

# Media Coverage and Citizens' Perceptions of Food Safety in Urban China

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## ABSTRACT

Given the lingering and rampant food scandals over the past decade, food safety has been among Chinese residents' top concerns. In this paper, we empirically examine the effects of media coverage of food scandals on citizens' food safety perceptions. We draw on a nationwide telephone survey of citizens in 160 cities across China, and use a multilevel model to estimate the results. We find that the number of media reported food scandals are negatively related to citizen satisfaction with food safety, which means citizens in cities with more media coverage of food scandals are less satisfied with food safety. The findings reported in this study help to enrich our understanding of citizens' satisfaction with food safety, and also to generate policy implications for regulatory agencies. The government should pay more attention to public perceptions of food safety, and strengthen its regulatory and communication capacity in mitigating citizens' concerns of food safety.

**Keywords:** food safety; media coverage; citizen perception; multi-level model; China

## **Cobertura mediática y percepción de los ciudadanos sobre la seguridad alimentaria en la China urbana**

### RESUMEN

Dados los escándalos alimentarios persistentes y desenfrenados durante la última década, la seguridad alimentaria ha estado entre las principales preocupaciones de los residentes chinos. En este documento, examinamos empíricamente los efectos de la cobertura mediática de los escándalos alimentarios en las percepciones de seguridad alimentaria de los ciudadanos. Nos basamos en una encuesta telefónica nacional de ciudadanos en 160 ciudades de China, y utilizamos un modelo multinivel para estimar los resultados. Descubrimos que la cantidad de escándalos alimentarios informados por los medios está relacionada negativamente con la satisfacción de los ciudadanos con la seguridad alimentaria, lo que significa que los ciudadanos de las ciudades con mayor cobertura mediática de los escándalos alimentarios están menos satisfechos con la seguridad alimentaria. Los hallazgos reportados en este estudio ayudan a enriquecer nuestra comprensión de la satisfacción de los ciudadanos con la inocuidad de los alimentos, y también a generar implicaciones de política para las agencias reguladoras. El gobierno debería prestar más atención a las percepciones públicas de la seguridad alimentaria y fortalecer su capacidad reguladora y de comunicación para mitigar las preocupaciones de los ciudadanos sobre la seguridad alimentaria.

**Palabras clave:** Seguridad alimenticia; Cobertura mediática; percepción ciudadana; modelo multinivel; China

## **新闻媒体披露与中国城市公民的食品安全感**

### 摘要

鉴于过去十年里挥之不去且猖獗的食品丑闻，食品安全已成为中国人民最担忧的关切之一。本文中，我们实证分析了新闻媒体在食品丑闻方面的报道对公民的食品安全感产生的影响。我们使用一项针对全国160个城市居民的电话调查，并

使用多层模型预测结果。我们发现，媒体报道的食品丑闻数量与公民的食品安全满意度呈负相关，这说明接收到更多食品丑闻报道的城市公民的食品安全满意度较低。本文的研究发现帮助提升我们对公民食品安全满意度的理解，并帮助为监管机构提供政策意义。政府应更关注公众的食品安全感，加强其在缓解公民的食品安全顾虑方面的监管和传播能力。

关键词：食品安全，媒体披露，公民感知，多层模型，中国

## Introduction

Given the lingering and rampant food scandals over the past decade, food safety has been among Chinese residents' top concerns. The people's growing concern for food safety is closely related to China's uniquely rapid development (Yan 2012). Although the government attempts to tackle the food safety issues that occur every now and then, people are still largely threatened by these problems. Despite the government's strengthening of its legislative, regulatory, and administrative approaches in addressing food safety, citizens are still very worried about food risk (Ma and Liu 2019). Citizens' discontent with government performance in combating food scandals and securing food safety may undermine support for the regime and government legitimacy. Thus, it is of theoretical and policy importance to examine what drives public perceptions of food safety. Individuals' assessment of food safety depends not only on the current state of food safety, but also on their expectations and media exposure to food scandals. The dissemination of

food scandals could amplify food risk, which may seriously affect public perceptions of government performance in food safety regulation. Despite the crucial role played by media framing and amplification, few studies seriously test this proposition.

Food safety scandals hold back good governance and result in a loss of trust in the public sector (Ma and Christensen 2019). The frequent outbreaks of food safety-related incidents, such as the toxic Sanlu milk powder incident of 2008, the gutter oil incident, and the lean meat powder incident, have severely undermined people's confidence in the government's ability to address these issues (Foster 2011). Due to a low degree of transparency and openness in risk communication (Magstad 2012), the government usually contains the spread of information, releases one-sided media stories, or declines inquiries during major food safety incidents (Yang 2013), which inevitably damages the government's credibility in eyes of the general public (Wu, Yang, and Chen 2017). Meanwhile, the central government has taken measures to restructure

food safety policy agenda and institutions. The first *Food Safety Law* was promulgated in 2009, which set up the State Council Food Safety Committee to be in charge of food safety issues in 2010. Later in 2013, China Food and Drug Administration (CFDA) was established as a specific organization to provide scientific and technical support for food safety criteria, food risk supervision, and public communication. In 2015, the *Food Safety Law* was revised in response to increasing food safety concerns.

In this paper, we use a recent nationwide survey of urban residents in China to empirically examine the effect of media coverage of food scandals on public perceptions of food safety. We find that the number of media reported food scandals are negatively related to citizen satisfaction with food safety, which means citizens in cities with more media coverage of food scandals are less satisfied with food safety. The findings reported in this study help to enrich our understanding of citizens' satisfaction with food safety, and also generate policy implications for regulatory agencies.

In the remainder of this paper, we first introduce the background of food safety in China, followed by the theoretical framework and testable hypotheses. We then present the data and methods used in this study and report the main empirical findings. We discuss the theoretical and policy implications of our results, and conclude with limitations and future research directions.

## Theoretical Framework and Propositions

### *The context of media coverage in China*

The report of the Thirteenth National Congress of the Communist Party of China used the concept of public opinion supervision. Ever since, public opinion supervision has been a vital means of governance in China. However, the system of Chinese media is much more sophisticated. It is a hybridity performed by official media with political inquiries, commercialized media for profit, public media, social interactions, etc. Different media have variable influence on citizens and result in different perceptions. However, the official media coverage in China is largely positive, and negative reports such as the disclosure of food safety issues are suspiciously rare (Mou and Lin 2014). This report also shows that the higher a person's education level, the more concerned they are for food safety issues and the more skeptical they are of official information (Veeck, Veeck, and Zhao 2015). Hence, it is safe to say that although the number of reported food safety incidents is much lower than the actual number, the media reports are still influential enough to increase the public's awareness level of the food safety issues (Yang 2013). In other words, even when the media have done a rather comprehensive report on an incident, people are still likely to think there is more information to be revealed than what meets the eye, and that the story they get is only a fragment of the truth. In fact, major scandals such as

the toxic Sanlu milk powder incident are rather rare to begin with; therefore, smaller food safety incidents can give the public a tremendous sense of anxiety as they fear what they see is only a glimpse of something much more appalling that is yet to be exposed. Anxiety over food safety can lead to a biased public perception of related issues and cause a short-term or even long-term contagion effect among consumers for the safety of the food market in general (Beardsworth and Keil 1997). Studies have shown that the contagion effect is more likely to occur when a scandal undermines the nature of an industry that many companies share (Roehm and Tybout 2006).

Compared with suburban regions, traditional media and social media coverage and consumption rate in urban China is much higher; thus, people have more channels and opportunities to learn about food safety scandals. With more media coverage of incidents involving food safety and health risks, public knowledge and awareness increase and people are more inclined to pay closer attention to these issues (Roosen, Thiele, and Hansen 2005). For most suburban areas, the main channel by which people learn about the outside world is television. Limited media coverage of the truth leads to more trust in the government and its official media. As a result, while these areas suffer from more food safety hazards, the people's perception of the risks is much weaker than that of the urban areas (Wu, Yang, and Chen 2017). For urban citizens, however, the fact that people know little about the

process of food production, transportation, and storage aggravates people's concern for food safety. They generally have much higher per capita income and education level, which translates to more exposure and susceptibility to mass media (Liu et al. 2015).

### *Media exposure and food safety perceptions*

People pay different levels of attention to different issues and choose which part of the story to believe based on their opinions (Shin, Schallert, and Savenye 1994). When the issue at hand is closely related to one's personal interests, people will not only carefully verify the authenticity of the information, but also carefully weigh the pros and cons (Chaiken 1980). Food safety affects all members of the society, and the food supply is the cornerstone of everybody's health. Therefore, people continue to collect and process relevant information to avoid the harm of food safety problems (Yang, Chen, and Feng 2015). Although it is difficult for people to see all sides of a food safety related story when it comes to traditional media, due to rigorous government censorship, the rise of social media has created opportunities for the free circulation of information and a platform for people to interact with each other and exchange opinions (Bigger 2011). The problem with this is that more people are now consciously looking for information on food safety issues when using social media. Over time, what are in fact small and random incidents may be artificially correlated, creating an exaggerated version of unrelated

issues. With secondary dissemination through social media, such risky misinformation may induce panic over food safety on a large scale (Chung 2011).

Eventually, the media will make full use of the feedback mechanism to find topics the public is most interested in through real-time dynamic adjustments, so as to attract more people and increase the level of interaction with the public (González-Avella et al. 2006).

### ***Media amplification of food risk and public discontent***

With the rapid development of online and social media, people are now living in a world where the media has slowly become a window through which we understand the world. The media does not necessarily force people to accept a certain point of view directly, but it can influence how people think in subtle ways (McCombs and Shaw 1972). Due to inherent human limitations and geographical isolation, combined with the fact that the media speak to different interests and aspirations, people tend to turn to the media for relevant information and to learn about the views of experts and scholars in order to facilitate their own lives (Pinto, Balenzuela, and Dorso 2016). At the same time, people perceive societal risks through media reports (Koné and Mullet 1994). When media reports are based mostly on science and facts, they affect the general public's perceptions of the research (Hornung 1989). Generally speaking, most people learn food safety incidents from reports and exposure given by tra-

ditional and social media, and these two forms of media work in very different ways. Social media focuses on the maximization of its own utility and tends to go for sensational effects, which means it tends to cover more incidents involving famous companies and hot topics (Core, Guay, and Larcker 2008). The key difference between official media and social media is that social media is more profit-oriented, while official media is dependent on political resources (Guo 2001). Driven by commercial interests, social media tends to report on the same event in order to cater to readers once a food safety incident occurs. On the other hand, official media bears responsibility for in-depth reporting and keeping track of the progress and tracing the root causes while being the "mouthpiece" of the country and the party. Hence, the role of social media is more evident in the short term, while official media plays a supervisory role in the long run. In addition, different social media platforms use varied types of propaganda. With their unique visual specialties, audiovisual reports adopt the method of episodic framing (Scheufele 1999) which allows people to spend less energy obtaining information about members of society compared with the thematic framing adopted by traditional paper-based reports (Graber 2001). Therefore, reports employing episodic framing have a profound impact on recipients' risk assessments (Marks et al. 2003). Thus, it is necessary for the media to consider the overall process of the event before using language and text when report-

ing on food safety-related issues (Pinto, Balenzuela, and Dorso 2016). When people are not involved in food safety incidents, they make their own judgments based on their experience and observations (Fleming, Thorson, and Zhang 2006).

Although the number of actual food safety scandals remains unchanged, the higher exposure rate misleads people that food safety problems are graver than they are (Lofstedt 2006). The amplification effect of media coverage on food safety incidents can be explained using the following four aspects: the rise of social media, homogeneous reports on food safety events, the lack of effective government risk communication mechanisms, and the lack of knowledge on food safety issues among members of society (Liu and Ma 2016). The ever-growing food safety scandals have aggravated people's concerns. Hence, this paper is aimed at discussing whether it is the high exposure rate or the wide coverage of the food safety scandals that causes this phenomenon (Kasperson, Renn, and Slovic 1988).

Unlike previous studies, we aim to have a better understanding of citizens' satisfaction with food safety: in particular, how food safety news influences citizen concerns and perceptions of food safety. We hypothesize that negative news about food safety, particularly food safety scandals, are negatively related to citizen satisfaction and perception of food safety. In contrast, positive news about food safety is more likely to boost consumers' confidence in and satisfaction with food safety.

## **Data and Methods**

### *Samples and data sources*

**D**ata used in this study were taken from multiple sources. The data on citizen perceptions are from the Subjective Survey for Chinese Livelihood Index (SSCLI) in 2016. SSCLI is a nation-wide survey on subjective life satisfaction covering all thirty-one provincial-level administrative regions (e.g., provinces, municipalities, and autonomous regions) in China. The survey was conducted by the Center for Public Opinion Survey (CPOS) in each province, which is affiliated with the Provincial Bureau of Statistics. CPOS adopts a computer-assisted telephone interviewing system, which randomly selects province-wide fixed telephone subscribers. Interviewers are locals and the local language variety is used while conducting the survey. Respondents in this survey include both rural and urban residents between eighteen and seventy-five years of age, and only urban observations were used in this study. The sample size is about 32,000, covering 160 cities. In this survey, respondents were asked if they are satisfied with food safety.

The data on media coverage of food safety come from three sources: the China Core Newspapers Full-text Database of China Knowledge Resource Integrated Database (CNKI), which has archived key newspapers since 2000 (<http://epub.cnki.net/kns/brief/result.aspx?dbPrefix=CCND>), the Baidu News search engine, which documents online news in Chinese ([http://news.baidu.com/advanced\\_](http://news.baidu.com/advanced_)

news.html), and the *Zhichu Chuangwai* (ZCCW) website, which records food scandals reported in mass media since 2005 (<http://zccw.info/>). We used “food safety” (*shipin anquan*) and city names as keywords when searching on these platforms, and the number of media reports is used as a proxy for media coverage of food safety.

### *Variable measurement*

The variables used in this study are summarized in Table 1.

Following the literature, a five-point Likert scale item was used to measure food safety satisfaction, including (5) “very satisfactory,” (4) “fairly satisfactory,” (3) “so-so,” (2) “fairly unsatisfactory,” and (1) “very unsatisfactory.” The respondents were asked to what extent food safety had been getting better over the past year, and a five-point Likert scale item was also provided, including (5) “obviously improved,” (4) “slightly improved,” (3) “nothing changed,” (2) “slightly deteriorated,” and (1) “much deteriorated.”

Our three media-based food safety variables are different in methods and coverage; thus, any interpretation of the results should be undertaken with caution. CNKI only compiles important newspapers, and news reports of food safety mostly involve official releases of new policies, best practices, and detection data. ZCCW only archives media-reported food scandals, and one record for one event, meaning every entry is unique and never repeated, and positive news about food safety regulation is not included. In contrast,

Baidu news has the most extensive media coverage, since all online news portals are archived. In the case of CNKI and Baidu, several outlets can repeatedly report one event. Baidu news thus archives more entries (median=123, mean=8535.679) than CNKI (median=50, mean=126.723) and ZCCW (median=0, mean=4.937). According to prior studies, ZCCW is highly related to official data on food safety cases (e.g., foodborne diseases, producers’ violations), and can be used as a proxy for objective food safety performance. While CNKI and Baidu usually include repeated entries about the same events, they are reasonable in weighting events by their salience and repercussions. Other things being equal, more salient events with amplified consequences (e.g., more abominable, extensive, and severe cases) are more likely to be reported repeatedly by many media outlets. Given that food safety scandals vary substantially in severity, extensiveness, and impact, it is appropriate to aggregate them with weights, although there is no consensus in the calculation of weights. In a nutshell, the three media-based measures of food safety differ in coverage (online, print), color (positive, negative), and repeatability (unique, repeated).

Individuals with different socioeconomic characteristics may have different expectations of food safety, and may therefore have different levels of satisfaction. We thus control for citizens’ gender, age, education, household registration, civil status, occupation, income, and rural/urban residence, as well as whether they live with juve-

**Table 1.** The operationalization of key variables

<b>Variable</b>	<b>Measurement</b>
<i>City-level</i>	
CNKI	The total number of news reports including “food safety” and city name in the CNKI newspapers database in 2015.
Baidu	The total number of news reports including “food safety” and city name in the Baidu news database in 2015.
ZCCW	The total number of news reports including “food safety” and city name in the ZCCW database since 2011.
Internet	The share of household broadband subscriptions among total population in 2015.
Ethnic minority	The share of ethnic minorities among total population in 2010.
<i>Individual-level</i>	
Food safety satisfaction	The respondents’ overall assessment of local food safety, ranging from “very unsatisfied” (1) to “very satisfied” (5).
Food safety improvement	The improvement of local food safety over the past year, ranging from “obviously improved” (1) to “obviously deteriorated” (5).
Gender (Male=1)	Male=1, female=0.
Age group	Includes six categories: 18-24, 25-34, 35-44, 45-54, 55-64, and 65 and above.
Education level	Middle school and below (1), high school (2), college (3), university and above (4).
Local household	Local=1, others=0.
Married	Married=1, others=0.
Employed	Employed=1, unemployed=0.
Family size	The total number of family members.
Family income	The total annual family income in 2015, ranging from less than 10,000 Yuan (1) to over than 500,000 Yuan (8).

niles. Risk perception is the subjective judgment of the size of a risk, which is inseparable from the objective risk (Ma and Yu 2018). Many researchers believe that there is no complete objective risk, and that risk itself is either constructive or subjective (Slovic

2000). The main determinants of risk perception are the fear of risk itself, the familiarity of the risk, and the scope of risk threats (Slovic, Fischhoff, and Lichtenstein 1979). Among them, the fear and familiarity of the risk play the biggest role (Knight and Warland 2005).

Many food safety incidents themselves are not harmful to society, but the loss caused by food safety panic is often much higher than the direct loss caused by the food safety problems. In other words, subjective food safety risk perception is very different from objective food safety risks (Smith and Riethmuller 1999).

The public awareness of food safety risks varies from demographic characteristics to individual socioeconomic status (Fein et al. 2011). To start with, the first factor is gender. Women tend to perceive more food safety risks than men (Böcker 2003), and this may be related to their responsibility for preparing family meals and attending to children (Lin 1995). The second factor is age. Age affects people's attitude towards food safety: the older people are, the more worried they are about food safety issues (Ergönül 2013). Elderly people, especially those who have experienced food-induced harm, pay special attention to pesticide residues, additives, and food damages (Dosman, Adamowicz, and Hruday 2001). The third is the level of education. People with a higher education level (those who have received a college education) perceive more risks than those with only secondary education (Roosen, Thiele, and Hansen 2005). The composition of family members is the fourth factor. Families with members that are more vulnerable to food safety issues, such as infants and children, perceive more food safety risks than families with no children. The fifth is marriage status: married people are expected to suffer more food risks than those who

are single. The sixth is geographical. Residents in suburban areas suffer more food safety risks than urban residents; however, the public awareness of food safety risks in suburban areas is weaker than that in urban areas (Wu, Yang, and Chen 2017). The seventh factor is political tendencies. Some researchers divide food safety risks into natural hazards, such as Salmonella carried by poultry, and other modern technology hazards, such as genetically modified foods. They believe that a negative attitude towards modern technology adds to people's perception of modern technical food safety risk, and that people with left political views perceive more technical food safety risks than those with right political views (Siegrist 2003). The eighth is personal income. Not only do the poor perceive more food safety risks than the rich, they are also more expectant for the public to participate in the process of risk management, thereby reducing food safety risks (Frewer 1999). Members of society who often face with or hear about food safety incidents are more anxious about food safety problems (McCluskey and Swinnen 2011).

Apart from individual-level attributes, we also control for city-level attributes that may affect food safety perceptions, including size, affluence, and food supply and consumption. It is a pity that media exposure is not included in the survey, and we instead use city-level internet penetration rate to gauge its effect. For prefectures with missing data, we impute media exposure with the provincial internet penetration rate. Prior studies reveal that

the share of ethnic minorities among the population is negatively related to food safety concerns, and we therefore include this variable in our model estimates.

### ***Model specifications***

We used multilevel models to examine the effect of media coverage of food safety on citizen perceptions of food safety. We were interested in testing the effect of city-level media coverage on individual-level perceptions, which means our model estimates involve cross-level phenomena. Given the nested nature of the data (i.e., individuals are nested in cities), an ordinary least square (OLS) model is not suitable. We instead use a multilevel model to estimate the results, which helps to simultaneously estimate variances across multiple levels. Individual-level demographics and perceptions are Level 1 variables, while city-level media coverage and other controls are Level 2 variables. Given the nested nature of the data, we use multilevel model to estimate the results. Apart from individual-level (Level 1) demographics, we include city-level (Level 2) variables that may affect citizens' food safety perceptions. We follow conventional approaches to center our independent variables and estimate the models.

## **Results**

### ***Descriptive and correlation statistics***

**A**part from the 2.47 percent of the respondents who did not know or refused to answer 26.57 and 10.68 percent were satisfied

and very satisfied with local food safety, respectively. The results show that 40.75 percent were neutral, and 14.58 and 7.42 percent were unsatisfied and very unsatisfied, respectively. In terms of the improvement of local food safety, 29.66 and 17.86 percent believed there were some and substantial improvements, respectively, excluding the 3.38 percent who were unaware or refused to answer. We found that 47.07 percent were neutral, and 3.52 and 1.89 percent witnessed some or obvious deterioration, respectively. The two citizen perception variables are highly correlated ( $r=0.90$ ,  $p<0.05$ ), although they capture different aspects of citizen attitudes toward food safety.

With regard to city-level average perceptions of food safety, we find that citizen satisfaction ranges from 2.696 to 4.039, with a mean of 3.197. The average level of improvement ranges from 3.223 to 4.409, with a mean of 3.614. The results reveal substantial variations in food safety perceptions among the sampled cities. As shown in Table 2, media coverage of food safety in the sampled cities also varies notably, no matter which sources are used (i.e., CNKI, Baidu, or ZCCW). The three media-reported food safety variables are highly and positively interrelated, and the correlation coefficients range from 0.37 to 0.57, all statistically significant at the 0.05 level. While none of them is perfect in gauging media-reported food safety, our inclusion of the three helps to generate robust model estimates.

**Table 2.** The descriptive statistics of key variables

Variable	N	Mean	SD	Min	Max
Food safety satisfaction	31,886	3.185	1.049	1	5
Food safety improvement	31,590	3.581	0.886	1	5
CNKI	159	126.723	315.01	0	3225
Baidu	159	8535.679	36363.6	2	257000
ZCCW	159	4.937	17.25	0	179
Internet	159	0.191	0.139	0.035	1.000
Ethnic minority	159	12.569	21.618	0.060	97.190
Gender (Male=1)	32,640	0.536	0.499	0	1
Age group	32,640	3.102	1.321	1	6
Education level	32,640	2.706	1.109	1	4
Local household	32,640	0.820	0.384	0	1
Married	32,640	0.786	0.410	0	1
Employed	32,640	0.769	0.422	0	1
Family size	32,640	2.589	1.011	1	4
Family income	30,057	3.904	1.500	1	8

The scatterplot and linear fit line in Figure 1 shows that media coverage of food safety is strongly and negatively correlated with citizen satisfaction. The correlation matrix in Table 3 also reveals similar patterns by using other

measures of media coverage and citizen perceptions. The negative relationships between media coverage of and citizen satisfaction with food safety suggest that media exposure amplifies social risk.

**Table 3.** The correlation matrix of city-level variables

Variable	1	2	3	4	5	6
1. Food safety satisfaction	1.00					
2. Food safety improvement	0.90	1.00				
3. CNKI (log)	-0.16	-0.23	1.00			
4. Baidu (log)	-0.35	-0.42	0.48	1.00		
5. ZCCW (log)	-0.30	-0.39	0.37	0.57	1.00	
6. Internet	-0.31	-0.37	0.24	0.45	0.53	1.00
7. Ethnic minority	0.30	0.25	-0.39	-0.38	-0.29	-0.20

Note: Food safety satisfaction and improvement are average values of individual entries at city level. The absolute value of Pearson's correlation coefficient larger than 0.15 is statistically significant at the 0.05 level.

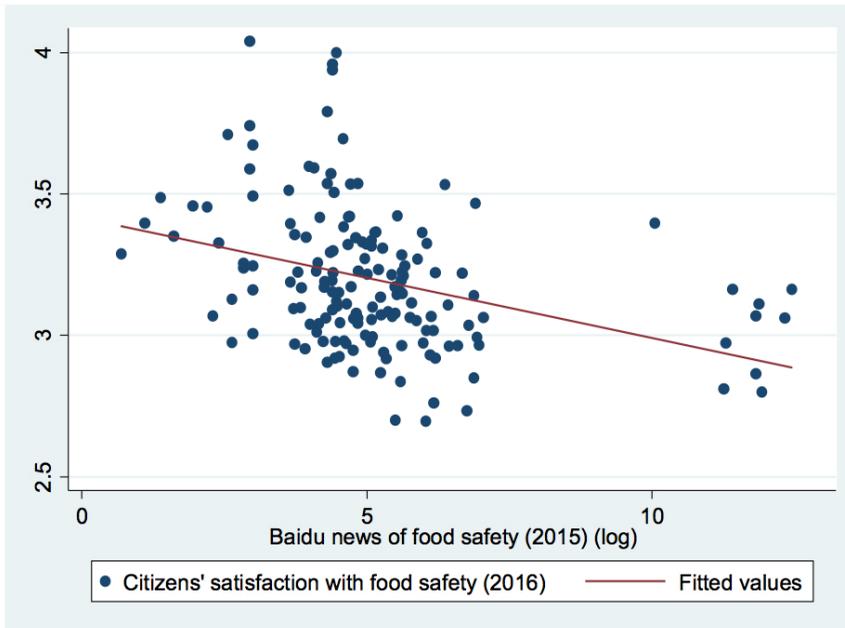


Figure 1. The correlation between media coverage of and citizen satisfaction with food safety.

Note: The number of Baidu news about food safety in each city in 2015 is used to gauge media coverage, while the average level of citizens' overall satisfaction with food safety in each city is used to measure city-level food safety perceptions.

### *Multilevel model estimates*

The null models without independent variables are first estimated, and then interclass correlation (ICC) statistics are reported, which gauge the percent of total variance of dependent variables explained by Level 2 variables. The results show that 5.15 and 6.39 percent of total variance of food safety satisfaction and improvement can be attributed to Level 2 variables. Level 1 variables explain the lion's share of the total variance of the two dependent variables, but the likelihood-ratio tests suggest that we should use a multilevel model instead of a linear model.

Given that the three media-reported food safety variables are highly

related and tautological, we enter them separately into the models. As shown in Table 4, all three media-based variables are negatively and significantly related to citizen satisfaction with and improvement of food safety, except for the regression coefficient of CNKI on food safety satisfaction. In other word, our hypothesis is largely supported and media coverage of food safety makes citizens more concerned about and discontent with food safety.

As we hypothesized, negative news about food safety, particularly food safety scandals, is negatively related to citizen satisfaction and perception of food safety improvement. Positive news about food safety is more likely

Table 4. Multilevel model estimates of food safety satisfaction and improvement.

DV	Food Safety Satisfaction			Food Safety Improvement		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
IV (log)	CNKI	Baidu	ZCCW	CNKI	Baidu	ZCCW
Gender (Male=1)	0.105*** (0.013)	0.105*** (0.013)	0.105*** (0.013)	0.0596*** (0.010)	0.0596*** (0.010)	0.0595*** (0.010)
Age	-0.0415*** (0.008)	-0.0415*** (0.008)	-0.0415*** (0.008)	0.0147** (0.007)	0.0147** (0.007)	0.0148** (0.007)
Education	-0.00932 (0.009)	-0.00934 (0.009)	-0.00932 (0.009)	-0.0225** (0.007)	-0.0226** (0.007)	-0.0225** (0.007)
Local household	0.0787*** (0.020)	0.0787*** (0.020)	0.0786*** (0.020)	0.0458*** (0.017)	0.0458*** (0.017)	0.0458*** (0.017)
Married	-0.143*** (0.018)	-0.143*** (0.018)	-0.143*** (0.018)	-0.0817*** (0.015)	-0.0817*** (0.015)	-0.0817*** (0.015)
Employed	-0.00544 (0.021)	-0.00543 (0.021)	-0.00543 (0.021)	0.0344* (0.018)	0.0344* (0.018)	0.0344* (0.018)
Family size	0.0107 (0.007)	0.0107 (0.007)	0.0107 (0.007)	0.0177*** (0.006)	0.0177*** (0.006)	0.0177*** (0.006)
Family income	0.00944** (0.005)	0.00944** (0.005)	0.00944** (0.005)	0.00433 (0.004)	0.00434 (0.004)	0.00434 (0.004)
Media coverage	<b>-0.00123 (0.005)</b>	<b>-0.0247*** (0.008)</b>	<b>-0.00459* (0.003)</b>	<b>-0.00922* (0.005)</b>	<b>-0.0320*** (0.007)</b>	<b>-0.00739*** (0.002)</b>
Internet	-0.479*** (0.115)	-0.338*** (0.116)	-0.360*** (0.125)	-0.537*** (0.108)	-0.379*** (0.112)	-0.369*** (0.108)
Ethnic minority	0.00288*** (0.001)	0.00221** (0.001)*	0.00263*** (0.001)	0.00152** (0.001)	0.000976 (0.001)	0.00142** (0.001)
Constant	3.193*** (0.018)	3.193*** (0.018)	3.194*** (0.018)	3.610*** (0.017)	3.611*** (0.016)	3.612*** (0.017)
Variance (Level 2)	0.0490*** (0.008)	0.0471*** (0.008)	0.0482*** (0.008)	0.0422*** (0.006)	0.0393*** (0.006)	0.0405*** (0.006)
Variance (Level 1)	1.041*** (0.016)	1.041*** (0.016)	1.041*** (0.016)	0.730*** (0.014)	0.730*** (0.014)	0.730*** (0.014)
AIC	83611.643	83606.052	83609.266	72792.929	72783.326	72787.146
BIC	83727.453	83721.863	83725.077	72908.626	72899.022	72902.843
N	28917	28917	28917	28683	28683	28683
Clusters	159	159	159	159	159	159

Note: Robust standard errors clustered at city level are in parentheses. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. AIC and BIC refer to model fit statistics Akaike's and Schwarz's Bayesian information criteria respectively.

to boost consumers' confidence in and satisfaction with food safety. According to Expectancy Theory, negative information is more prominent than positive information in eliciting decision-makers' attention. In comparison with print media, online news is more likely to be consumed by citizens during our survey time, i.e., 2016. Our results are consistent with these expectations. We find that the CNKI measure is not significantly related to citizen satisfaction, while the Baidu and ZCCW measures are both significantly associated with citizen satisfaction. A similar pattern is also found with regard to the magnitude and significance of regression coefficients in models of food safety improvement.

Women are less satisfied with food safety than men, while older respondents are more discontent with food safety than younger respondents. Women are usually responsible for cooking, are more sensitive to food quality, and more prone to foodborne diseases, and they are thus more concerned about food safety than men. Elders are more concerned about nutrition and healthy food, and they are less satisfied with food safety. The respondents' highest education is not significantly related to food safety satisfaction, but higher-educated citizens perceive less improvement in food safety. Given their higher expectations for and disparagement of food safety, higher-educated respondents are likely more cynical about government performance. The respondents registered with local households are more satisfied with food safety than nonlocal

ones. We find married respondents are more discontent with food safety than single, widowed, and divorced respondents. Employed respondents perceive more improvement in food safety than unemployed respondents, but the two groups are indifferent toward food safety satisfaction. People in larger families perceive more improvement in food safety, although they are not significantly more satisfied. The findings reveal that family income is positively related to food safety satisfaction, and its relationship with food safety improvement is positive, albeit insignificant.

The two city-level variables are both significant, negatively with internet penetration rate negative and positively with ethnic minority status. Internet penetration rate as a proxy of media exposure means citizens are more likely to be exposed to media coverage of food safety, particularly food safety scandals disseminated through social media, which elicits more concerns about and lower satisfaction with food safety. Ethnic minorities commonly follow religious traditions and norms in handling and processing foods, which helps protect consumers from the unethical behaviors of food producers and sellers. For instance, Muslim consumers only consume chicken, beef, and mutton that are processed with the approval of imams, and Halal principles are strictly verified by official certificates released by religious organizations. These religious practices help assure food safety in ethnic neighborhoods, and residents are more satisfied with food safety.

## Discussions

In this paper, we aimed to empirically examine the effects of media coverage of food scandals on citizens' food safety perceptions. We find that the number of media reported food scandals is negatively related to citizen satisfaction with food safety, and citizens in cities with more media coverage of food scandals are less satisfied with food safety. We also find that citizens' media exposure (using internet penetration rate as a proxy) is negatively related to citizen satisfaction with food safety.

Our findings contribute to the literature on food safety perceptions and help enrich our understanding of citizens' satisfaction with food safety. The main contribution of this study is that we used a large-scale nationwide survey that included more than 36,000 respondents covering 160 cities in China in order to test a pivotal proposition in the literature. We found that residents in cities with more coverage of food safety are less satisfied with food safety, and the number of food safety reports also lowers citizen's assessments of food safety. The results reported in this study are to some extent different from prior studies on provincial capital cities, partially due to our coverage of cities, which includes large, medium, and small cities.

The findings reported in this study also generate policy implications for regulatory agencies. The government should pay more attention to public perceptions of food safety and strengthen its communication capacity in mitigating citizen concern of food

safety. The government should make food safety information transparent to the public and allow third parties to conduct professional policy evaluation on food safety improvement, since the public is more willing to trust non-governmental organizations (NGOs) (Erğönül 2013). The regulatory authorities should work with other entities (e.g., the food industry and NGOs) to advance food safety communication in order to mitigate the framing and spillover effects of food safety concerns. The media should promote its scientific functions on food safety reports to provide the public with easy access to scientific knowledge in order to mitigate unnecessary concerns over food safety. It is found that that the government is able to increase the level of public welfare by regulating the food market to reduce the level of food borne pathogens and by developing educational programs to raise consumer awareness of the risk of food borne diseases (Crutchfield et al. 1997).

Public involvement and third sector participation, such as consumer participation, media supervision, and industry organizations, also constitute an important approach to solving food safety concerns (Roasto, Hérman, and Hanninen 2012). A policy choice for food safety governance has been to establish a comprehensive social governance system that combines government regulation that allows consumer participation and third-party governance (Rouvière and Caswell 2012). People prefer to have information provided by consumers, environmental protection organizations, nutritionists,

and doctors to that of governments, food producers, and the media (Röhr et al. 2005). The “top-down” model of food safety supervision should gradually transform into an information disclosure mechanism that involves the social supervision of consumers’ participation. In this way, it will more effectively improve food safety (Innes 2006). The efficiency of the supply of food safety information can be improved to address or alleviate the information asymmetry in the food market with the help of mandatory provision of displaying nutritional information, the strict regulation of the use of voluntary declarations, and the quality signal transmission mechanism (Caswell and Mojduszka 1996). Upstream and downstream enterprises can work closely together to improve food quality and safety levels by tracking and tracing information in the supply chain (Aruoma 2006).

This study is limited in at least three aspects, and we call for future studies to address these limitations. First, due to the lack of relevant data, individual exposure to media reports could be measured by more fine-tuned indicators. Individuals differ from each other in the degree of media exposure; the media coverage thus has different degrees of impact on their food safety assessment. For instance, citizens’ exposure to social and traditional me-

dia would provide them with different sources of information on food safety, and people using social media are more likely to be affected by rumors and informal news. Second, the cross-sectional data used in the study cannot test the casual relationship between media coverage and citizen perceptions, and longitudinal and experimental designs can be used in future studies. Third, our findings could be replicated and extended in other contexts, since media control and food safety regulation in China are different from other countries.

Despite these limitations, the findings reported in this paper help explain variations in food safety perceptions across regions. While public perceptions may be biased or inaccurate due to cognitive biases, inherent predispositions, or information asymmetry, our results suggest that they are congruent with objective indicators of food safety. Media coverage of food safety largely mirrors the performance of local food safety regulation, and citizen perceptions are reasonably consistent with regulatory performance. The government should strengthen regulation and reduce food scandals, and concrete communication strategies should also be adopted to allow consumers to acquire credible information in order to retain consumers’ confidence in food safety.

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