variables. The second is with *risk perception* as the outcome variable, *Under the Dome exposure* as the independent variable, *air-pollution knowledge* as the mediator, and demographic factors and *environmental-news exposure* as the control variables. The number of bootstrap samples for bias-corrected confidence interval was set as 1,000.

Results

Sample Characteristics, Descriptive Statistics, and Correlations

The present study's final sample was 523 Beijing residents, who participated in our survey and provided valid responses. The sample had 44.7% males. The average age of participants was 33.4 (range, 18–72), and most participants (95%) were of the Han ethnicity. Their average health status was close to fair ($M = 5.2$, $SD = 1.1$). The sample reflected a

Table 1. Descriptive Statistics of Major Variables.

Variable	Minimum	Maximum	M	SD
Environmental-news exposure	1	7	5.15	1.04
<i>Under the Dome</i> exposure	0	1	0.61	0.49
Air-pollution knowledge	1	7	5.38	0.97
Risk perception	1	7	5.40	1.11

Table 2. Zero-Order Correlation Matrix of Major Variables.

Variable	1	2	3	4
1. Environmental-news exposure	—	.177**	.467**	.260**
2. <i>Under the Dome</i> exposure (0 = no; 1 = yes)		—	.135**	.185**
3. Air-pollution knowledge			—	.241**
4. Risk perception				—

** $p < .01$.

high education level: A majority (76.9%) of participants had college or a bachelor's degree, while 17% participants had a master's degree or above; few participants (5.7%) had senior high school education, and very few participants (0.4%) had only junior high school education. The average monthly income of participants was 8,170 Chinese Yuan (i.e., US\$1,187),¹ and a majority (61.8%) of them were married. A total of 320 (61.2%) participants have watched the documentary while 203 (38.8%) participants have not. Table 1 shows descriptive statistics and Table 2 shows a zero-order correlation matrix of major variables.

Predicting Risk Perception

We conducted path analysis using the PROCESS macro developed by Hayes (2013). PROCESS is a path analysis modeling tool widely used in the social, behavioral, and health sciences (Hayes, 2013). The first mediation model mentioned in the "Analysis Plan" section was significant and explained 17.4% of the variance, $R^2 = .174$, $F(10, 512) = 10.81$, $p < .001$. The results showed that environmental-news exposure was significantly and positively associated with both air-pollution knowledge, $B = .412$, $SE(B) = 0.037$, $\beta = .440$, $p < .001$, and risk perception, $B = .167$, $SE(B) = 0.049$, $\beta = .156$, $p = .001$. Thus, both H1 and H2 were supported.

The results showed that *Under the Dome* exposure was not associated with air-pollution knowledge, $B = .082$, $SE(B) = 0.079$, $\beta = .041$, $p = .304$, but was significantly and positively associated with risk perception, $B = .257$, $SE(B) = 0.095$, $\beta = .113$, $p = .007$. Therefore, H3 was not supported; however, H4 was supported.

The results also showed that air-pollution knowledge was significantly and positively associated with risk perception, $B = .204$, $SE(B) = 0.053$, $\beta = .178$, $p < .001$. Thus, H5 was supported.

The bootstrap mediation analysis found that environmental-news exposure had a significant indirect effect on risk perception through air-pollution knowledge, $B = .084$, 95% CI: [0.033, 0.153], $SE(B) = 0.029$, $\beta = .078$, answering RQ1.

As *Under the Dome* exposure was not associated with air-pollution knowledge, it is not necessary to run the second mediation model mentioned in the "Analysis Plan" section. *Under the Dome* exposure did not have a significant indirect effect on risk perception through air-pollution knowledge, thus RQ2 was addressed. Figure 2 shows the final tested model with the standardized path coefficient (i.e., β value) for each path.

Discussion

In recent years, severe smog has become a major threat to public health in Beijing. To examine Beijing residents' risk perception of contracting smog-related diseases, we proposed a conceptual model in which air-pollution knowledge is a theoretical mechanism accounting for the influence of environmental-media exposure on risk perception. Data were collected from Beijing residents from February to March in 2017, a time when Beijing had, on numerous occasions, experienced severe smog lasting for several days, with more such occasions anticipated. Analyses of our sample ($N = 523$) provided partial support for the proposed model: Exposure to environmental news is positively associated with both air-pollution knowledge and risk perception; exposure to environmental news has an indirect effect on risk perception through air-pollution knowledge; exposure to *Under the Dome* is not related to knowledge but is positively related to risk perception. Below we discuss the implications of findings.

Interpretation of Findings

An important finding of this study is that participants who have more exposure to environmental news will have more air-pollution knowledge and higher risk perception. This finding supports SCT's argument that environmental factors such as exposure to environmental news will influence cognition (e.g., knowledge, risk perception; Bandura, 1986). More importantly, it confirms the impact of mass media at the *personal* level. Some studies (e.g., Shrum & Bischak, 2001) have suggested that media enhance risk perception primarily at the *social level*, but not at the *personal level*. The

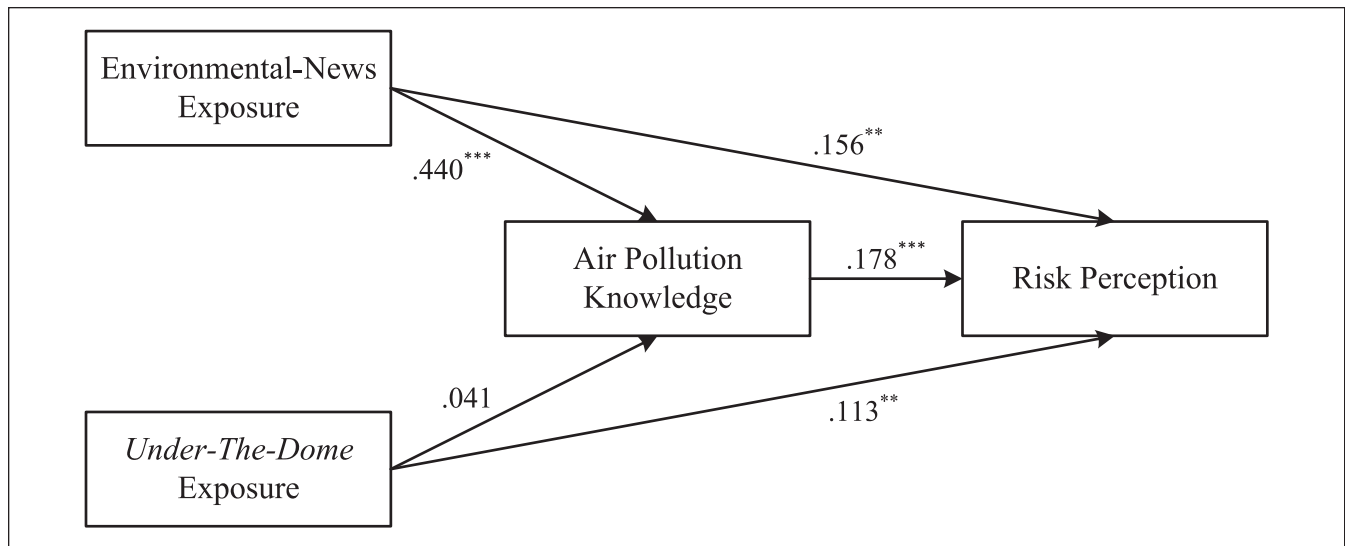


Figure 2. Final tested model with standardized path coefficients.
 Note. Risk perception = risk perception of contracting smog-related diseases.
 ** $p < .01$. *** $p < .001$.

present finding suggests that repeated exposure to environmental news can have significant influences at the personal level. This finding is also in line with Noar's (2006) review, which concluded that mass media can have small-to-moderate effects on a series of outcomes, including health knowledge, beliefs, and attitudes.

A second interesting finding is that *Under the Dome* exposure is not related to air-pollution knowledge, but significantly increases risk perception. *Under the Dome* is a media event that happened 2 years before the present survey study was conducted. As it was censored a week after its launch (Wong, 2015), many participants who reported having watched it might have been exposed to the documentary only at that time (i.e., February–March in 2015). For those participants, some or all of the information gained from the documentary might have been forgotten during the 2-year time lapse. This is probably one of the reasons that exposure to the documentary does not contribute to participants' air-pollution knowledge. In contrast, exposure to environmental news from mainstream media was likely to have occurred much more recently when participants filled out the present survey. This recency effect may explain why exposure to environmental news had a much stronger effect in boosting knowledge than exposure to *Under the Dome*. On the contrary, the fact that *Under the Dome* exposure increases risk perception is in line with J. Huang and Yang's (2020) finding and may suggest the amplification effect of a noteworthy media event on risk perception. Specifically, focused and in-depth presentations of information using a "TED-talk" style, such as *Under the Dome*, are able to amplify individuals' perceptions of risk.

A third important finding is that participants who have more air-pollution knowledge will have higher risk perception. Unfortunately, no existing studies have examined the

direct relationship between air-pollution knowledge and risk perception. Some studies have suggested that improving climate-change knowledge is an ineffective strategy to increase risk perception, which is subjective and is largely determined by values, not factual knowledge (e.g., Kahan et al., 2012; Kellstedt et al., 2008). Air pollution and climate change are both environmental issues and have mutual influences on each other: Air pollution results in changes to the climate, while climate change is making air pollution worse (U.S. Environmental Protection Agency, 2020). However, air pollution and climate change are issues with different scopes. Air pollution is a regional or local issue, often occurring in cities with large populations or close to heavy industry, and thus people living in those cities are likely to perceive it as a very close issue, which is highly relevant to their everyday lives. In contrast, climate change is a global issue and is likely to be perceived by many people as distant and not very relevant to them. There is also evidence that talking about air pollution is more likely to receive policy support than talking about climate change (Hart & Feldman, 2018). This probably explains why previous studies found improving climate-change knowledge is not effective in increasing risk perception, (e.g., Kahan et al., 2012; Kellstedt et al., 2008), while we found improving air-pollution knowledge is effective in increasing risk perception.

On the contrary, the risk-as-feeling hypothesis argues that risk perception is closely related to feelings toward the hazard (Loewenstein et al., 2001). The present finding suggests that, while risk perception may be influenced by values and feelings, the impact of risk knowledge on risk perception cannot be ignored. In other words, perhaps only after individuals perceive that their factual knowledge of the hazard is sufficient will they feel that they can adequately assess their risk of the hazard.

A fourth important finding is that air-pollution knowledge mediates the relationship between exposure to environmental news and risk perception. Risk perception is often theorized to be a mechanism accounting for the effects of media exposure on health/risk behaviors (e.g., Y. Chen, 2018; Chew et al., 2002). However, how media exposure influences risk perception is comparatively less explored. The present finding fills the gap in the literature by suggesting that media exposure may augment risk perception by improving individuals' perceptions of factual knowledge. Specifically, repeated exposure to environmental news from mainstream media can increase risk knowledge, which in turn contributes to the development of risk perception. Based on this finding, improving public knowledge of hazards through environmental-news delivery is a promising approach to the formation of the public's risk assessments. Such risk assessment may be more rational, as it relies upon perceptions of factual knowledge generalized from scientific findings.

Theoretical Implications

This study has two important theoretical implications. First, we proposed a theoretical mechanism for the influence of media exposure on risk perception. Specifically, media exposure may carry an impact on risk perception through the pathway of hazard knowledge. It should be noted that SCT only specifies a potential main effect of media exposure on knowledge or risk perception (Bandura, 1986). Extant studies have largely focused on risk perception as a pathway between media exposure and behavioral outcomes (e.g., Y. Chen & Yang, 2015; Chew et al., 2002). The mechanism by which media exposure influences risk perception remains unknown. By proposing knowledge as a theoretical mechanism between media exposure and risk perception, we argue that media exposure may function on risk perception through a mediating model, in addition to a main-effect model, thus answering a question that has not been addressed by SCT (Bandura, 1986). Second, that knowledge serves as a theoretical mechanism linking media exposure to risk perception suggests that *rational* assessment of hazard probability and severity is an important component of risk perception, although previous scholars have proposed alternative perspectives such as risk as feelings (Loewenstein et al., 2001) and risk as values (Finucane & Holup, 2006).

Practical Implications

In practice, this study suggests that environmental news from mainstream media has been successful in increasing Beijing residents' air-pollution knowledge and risk perception of air pollution. While the documentary was *not* found to improve knowledge, probably because it is not a recent media event, it was found to enhance risk perception beyond the impact of environmental news. Although the documentary had been censored in China since early March in 2015 (Wong, 2015), it already had a profound impact on the public due to its viral

distribution before the censorship (Cui, 2017). Before watching the documentary, many people in China misunderstood the smog as "fog": something that causes daily inconvenience and temporary symptoms, such as coughing and irritation of the eyes, nose, and throat, during the winter seasons. Such misunderstanding might have downplayed the risks of smog. Only after watching the documentary have they started to realize that the "fog" covering their cities in winter is very likely (i.e., the probability dimension of risk) to lead to lung and heart diseases and may be deadly (i.e., the severity dimension of risk; Powers, 2016). Perhaps it is not only the information contained in the documentary but also its speedy distribution, that has raised public awareness of the air pollution problem surrounding China for the past 10 years and has subsequently created a public outcry to reduce air pollution.

Since the documentary was launched, China's central government has been under great public pressure to reduce air pollution (Lee, 2015), despite the censorship of the documentary in China. This public pressure has prompted the government to take a series of administrative steps to improve air quality since 2015 (Jia & Wang, 2017). These steps have been effective: Recent pollution levels in Beijing have fallen sharply, dropping 53% in the last 3 months of 2017, compared with the last 3 months of 2016, based on a Greenpeace analysis of government data (Myers, 2018). The improvement in air quality in Beijing may indicate that the value of the *Under the Dome* documentary goes beyond increasing public risk perception, to inspiring civic engagement in reducing air pollution and improving environmental protection (Cui, 2017), and finally to the central government's taking action to address public demands (Jia & Wang, 2017).

As exposure to *Under the Dome* significantly improved risk perception, and this effect was similar to the effect of ordinary environmental-news exposure, we believe *Under the Dome* is a successful risk communication model that can be imitated by other risk-communication practitioners. We applaud the effort of Chai Jing in producing it, an endeavor that certainly demanded a lot of courage and bravery. We advocate the production and circulation of more such documentaries in the future, in the hopes that informing the Chinese public of the risks posed by air pollution will result in public demand to improve environmental conditions in China and diminish threats to public health.

Limitations

This study has several limitations. One limitation is that all measures were based on self-report. Thus, social desirability might be an issue. For example, we measured air-pollution knowledge using a scale of subjective knowledge, not a scale of objective knowledge assessing scientific factual knowledge. As such, some participants might exaggerate their air-pollution knowledge. However, there is evidence that subjective environmental knowledge is a significant predictor of environmental risk perception, while objective (i.e., factual) environmental knowledge is not (Onel &

Mukherjee, 2016). Therefore, perhaps subjective knowledge, rather than objective knowledge, represents a more appropriate theoretical mechanism of the knowledge pathway between media exposure and risk perception.

The second limitation is that the measure of Exposure to Environmental News only considers environmental news on smog to which participants were exposed through different types of media (e.g., print media, social media); it does not consider whether such environmental news aims to trigger a cognitive response or an emotional response. It should be noted that differences like these in the framing of environmental news on smog may produce different impacts on the outcome variables (e.g., risk perception). However, due to the strictly controlled media environment in China (Xu & Albert, 2017), news stories on sensitive topics like smog will not differ much from one another. Specifically, because environmental news on smog is considered a sensitive topic in China, all reporting is required by the central government to follow official press releases from the state-run Xinhua News Agency; anything deviating from Xinhua will be censored (U.S. House, 2011).

The third limitation is that we only examined air-pollution knowledge as a potential mediator. In reality, other factors such as worry (Y. Chen & Yang, 2017; Peipins et al., 2015) or self-efficacy (Hofstetter et al., 2001; Zhou et al., 2016) might also account for the relationship between media exposure and risk perception. Fourth, we used a convenience sample, thus the findings of our study may have limited generalizability (i.e., external validity). Fifth, due to the cross-sectional nature of this study, causal inferences of our findings should be interpreted with caution.

Finally, as the documentary had been censored in China since early March of 2015, some participants who reported having watched the documentary had to make a special effort to bypass the “Great Firewall of China” in order to find it on YouTube. Those participants may already have had high-risk perceptions before watching the documentary, but there may be many factors at play. For example, censorship may create psychological reactance, “the motivational state that is hypothesized to occur when a freedom is eliminated or threatened with elimination” (Brehm & Brehm, 1981, p. 37) and can be modeled as “a combination of anger and negative cognitions” (Quick & Stephenson, 2007, p. 255). Future research may want to examine the role of censorship on individuals’ feelings and cognitions related to smog/air pollution.

Conclusion

Despite the limitations mentioned above, this study represents an initial effort to test the potential impacts of exposure to environmental media, with news from mainstream media and a noteworthy documentary being examined separately. Findings suggest that environmental-news exposure has been successful in increasing Beijing residents’ air-pollution knowledge and risk perception of contracting smog-related diseases. Findings also indicate that increased

air-pollution knowledge due to exposure to environmental news will, in turn, boost risk perception among Beijing residents, providing partial support to the proposed mediational model. In contrast to most extant research related to *Under the Dome*, which generally used a critical-study approach (e.g., Deng, 2016; Han, 2016; F. Yang, 2016), we have explored its potential impact through constructing a theoretical model and empirically testing it with inferential statistics. Although we did not find a significant relationship between *Under the Dome* exposure and knowledge, we did demonstrate that *Under the Dome* exposure is able to amplify risk perception, beyond the influence generated by mainstream environmental news. The *Under the Dome* documentary has significant personal and societal value to contemporary China in terms of enhancing public perceptions of risks related to smog.

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Ethics Statement

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Note

1. One USD was equivalent to 6.8821 Chinese Yuan on March 1, 2017 (visit <https://www.exchange-rates.org/Rate/USD/CNY/3-1-2017>).

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