

The role of media reporting in food safety governance in China: a dairy case study

by Zhu, Z., Huang, I.Y. and Manning, L.

Copyright, Publisher and Additional Information: This is the author accepted manuscript. The final published version (version of record) is available online via Elsevier.

This version is made available under the CC-BY-ND-NC licence:
<https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

Please refer to any applicable terms of use of the publisher

DOI: <https://doi.org/10.1016/j.foodcont.2018.08.027>



1 **The role of media reporting in food safety governance in China: a dairy case study**

2 **Xinyi Zhu, Iona Yuelu Huang and Louise Manning***

3 **Harper Adams University, Newport, Shropshire, TF10 8NB**

4 *corresponding author

5 **Abstract**

6 Using dairy products as the case study of interest, the aim of the research is to explore the role
7 of the media in food safety governance in China. Thematic content analysis is used to
8 evaluate government and media reports (n = 233) on dairy related food safety incidents in
9 China between 2004 and 2017 with differences identified between government and media
10 reporting. The data is extracted from an online database (Zhichuchuangwai). The results show
11 that the government performs better on exposing incidents earlier within the 14-year period
12 but the news media plays a complementary role in food safety governance exposing a wider
13 coverage of incidents. This study extends the current literature on the role of the news media
14 in food safety governance in China by focusing on a single food sector (dairy), but on a
15 national scale.

16 **Keywords** food safety, disclosure, media, governance,

17 **Highlights**

- 18 • Food safety governance in China shows emergent hybrid characteristics.
- 19 • Media communication has an important and complementary role in food safety
20 governance.
- 21 • Media only reported dairy product incidents tended to focus on those identified in the
22 home.

23

24 1. Introduction

25 Recurrent food safety incidents in China have exerted a profound negative impact on
26 consumer confidence and the wider international reputation of the Chinese food industry (Jia
27 & Jukes, 2013; Peng, Li, Xia, Qi & Li, 2015; Liu & Ma, 2016). Since the 1990s, China has
28 experienced both rapid industrialisation and urbanisation, causing great change in the food
29 supply chain (Zhang & Xue, 2016). China's food safety systems have a unique set of
30 challenges to address including the countries geography and size, historical weak institutional
31 governance and poor design of regulatory instruments and resource constraints, especially
32 local regulatory resources (Holtkamp, Liu & McGuire, 2014) although steps have been taken
33 to address the latter constraint in recent years.

34 Milk is a commodity of interest in China when considering food safety, fraudulent
35 behaviour (such as adulteration) and overall integrity in the food supply chain. What
36 constitutes food safety is debated especially as wider definitions arise such as food defense,
37 food fraud and adulteration. The World Health Organisation define foodborne disease as
38 being the result of ingestion of foodstuffs contaminated with micro-organisms or chemicals
39 (WHO, 2015). In this paper we consider food safety as encompassing this wider definition of
40 harm caused by ingestion of food that is rendered harmful by a variety of means including
41 presence of micro-organisms or chemicals or being affected by practices that could render the
42 food harmful. There have been multiple incidents associated with the Chinese dairy sector
43 including antibiotic contamination (year 2003); inadequate management of nutrition in infant
44 formula (2004, 2005, 2012), recycling expired milk (2005), microbiological contamination
45 (2005, 2008, 2011, 2012); melamine adulteration (2008); other illegal additions e.g.
46 hydrolysed proteins (2009), detergent (2012); and mercury (2012) see Wu et al. (2018). One
47 of the most notorious food safety incidents in China is the 2008 melamine in milk scandal.
48 Raw milk was diluted (adulterated) by adding water and melamine and the resultant high
49 levels of melamine in milk products killed six children and poisoned around 300,000

50 consumers causing kidney stones and kidney failure (Pei et al. 2011; Holtkamp, Liu &
51 McGuire, 2014; WHO, 2018). As a result, domestic consumption of milk dropped
52 significantly in China, product recalls were instituted and multiple countries prohibited the
53 imports of all products containing Chinese milk powder (Xiu & Klein, 2010; Ortega, Wang,
54 Olynk, Wu & Bai, 2011; Dong & Li, 2016). At the time of the melamine incident, Chinese
55 milk supply was based on 200 million farmers living in remote and underdeveloped regions of
56 China with an average herd size of less than ten cows and the associated supply consolidation
57 activities of a network of milk traders, and village milk supply stations (Gale & Hu, 2009; Xiu
58 & Klein, 2010; Pavlovich, Sinha & Rodrigues, 2016). The dairy sector has seen significant
59 growth with the average annual milk consumption of Chinese citizens doubling between 2002
60 and 2014, requiring integration of the supply chain, and leading to China after India and the
61 United States of America (USA) now being the third largest global milk producing country
62 (Wu et al. 2018). Further, Wu et al. (2018) argue dairy products from a food safety
63 perspective are high risk, easily contaminated at multiple steps in the supply chain and if not
64 suitably processed and refrigerated subject to rapid microbiological spoilage. Thus making
65 dairy products commodities of interest in this study.

66 Since the melamine incident, a decade ago, there is increasing focus on food safety
67 governance in China and while the government is primarily responsible for controlling food
68 safety, third-party bodies, especially news media, also contribute to wider governance
69 structures (Cope et al. 2010; Zhang et al. 2015). In this context, governance encompasses “the
70 culture and institutional environment in which citizens and stakeholders interact among
71 themselves and participate in public affairs.” (UNESCO, 2017). Governance is therefore
72 more than simply describing the role of the government in food policy. Disclosure of
73 information is an essential part of food safety governance (FAO & WHO, 2003) and while the
74 government is often the most trusted source, the majority of Chinese consumers still receive
75 information on food safety incidents from the media (Jin & Han, 2014; Peng, Li, Xia, Qi &

76 Li, 2015; Zhang, Xu, Oosterveer & Mol, 2016). The sharp increase in Chinese media
77 exposure of food safety incidents (Liu & Ma, 2016) shows the media's role in food safety
78 governance. However, there are several criticisms of their role for example, the potential for
79 inaccuracy with media reports. In order to further improve food safety governance in China, it
80 is arguably essential to understand the relationship between the government and the media in
81 terms of the disclosure of information on food safety incidents and critique the efficacy of
82 action. The aim of the research is to examine the role of news media in food safety
83 governance in China specific emphasis on dairy products.

84 The paper is structured as follows: firstly a review of relevant literature in order to
85 identify the research gap. Then, the methodology is explained, and the results presented,
86 interpreted and discussed. Finally, conclusions and recommendations are made which should
87 support the further development of food safety governance in China and the effective
88 disclosure of food safety information.

89 **2. Evolving models of safety governance**

90 Globalisation of food supply chains, growing economic power of retailers, decreasing
91 confidence in government regulation, emerging ethical concerns among consumers, and
92 recurrent food safety incidents means that hybridisation of food governance has occurred in
93 two dimensions: firstly the national and international dimension; and secondly between
94 government, producers and third-party organisations (Zhang, Qiao, Wang, Pu, Yu & Zheng,
95 2015; Verbruggen, 2016; Verbruggen & Havinga, 2017). In this paper, the second dimension
96 is the focus and specifically the role of government and third-party organisations in China.

97 **2.1 Official governance in China**

98 The Chinese regulatory food control system can be differentiated into: 1) food laws and
99 regulations, 2) food control management, 3) inspection services, 4) laboratory services, and 5)
100 information, education, communication and training (FAO & WHO, 2003). Food laws and

101 regulations can be divided into basic laws, subordinate laws and regulations, and provincial
102 government regulations (Jia & Jukes, 2013) see Figure 1. By referencing the latest regime
103 changes, the enforcement structure in China is presented (Figure 2 see Chen, Wang & Song,
104 2015) highlighting inspection is conducted by local government at province, city and county
105 level and laboratory services are provided at both national and local levels (Jia & Jukes,
106 2013).

107 **Take in Figures 1 and 2**

108 As an increasingly essential part of the food control regime, communication is assigned to
109 all main departments that are responsible for food safety governance: the China Food and
110 Drug Administration (CFDA), Ministry of Health (MOH), Ministry of Agriculture (MOA),
111 and Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) (FAO &
112 WHO, 2003; Jia & Jukes, 2013; Zhou, 2017). Additionally, the information disclosure roles
113 of each department are different (Figure 3).

114 **Take in Figure 3**

115

116 Whilst official food safety governance in China has improved significantly in past
117 decades, problems still remain (Liu, 2010; Lam, Remais, Fung, Xu & Sun, 2013; Holtkamp,
118 Liu & McGuire, 2014; Unnevehr & Hoffmann, 2015). Suggested reasons for this include:
119 unclear and overlapped responsibilities for different authorities (Liu, 2010; Holtkamp, Liu &
120 McGuire, 2014; Verbruggen & Havinga, 2017); poor coordination and communication
121 between departments and regions (Liu, 2010; Jia & Jukes, 2013), lax enforcement (Pei et al.
122 2011; Yang, 2013), low penalties (Liang, 2011), inferior legal requirements (Jia & Jukes,
123 2013; Yang, 2013); numerous small-scale producers (Peng, Li, Xia, Qi & Li, 2015;
124 Verbruggen & Havinga, 2017), and fragmented consumer groups (Zhou, 2017). In this nexus,
125 third-party governance began to develop.

126 **2.2 Third-party governance**

127 Third-party governance involves multiple stakeholders including the media, private
128 standards owners and third-party certification, consumer associations, non-governmental
129 organisations (NGOs) and industry associations (Zhang, Qiao, Wang, Pu, Yu & Zheng, 2015).
130 Media plays an important role in governance by exposing incidents and subsequently
131 influencing the behaviour and attitude of government, food producers and consumers (Cope et
132 al. 2010; Qiang, Wen, Jing & Yue, 2011; Liu, Pieniak & Verbeke, 2013; Mol, 2014; Peng, Li,
133 Xia, Qi & Li, 2015). By establishing governance standards, consumer associations contribute
134 considerably to food safety governance (Zhang, Qiao, Wang, Pu, Yu & Zheng, 2015).
135 Moreover, there are several private third-party certification (TPC) standards, such as
136 GlobalGAP (GAP = Good Agricultural Practice) and the British Retail Consortium (BRC)
137 standard amongst others. TPC schemes address the independent certification of the
138 management of elements of the food supply chain (Manning & Soon, 2014) and can interface
139 in a modular approach to provide whole assurance for a given supply chain (Manning, 2018).
140 Some question the trustworthiness of TPC (Albersmeier, Schulze, Jahn & Spiller, 2009)
141 especially as part of a wider private-public governance structure (Turku, Lepistö & Lundén,
142 2018). However, the use of TPC in China is restricted (Chen, Wang & Song 2015;
143 Kottenstede, 2017) and insufficient development of NGOs and industry associations mean
144 their impact is negligible (Zhang, Qiao, Wang, Pu, Yu & Zheng, 2015). Thus media reporting
145 has a role to play, despite food safety governance still predominantly being driven by
146 government (Chen, Wang & Song, 2015).

147 **2.3 Transparency of governance**

148 Transparency through information disclosure reduces information asymmetry between
149 consumers and powerful organisations, such as government and food enterprises, whereby
150 one party has more information or knowledge than another (Mol, 2014; Pettinger, 2017). In

151 China, food safety communication with consumers is undertaken through five official
152 channels. These channels are: official information releases (most frequently used), whistle-
153 blowing hotlines (e.g.12315), free consultations from food safety experts working jointly with
154 government, educational events (e.g. ‘Food safety on campus’ activities), and social media
155 reports by official or semi-official accounts provided by the CFDA, MOH, MOA, and AQSIQ
156 (Zhou, 2017). According to Food Safety Laws (FSL) (State Council of China, 2015), relevant
157 departments disseminate information when certain food products are deemed unsafe, and
158 failure to disclose will be punished through warning, demerit record, demotion or even
159 dismissal based on the seriousness of circumstances. However, the current official
160 information disclosure system is inhibited by a number of factors. Firstly, the large number of
161 food producers in China means it is difficult for regulatory departments to collect complete
162 food safety information, and consequently, they fail to make information immediately
163 available to consumers on regular basis (Jia & Jukes, 2013; Peng, Li, Xia, Qi & Li, 2015;
164 Zhou, 2017). Secondly, to maintain social stability and national image, release of information
165 on food incidents can be delayed in a three-step approach consisting of suppressing, framing
166 and repressing (Lam, Remais, Fung, Xu & Sun, 2013; Yang, 2013; Zhou, 2017). For instance,
167 several months before the exposure of melamine scandal in 2008, while some state agencies
168 received complaints from consumers, little information was released immediately, and
169 subsequently, only positive information was mainly published (Yang, 2013). Thirdly,
170 underreporting is common, especially for food-borne diseases with chronic and minor
171 symptoms (Soon, Singh & Baines, 2011; Lam, Remais, Fung, Xu & Sun, 2013).

172 While government transparency may be limited in this regard, it does not mean that
173 information disclosure systems functions poorly. Official departments are crucial in clarifying
174 potentially false rumours, otherwise they may generate unnecessary scares and consequently
175 social instability (Jia & Jukes, 2013; Zhou, 2017). Fake news reports that have required
176 clarification include fishermen using contraceptives to expedite growth of swamp eel (a

177 species of fish in China), and McDonald's using genetically modified six-wing chickens for
178 their products (CFDA, 2017). More importantly, studies found that most consumers regard
179 the government as the most reliable source of information, even though they believed official
180 information was underreported (Li et al. 2012; Liu, Pieniak & Verbeke, 2013; Zhang, Xu,
181 Oosterveer & Mol, 2016).

182 There has been a sharp rise in food safety scandals reported by media (Mol, 2014; Liu &
183 Ma, 2016). In addition, according to WHO (2017), over 60% of outbreak reports arise from
184 unofficial sources, especially online media, clenbuterol-contaminated pork and white sprite
185 containing plasticizers were firstly revealed online (Zhang, Qiao, Wang, Pu, Yu & Zheng,
186 2015). Some Chinese consumers report that the media is their main source for receiving food
187 safety related information (McCluskey & Swinnen, 2011; Li et al. 2012; Jin & Han, 2014).
188 However when considering transparency, journalists may choose to expose or omit certain
189 reports when disclosing (Veil & Yang, 2012). For example, at the beginning of the melamine
190 milk scandal, the company Sanlu mainly responsible for the incident, reached a deal with
191 Baidu, the largest search engine in China, to delete the relevant negative online news (Zhang,
192 Qiao, Wang, Pu, Yu & Zheng, 2015; Huang, Wu & Cheng, 2016). Secondly, due to the lack
193 of employees with scientific background, media tends to acquire information from unreliable
194 sources, exaggerate incidents and disseminate false information (Jia & Jukes, 2013; Zhang,
195 Qiao, Wang, Pu, Yu & Zheng, 2015; Huang, Wu & Cheng, 2016). Moreover, since the media,
196 by and large, is influenced by the government (Stockmann & Gallagher, 2011; Gehlbach &
197 Sonin, 2014; Yuan, 2016), disclosure may be limited and bias could occur. While these
198 critiques in the literature have some value, since the reformation of the media in the 1980s,
199 control has lessened considerably (Holtkamp, Liu & McGuire, 2014; Babu, Aggarwal &
200 Chen, 2017). After the launch of Food Safety Laws by the State Council of China in 2009,
201 food safety information is released without government intervention (Liu, Liu & Gao, 2015).
202 Additionally, the Chinese government tends to encourage the media to expose food safety

203 scandals (Lu & Wu, 2014; Zhang, Qiao, Wang, Pu, Yu & Zheng, 2015), because of their low
204 political sensitivity (Liu & Ma, 2016).

205 Several studies use media reports in China as their data sources for research. Some looked
206 at patterns of news media coverage only (Liu & Ma, 2016; Zhang & Xue, 2016). Others have
207 compared the official reports against public news media reports (Holtkamp, Liu & McGuire,
208 2014; Liu, Liu, Zhang & Gao, 2015; Chen, Huang, Nong & Kwan, 2016). Exploring patterns
209 of news media coverage of food safety incidents in China, Zhang and Xue (2016) manually
210 collected 2534 media reports (1553 incidents) for the period of 2004-2014 from nearly 40
211 news media, covering 32 provinces. They found that all food safety incidents were associated
212 with economically motivated fraud or adulteration, which are very much linked to the level of
213 industrialisation and urbanisation, i.e. that complex supply chains are becoming increasingly
214 opaque. Economically developed provinces such as Guangdong, Beijing, Shandong, Zhejiang
215 had the highest number of exposures. This finding concur with Liu and Ma (2016), who found
216 the capital city of Guangdong, Beijing, Shandong and Zhejiang provinces had the highest
217 number of reports of food scandals by analysing the reports collected by a team of 34
218 volunteers (Wu, 2011). Zhang and Xue (2016) also found that intentional distribution of
219 contaminated products and artificial enhancement were the top fraud types reported. However
220 in neither of these studies did the methodology seek to distinguish reports by source i.e.
221 government sources and information sourced from public news reports. This research gap is
222 considered in this paper to be of interest as the disclosure of information between different
223 sources may be nuanced and driven by the particular motivations of the government and also
224 the media which may, or may not be similar.

225 Studies examining differences between government reports and media reports observe
226 differences in terms of the location or cause of the reported incident (Chen, Huang, Nong &
227 Kwan, 2016), quantity of reporting (Holtkamp, Liu & McGuire, 2014; Liu, Liu, Zhang &
228 Gao, 2015), and original sources of reports (Liu, Liu, Zhang & Gao, 2015). Comparing

229 official and news media reports between 2006 and 2012 on food poisoning incidents (based
230 on a database collected through web-crawler, n=6701), Chen, Huang, Nong and Kwan (2016)
231 found that official news reported higher home and school/company cafeterias food poisoning
232 occurrences with microorganism (40%) and animal, plant and fungi toxin (31%) being the top
233 causes, whilst news media report more cases occurred at cafeteria and restaurants, with top
234 causes being man-made chemical hazards (22%) or not clearly identified (37%). The other
235 two studies both rely on Wu's (2011) database. Holtkamp, Liu and McGuire (2014) analyse
236 government and media reports between 2004 and 2011 across the whole country (n=2107).
237 They find that the number of food safety incidents reported by the media tended to be lower
238 than by official departments. This nationwide trend concurs with Liu, Liu, Zhang and Gao
239 (2015) who use the same database with a focus on Beijing only (n = 295). They differentiate
240 between incidents revealed by government and by news media and find that government
241 reports (n = 150) are slightly more than those disclosed by news media only. They also find
242 that consumers provide the information for 40% of the incidents reported, suggesting that the
243 media could be a "chosen" information channel for consumers to highlight their complaints.
244 Findings from the above mentioned studies are based on incidents across all food categories
245 and such data provides good insight into the patterns and trends of food scandals in China.
246 However, it is difficult to assess the role public news media plays compared with official
247 government reporting. Through comparing government and media reports on food safety
248 incidents of a single category of products (dairy related), this study aims to examine the role
249 of news media in food safety governance in China by considering four research questions:

250 **Question 1: What were the quantity and nature of incidents exposed by the**
251 **government and by media and how did this change over time?**

252 **Question 2: What were the origin of information, geographic location and the cause**
253 **of the incidents reported by the government and by media?**

254 **Question 3: What was the reporting timescale for incidents and did this vary**
255 **according to communication channel?**

256 **Question 4: How did the information compare and contrast between government**
257 **reports and media reports?**

258

259 Dairy products were chosen because of the global role China plays in dairy production and
260 due to the array of incidents that have occurred in the supply chain (see Wu et al. 2018). The
261 research approach is now discussed.

262 **3. Material and methods**

263 The research took an inductive, longitudinal approach through directly comparing real
264 life reporting of food safety incidents by government and news media over a 14-year period
265 (2004-2017). Holtkamp, Liy and McGuire (2014 p.459) suggest that “media data can be a valid
266 source for scholars interested in studying food safety or other controversial topics in China”
267 and this approach is used by Liu, Liu, Zhang and Gao (2015) in their research. Two online
268 databases in relation to online media reports on food safety incidents are available in China.
269 They are “Zhichuchuangwai (ZCCW)” (Wu, 2011) and Food Safety Information Database for
270 Greater China (FSIDfGC) (Chen, Huang, Nong & Kwan, 2016). A comparison of the two
271 databases are presented in Table 1.

272 **Take in Table 1**

273 The data used in this study is from ZCCW. The database is considered as more appropriate
274 for its representativeness of reporting online (Wu, 2011; Liu, Liu, Zhang & Gao, 2015; Liu &
275 Ma, 2016), higher relevance to food safety incidents and longer period it covered. FSIDfGC is
276 based on web-crawling using keywords. This means that the database contains reports not
277 relevant to food safety incidents. For example, a search of “melamine” could include reports
278 about policy, trend, scientific research reports, trade association reports and regulations whilst
279 the ZCCW database is manually filtered for food safety incidents (Wu, 2011; Liu, Liu, Zhang
280 & Gao, 2015). We also test-searched on FSIDfGC some incidents that are included in ZCCW
281 and failed to find them in FSIDfGC. This could be because some incidents were deleted from

282 online search engines as reported by Zhang, Qiao, Wang, Pu, Yu and Zheng, (2015), hence
283 could not have been included in FSIDfGC which was only completed in 2015, whilst the
284 initial ZCCW database was completed in 2011 and then updated periodically (Wu, 2011; Liu
285 & Ma, 2016).

286 ZCCW has developed two lists of key words to facilitate online search of the database.
287 One list includes 1610 food names identified by the editors and the other list includes 2159
288 keywords indicating causes of food safety incidents (<http://www.zccw.info/query>). Those
289 keywords were also adopted by Chen Huang, Nong and Kwan (2016) for FSIDfGC. In this
290 study, out of the listed 2159 search terms, fifty-one were identified to be relevant to dairy
291 products and dairy incidents (Figure 4). Full translation is provided in the Appendix. This
292 generated 248 reports in the timeframe between 2004 and 2017. Fifteen reports were excluded
293 because they were dairy product safety alerts or advice. Therefore, the total number of dairy
294 safety incident related reports was 233. Although the database is supposed to include
295 “uniquely identified” food safety incidents (Liu & Ma, 2016, p. 105), some multiple reports
296 were found of the same incidents. Further cleaning of the data resulted in the identification of
297 165 unique incidents.

298 Take in Figure 4

299 The reports were then subjected to thematic content analysis using NVivo 11 in line with the
300 previously published methodology (see Liu, Liu, Zhang & Gao, 2015). Although the reports
301 were in Chinese, the coding was manual and in English. A structured coding system was
302 initially generated from the literature and then iteratively developed by the first two authors
303 (see Table 2). The coding was conducted by the first author and checked by the second
304 author. The second author only recoded areas of disagreement. Therefore standard Kappa
305 coefficient was not obtained.

306 **Take in Table 2**

307 The results are now presented and analysed.

308 **4. Results and analysis**

309 In the dairy incidents dataset (n = 233), government reports were substantially fewer than
310 media reports where media reports accounted 76.4% of the dataset (n = 178) with 24 incidents
311 reported by both media and government and 27 incidents by government only.

312 **Question 1: What were the quantity and nature of incidents exposed by the government** 313 **and by media and how did this change over time?**

314

315 The reports are analysed by source/channel (Table 3) and by product type (Table 4).

316 **Take in Tables 3 and 4**

317 The total number of incidents on milk powder (n = 72) and fresh milk (n = 57) is higher than
318 other types. Specifically, incidents on milk powder (45.8%) are most likely to be reported by
319 both government and media. In addition, yogurt (16.7%) and milk beverage (12.5%) incidents
320 are reported by both the government and media. The most frequent product incident reported
321 by government is related to milk powder (48.1%) and apart from milk powder (42.1%),
322 “media only” reported incidents were associated with fresh milk (43.9%). For fresh milk
323 related incidents, almost 90% were covered by the media and the media revealed an additional
324 33 more incidents with milk powder than with the government reporting.

325 **Question 2: What were the origin of information, geographic location and the cause of** 326 **the incidents reported by the government and by media?**

327 **4.1 Causes of incidents**

328 The causes of incidents are divided into ten categories: non-food raw materials found in dairy
329 products e.g. melamine in milk powder; counterfeit products; microbial contamination;
330 foreign bodies such as hair; additives which did not comply with food safety standards
331 including preservatives; insects contamination such as maggots; out of date/expired products;

332 dairy products that were reprocessed from inferior materials; nutritional non-compliance e.g.
333 insufficient protein content; with other causes accounting for only a very small percentage of
334 reports (Table 5).

335 **Take in Table 5**

336 The causes of incidents include both food safety (microbial or foreign body contamination),
337 food fraud issues such as counterfeit product and misrepresentation that may, or may not,
338 have health implications. Interestingly foreign body contamination, and insect contamination
339 are only reported in the media. Sixty-nine percent of the incidents are reported in the “media
340 only”, compared with government only (16,4%) and both media and government (14.5%).
341 This highlights the role of the media in information disclosure to the Chinese population.

342 **5.2 Geographic location (province)**

343 Table 6 compares the provinces where the incidents occurred. Provinces with six or
344 more reports published on food safety incidents are listed separately. Provinces with fewer
345 than six incidents are labelled as “other provinces”. When the same incidents occur in several
346 provinces, they are labelled as “multiple provinces” incidents. Multiple provinces reported the
347 highest incidence (n=41 [65%]) followed by those in Guangdong (12.7%). Both government
348 and media tended to report incidents occurring in multiple provinces, Guangdong and
349 Shanghai. The number of the reports in some provinces (Zhejiang, Beijing, Guangxi, Hebei,
350 Shandong, Henan and Jiangsu) is only one or zero. Government only reports tend to expose
351 incidents in multiple provinces (29.6%), Guangdong (18.5%), and Beijing (14.8%). In terms
352 of incidents exposed by “media only”, they are more likely to occur in multiple provinces
353 (22.8%).

354 **Take in Table 6**

355 Additionally, the proportion of incidents in Guangdong, Zhejiang, Shanghai and Beijing is
356 also high, with each accounting for approximately 10%. Moreover, the number of media
357 reports in all other provinces was fewer than six in each case. However within this analysis it
358 should be noted that although the number of media reports in Guangxi was ten, all these
359 reports were about one incident namely farmers adding chlorine dioxide into fresh milk to
360 extend shelf-life. By contrast, some types of incidents were generally reported only once.
361 Therefore it is important not to translate the frequency of reports directly as a means to
362 identify the frequency of actual incidents.

363 **5.3 Physical location that incidents occurred**

364 The physical locations where the reported dairy related incidents occurred are divided into six
365 categories: home; factories; farms; retailers/supermarkets; stores and local street shops;
366 schools; and not specified, i.e. where the location is not mentioned in the incident reports. The
367 incidents without specified physical location was the largest group (58.1%), followed by those
368 occurring at home (29.7%). Incidents occurring at schools (1.8%) are the least likely to be
369 reported by all channels (Table 7). The majority of government reports did not mention
370 location (96.3%), compared to only 4.2% where location was not identified by “media only”
371 reports. This is an interesting difference between the two channels.

372 **Take in Table 7**

373 While “media only” reports exposed forty-six incidents at home, only one incident is reported
374 by government only reports. All incidents reported as occurring in factories, farms, retailers
375 and schools are exposed by the “media only” although proportionately each of these
376 categories is below 7% of the total. In the media reports incidents occurring in factories and
377 without specified locations tend to be reported several times with two factory located
378 incidents being identified in 14 reports. One example identified shows producers extracting
379 proteins from disposed of leather shoes or sofas and adding them to milk powder in order for

380 defective products to pass analytical tests for protein content. The other incident highlights a
381 dairy company mixing in-date and expired milk powder, then re-selling those products to
382 consumers.

383 Other areas included in the reporting information are: identification of government
384 response, risk communication about the incident, e.g. the negative effects of ingesting
385 melamine or how to recognise counterfeit products; information linking with previous
386 incidents; introducing the corrective action by dairy companies which included both positive
387 and negative comment; comments on the government, e.g. complaints on weak response by
388 local government; market research to gain opinions from consumers or investigate whether
389 unsafe products were still sold by retailers (Table 8).

390 **Take in Table 8**

391 Media reports are more likely to include educational content about the incidents (33.1%).
392 Furthermore, media reports provide information about linkages with previous incidents
393 (20.2%), government reaction (19.7%), dairy company reaction (16.3%), comments on the
394 government (12.9%), suggestions (8.4%) and market research (8.4%).

395 **Question 3: What was the reporting timescale for incidents and did this vary according** 396 **to communication channel?**

397 Of the 24 incidents exposed by both government and media, almost 90% (n = 21) are exposed
398 first by the government, and only three are reported earlier by the media. Table 9 shows the
399 feature of incidents exposed by both government and media.

400 **Take in Table 9**

401 In terms of product types, the incidents reported earlier by government are more likely to be
402 milk powder. However, it should be noted that due to the small number of incidents discussed
403 here, generalisations are not possible. Differences in reporting channel between geographic

404 location and causes are not substantial, especially as over 90% of the earlier incidents
405 revealed by government did not specify geographic location and all incidents reported earlier
406 by the media occurred in multiple areas. Figure 5 shows that the total number of incidents
407 exposed was the highest in 2005 and 2012. In 2005, 37 incidents were reported 51 times. In
408 2012, 29 incidents were reported 63 times. As shown in Figure 4, milk powder and fresh milk
409 were affected most. Top causes reported in 2005 were substandard nutrition and counterfeit
410 products whilst in 2012 product adulteration and microbial contamination were reported most.
411 Strikingly, very few or no incidents were reported in 2004, 2010, and between 2014 and 2017.
412 The government exposed the highest number of incidents in 2005, with eight incidents being
413 exposed, however, the number for other years is fewer than five (Figure 6). The incidents
414 uncovered by media only in 2005, 2011, 2012 and 2013 are more than other years, being all
415 above 15. Additionally, there is also a noticeable increase in 2009 before a sharp decrease in
416 2010.

417 **Take in Figures 4, 5 and 6**

418 Comparatively in most the years, “media only” highlight more incidents than the government
419 alone. This is particularly true for 2005 and 2012. In 2005, while “media only” reported 23
420 incidents, government alone only exposed eight. In 2012, “media only” revealed 21 incidents,
421 nevertheless, only two were exposed government alone.

422 **Question 4: How did the information compare and contrast between government** 423 **reports and media reports?**

424 From 2004 to 2017, only twenty-four of the safety incidents (n = 165) were reported
425 by both government and media. This shows the degree of differentiation between the two
426 reporting systems with the government alone revealing twenty-seven incidents. Without the
427 media reporting, consumers would be unaware of the additional incidents. This finding here is
428 in contrast with Holtkamp, Liu and McGuire (2014) and Liu, Liu and Gao (2015) who found

429 that the government tended to report more incidents than the media. One possible explanation
430 for this difference is that the previous research covers all food categories, while this study
431 only focuses on dairy products. Additionally, considering that 2009 is a milestone in China
432 food safety regulations, a comparison of reports published between 2004-2009 and those
433 between 2010-2017 was conducted. As presented in Figures 7 and 8, media reports were
434 significantly higher during 2010-2017.

435 **6. Discussion**

436 China has witnessed a sharp increase in reported food safety incidents, which has not
437 only raised concerns among Chinese consumers, but also damaged the international reputation
438 of Chinese food industry (Jia & Jukes, 2013; Peng, Li, Xia, Qi & Li, 2015; Liu & Ma, 2016).
439 To improve this situation, official food safety systems has been reformed, and third-party
440 stakeholders, especially news media, have played an increasingly important role in the
441 governance of food safety (Jia & Jukes, 2013; Zhang, Qiao, Wang, Pu, Yu & Zheng, 2015).
442 To protect public health, communicating food safety risk in a timely way is essential (Wright,
443 2016). Therefore, channels that provide early warning of incidents can play a more important
444 role in food safety governance. Food incidents impact on human health and erode consumer
445 trust (Elliott Review, 2014). Information disclosure and transparency increase consumer trust
446 (Mol, 2014). Consumers perceptions of food safety risk is dependent on the information they
447 receive, its source and then how they cognitively frame the message to inform trust (Liu,
448 Pieniak & Verbeke, 2014) who found that after the television the internet was the second most
449 frequent channel used by consumers for information about food safety. This study found food
450 producers to be the least trusted, a neutral level of trust in government information and
451 greatest levels of trust in consumer associations, research institutes, relatives and friends.

452 The role of the media as an information source and more widely as an actor in food
453 safety governance is considered here and increasing public attention towards the safety of

454 dairy products in China may have contributed to the greater reporting of incidents by
455 consumers direct to the media. Government reported incidents are based on official
456 inspections, which indicates that Chinese government tends to only trust its own inspections
457 as has been suggested by some want to ensure that all reports are verified before release (Jia
458 & Jukes, 2013; Zhou, 2017). In contrast, the media relies heavily on collecting information
459 from a wide range of sources, but the reliability of the information provided by such sources
460 is arguably difficult to validate and thus the interpretation of such data should be undertaken
461 with caution. The fact that no media reports are identified as being sourced from official
462 inspections suggests that the government tends not to share their information with the media
463 concurring with the study of Liu, Liu and Gao (2015). Although the number of incidents
464 sourced from trade associations and dairy companies was extremely low, these incidents are
465 more likely to be reported multiple times perhaps because the media felt they had greater
466 reliability.

467 Milk powder is the most reported incident, although the influence of purposive
468 regulatory sampling should be considered (see Kowalska, Manning & Soon, 2018). In the
469 “media only” incidents there is a strong focus on fresh milk, probably as a result of the shorter
470 shelf-life as out of date/expired products were the mostly commonly reported problem. A
471 focus in this research on incident types adds to the current literature, since no previous study
472 has compared the type of reported incident with a specific focus to the dairy products. Apart
473 from microbial contamination, which is heavily reported by the government, the media also
474 exposes substandard nutrition and counterfeit products frequently as did Chen, Huang, Nong
475 and Kwan (2016). However in contrast the results from this study did not highlight animal,
476 plant or fungi toxin and food additives as frequently reported issues probably ue to the
477 product type. For example, there is no regulation on pesticides and veterinary drug residues
478 for dairy products in China, since the government only controls this issue through monitoring
479 animal feeds (NHCPRC, 2013). Interestingly “media only” reported incidents are related to

480 expired products, foreign body and insect contamination perhaps explained by the heavy
481 reliance of media on consumers as the information source. It should be noted that government
482 reports did not focus on foreign body or insect contamination.

483 This study is novel in examining the provinces where dairy incidents occur and
484 interestingly most incidents reported by government do not identify the physical location
485 where the incident occurs, but perhaps that is because the product has already been removed
486 from sale and is not seen to pose a risk thus the location is not identified. In media reports, the
487 home was the most frequently reported contradicting McCarthy, Brennan, De Boer and Ritson
488 (2008) and Chen, Huang, Nong and Kwan (2016) who state that the media tended to report
489 incidents that happen in public areas. The majority of government reports mention the
490 reaction of the government, which is not surprising, as the government seeks to show its
491 responsible behaviour to the public. Most media reports include educational information
492 about the incidents, link the incidents with previous incidents and introduce the reactions of
493 the government and dairy companies. Specially, areas of information comprising previous
494 incidents, comments on government activity, and market research are only included in media
495 reports. With more variety and a larger amount of information included in media reports, it is
496 possible for consumers to gain more understanding of an incident. These results support the
497 work of McCarthy, Brennan, De Boer and Ritson (2008) and Shan et al. (2014), and extent
498 their findings to identify additional information provided to the public. The timing of reports
499 identified in this study agrees with Shan et al. (2014) that the government exposes incidents
500 earlier than the media.

501 Through analysing the government and media reports on dairy related food safety
502 incidents reported between 2004 and 2017, differences were found between government
503 reporting and media reporting. This research shows that the media plays a complementary
504 role in food safety governance in China. Firstly, the media exposed more incidents than the
505 government, with 114 reported only by media, 27 only by government and 24 by both

506 government and media. Owing to the small number of incidents exposed by both government
507 and media in this study, no conclusions can be drawn on dual reporting. However, since this
508 comparison can contribute to a better understanding of the role of media in food safety
509 governance further empirical work should be undertaken in this area.

510 **7. Conclusion**

511 Using dairy products as the food item of interest, the aim of the research was to
512 explore the role of the media in food safety governance in China. Thematic content analysis
513 was used to evaluate government and news media reports on dairy related food safety
514 incidents in China between 2004 and 2017. However it should be noted that some original
515 websites hyperlinked on ZCCW cannot be accessed now, making it impossible to evaluate the
516 quality and validity of all the data, which is a limitation on this study. The small dataset
517 examined here means that only preliminary findings can be presented and further studies with
518 a larger dataset need to be undertaken to confirm the results can be further generalised. The
519 government performed better on exposing incidents earlier within the 14-year period but the
520 news media played a complementary role in food safety governance exposing a wider
521 coverage of incidents especially those identified in the home. This is particularly so after
522 2009 when adulteration and contamination incidents were reported more widely by media.
523 This study extends the current literature on the role of the news media in food safety
524 governance in China by focusing on a single food sector (dairy), but on a national scale, and
525 also considering the physical location where the incident has occurred. The contribution this
526 paper makes to existing literature is to address the role of media reporting of food incidents in
527 wider food safety governance. As supply chains become more global and complex, effective
528 risk communication is essential. It is important that emerging models of risk communication
529 are considered and critiqued in order to ensure that consumers can readily access information
530 about the food they consume. Although this research has focused on dairy sector specifically
531 the work has provided a some understanding that could be extended to other food categories.

532 News media alone was considered in this research. However, social media has played an
533 increasingly important role in food safety governance, hence, it would be helpful for further
534 research to investigate role of social media in food safety governance. Therefore, further
535 studies are suggested to investigate a wider range of media exposure to reflect the role of
536 media in food safety governance in China more comprehensively.

537

538 **References**

- 539 Albersmeier, F., Schulze, H., Jahn, G & Spiller, A. (2009), The reliability of third-party
540 certification in the food chain: from checklists to risk-oriented auditing, *Food Control*,
541 20(10), 927-935.
- 542 Babu, S.C., Aggarwal, S & Chen, J. (2017). *Role of media in shaping the policy process:
543 Comparative lessons from the food price crisis in Bangladesh, China, India, and Vietnam.*
544 [Online]. International Food Policy Research Institute. Available from:
545 [http://www.ifpri.org/publication/role-media-shaping-policy-process-comparative-lessons-
546 food-price-crisis-bangladesh-china](http://www.ifpri.org/publication/role-media-shaping-policy-process-comparative-lessons-food-price-crisis-bangladesh-china) Accessed 28 December 2017.
- 547 CFDA (China Food and Drug Administration). (2017). *A collection of recent food and drug
548 related rumour (No.2).* [Online]. CFDA. Available from:
549 <http://www.sda.gov.cn/WS01/CL1978/171963.html>. Accessed 04 December 2017.
- 550 Chen, S., Huang, D., Nong, W & Kwan, H.S. (2016). Development of a food safety
551 information database for Greater China. *Food Control*, 65, 54-62.
- 552 Chen, K., Wang, X.X & Song, H.Y. (2015). Food safety regulatory systems in Europe and
553 China: A study of how co-regulation can improve regulatory effectiveness. *Journal of
554 Integrative Agriculture*, 14(11), 2203-2217
- 555 Codex Alimentarius. 2011. *Milk and milk products*. 2nd ed. Rome: (Food and Agriculture
556 Organisation) and WHO (World Health Organisation).
- 557 Cope, S., Frewer, L.J., Houghton, J., Rowe, G., Fischer, A.R.H & de Jonge, J. (2010).
558 Consumer perceptions of best practice in food risk communication and management:
559 Implications for risk analysis policy. *Food Policy*, 35(4), 349-357.
- 560 Dong, X & Li, Z. (2016). Food safety issues in China: A case study of the dairy
561 sector. *Journal of the Science of Food and Agriculture*, 96(1), 346-352.
- 562 Elliott Review into the Integrity and Assurance of Food Supply Networks (2014). *Final
563 Report A National Food Crime Prevention Framework* July 2014. HM Government. London
- 564 FAO (Food and Agriculture Organization) and WHO (World Health Organisation). 2003.
565 *Assuring food safety and quality: guidelines for strengthening national food control system.*

566 (FAO Food and Nutrition Paper 76). Rome: Food and Agriculture Organisation and World
567 Health Organisation.

568 State Council of China. (2015). *The Food Safety Law of the People's Republic of China*.
569 [Online]. Available from http://www.gov.cn/zhengce/2015-04/25/content_2853643.htm (in
570 Chinese). Last accessed 25 June 2018.

571
572 State Council of China. (2009). *The Food Safety Law of the People's Republic of China*.
573 [2009-02-28]. [Online]. Available from [http://www.gov.cn/flfg/2009-
574 02/28/content_1246367.htm](http://www.gov.cn/flfg/2009-02/28/content_1246367.htm) (in Chinese). Last accessed 25 June 2018.

575
576 Gale, F & Hu, D. (2009), "Supply chain issues in China's milk adulteration incident", *The*
577 *International Association of Agricultural Economic Conference*, Beijing, August 16-22.
578

579 Gehlbach, S & Sonin, K. (2014). Government control of the media. *Journal of Public*
580 *Economics*, 118, 163-171.

581 Holtkamp, N., Liu, P & McGuire, W. (2014). Regional patterns of food safety in China: What
582 can we learn from media data? *China Economic Review*, 30, 459-468.

583 Huang, Y., Wu, F & Cheng, Y. (2016). Crisis communication in context: Cultural and
584 political influences underpinning Chinese public relations practice. *Public Relations*
585 *Review*, 42(1), 201-213.

586 Jia, C & Jukes, D. 2013. The national food safety control system of China – a systematic
587 review. *Food Control*, 32(1), pp.236-245.

588 Jin, H.J & Han, D.H. (2014). Interaction between message framing and consumers' prior
589 subjective knowledge regarding food safety issues. *Food Policy*, 44, 95-102.

590 Kottenstede, K. (2017). Transnational private food standards in the People's Republic:
591 Hybridization with Chinese characteristics. In: Verbruggen, P. and Havinga, T. ed.
592 *Hybridization of food governance: trends, types and results*. Cheltenham: Edward Elgar
593 Publishing. pp. 215-239.

594 Kowalska, A., Soon, J.M., and Manning, L. (2018). A study on adulteration in cereals and
595 bakery products from Poland including a review of definitions *Food Control*, 92, 348-356

596 Lam, H.M., Remais, J., Fung, M.C., Xu, L & Sun, S.S.M. (2013). Food supply and food
597 safety issues in China. *The Lancet*, 381(9882), 2044-2053.

598 Li, D., Nanseki, T., Takeuchi, S., Song, M., Chen, T & Zhou, H. (2012). Consumer
599 Perceptions upon Food Safety and Demographic Determinants in China: Empirical Analysis
600 based on a Survey of 512 Respondents. *J. Fac. Agr., Kyushu Univ*, 57(2), 517-525.

601 Liang, J. (2011). Increasing the intensity of management of food safety in those large-scale
602 food enterprises. *Jingchu Website*, 14 April, [Online]. Jingchu Website. Available from:
603 <http://focus.cnhubei.com/original/201104/t1671057.shtml> [Accessed 26 November 2017].

604 Liu, P & Ma, L. (2016). Food scandals, media exposure, and citizens' safety concerns: A
605 multilevel analysis across Chinese cities. *Food Policy*, 63, 102-111.

606 Liu, F., Liu, Y & Gao, J. (2015). Food safety incidents in Beijing: occurrence patterns, causes
607 and wider social implications. *Palgrave Communications*, 1. [Online]. Palgrave. Available
608 from: <https://www.nature.com/articles/palcomms201529.pdf> [Accessed 16 November 2017].

609 Liu, Y., Liu, F., Zhang, J & Gao, J. (2015). Insights into the nature of food safety issues in
610 Beijing through content analysis of an Internet database of food safety incidents in
611 China. *Food Control*, 51, pp.206-211.

612 Liu, R., Pieniak, Z & Verbeke, W. (2014). Food-related hazards in China: Consumers'
613 perceptions of risk and trust in information sources. *Food Control*, 46, 291-298.

614 Liu, R., Pieniak, Z & Verbeke, W. (2013). Consumers' attitudes and behaviour towards safe
615 food in China: A review. *Food Control*, 33(1), 93-104.

616 Liu, P. (2010). Tracing and periodising China's food safety regulation: A study on China's
617 food safety regime change. *Regulation & Governance*, 4(2), 244-260.

618 Lu, F & Wu, X. (2014). China food safety hits the “gutter”. *Food Control*, 41, 134-138.

619 Manning, L. (2018), Triangulation: effective verification of food safety and quality
620 management systems and associated organisational culture *World Hospitality and Tourism*
621 *Themes* 10(3), 297-312

622 Manning, L & Soon, J.M, (2014). Developing systems to control food adulteration, *Food*
623 *Policy*, 49(1), 23-32

624 McCarthy, M., Brennan, M., De Boer, M & Ritson, C. (2008). Media risk communication–
625 what was said by whom and how was it interpreted. *Journal of Risk Research*, 11(3), 375-
626 394.

627 McCluskey, J & Swinnen, J. (2011). The media and food risk perceptions. *EMBO*
628 *reports*, 12(7), 624-629.

629 Mol, A.P. (2014). Governing China's food quality through transparency: a review. *Food*
630 *Control*, 43, 49-56.

631 NHCPRC (National Health Commission of the People’s Republic of China). 2013. *Answers*
632 *to the questions about the standards on dairy products*. [Online]. NHCPRC. Available from:
633 <http://www.nhfpc.gov.cn/zwgk/zswd/201306/1d5f7a29e2a14ae59aece704fc11b2b0.shtml>
634 [Accessed 20 April 2018].

635 Ortega, D.L., Wang, H.H., Olynk, N.J., Wu, L & Bai, J. (2011). Chinese consumers' demand
636 for food safety attributes: A push for government and industry regulations. *American Journal*
637 *of Agricultural Economics*, 94(2), 489-495.

638 Pavlovich, K., Sinha, P. N & Rodrigues, M. (2016). A qualitative case study of MNE
639 legitimacy: The Fonterra-Sanlu IJV corporate milk scandal in China. *International Journal of*
640 *Emerging Markets*, 11(1), 42-56.

641 Pei, X., Tandon, A., Alldrick, A., Giorgi, L., Huang, W & Yang, R. (2011). The China
642 melamine milk scandal and its implications for food safety regulation. *Food Policy*, 36, 412–
643 420.

644 Peng, Y., Li, J., Xia, H., Qi, S & Li, J. (2015). The effects of food safety issues released by
645 we media on consumers' awareness and purchasing behaviour: A case study in China. *Food*
646 *Policy*, 51, 44-52.

647 Pettinger, T. (2017). *Asymmetric information problem*. [Online]. Economics help. Available
648 from: <https://www.economicshelp.org/blog/glossary/asymmetric-information/> Accessed 10
649 December 2017.

650 Qiang, L., Wen, L., Jing, W & Yue, D. (2011). Application of content analysis in food safety
651 reports on the Internet in China. *Food Control*, 22(2), 252-256.

652 Shan, L., Regan, Á., De Brún, A., Barnett, J., van der Sanden, M.C., Wall, P & McConnon,
653 Á. (2014). Food crisis coverage by social and traditional media: A case study of the 2008 Irish
654 dioxin crisis. *Public Understanding of Science*, 23(8), 911-928.

655 Soon, J.M., Singh, H & Baines, R. (2011). Foodborne diseases in Malaysia: A review. *Food*
656 *Control*, 22(6), 823-830.

657 Stockmann, D & Gallagher, M.E. (2011). Remote control: How the media sustain
658 authoritarian rule in China. *Comparative Political Studies*, 44(4), 436-467.

659 Turku, M., Lepistö, O & Lundén, J. (2018). Differences between official inspections and third
660 party audits of food establishments, *Food Control*, 85, 459-465.

661 UNESCO (United Nations Educational, Scientific and Cultural Organisation). 2017. *Concept*
662 *of governance*. [Online]. UNESCO. Available from:
663 [http://www.unesco.org/new/en/education/themes/strengthening-education-systems/quality-](http://www.unesco.org/new/en/education/themes/strengthening-education-systems/quality-framework/technical-notes/concept-of-governance/)
664 [framework/technical-notes/concept-of-governance/](http://www.unesco.org/new/en/education/themes/strengthening-education-systems/quality-framework/technical-notes/concept-of-governance/) [Accessed 13 January 2018].

665 Unnevehr, L & Hoffmann, V. (2015). Food safety management and regulation: International
666 experiences and lessons for China. *Journal of Integrative Agriculture*, 14(11), 2218-2230.

667 Veil, S.R & Yang, A. (2012). Media manipulation in the Sanlu milk contamination
668 crisis. *Public Relations Review*, 38(5), 935-937.

669 Verbruggen, P & Havinga, T. (2017). Hybridization of food governance: An analytical
670 framework. In: Verbruggen, P. and Havinga, T. ed. *Hybridization of food governance: trends,*
671 *types and results*. Cheltenham: Edward Elgar Publishing. pp. 1-27.

672 Verbruggen, P. (2016). Understanding the New Governance of Food Safety: Regulatory
673 Enrolment as a Response to Change in Public and Private Power. *Cambridge J. Int'l & Comp.*
674 *L.*, 5, p.418.

675 WHO (World Health Organisation). (2018). *Questions and answers on melamine*. [Online].
676 WHO. Available from: <http://www.who.int/csr/media/faq/QAmelamine/en/> [Accessed 13
677 January 2018].

678 WHO (World Health Organisation). (2017). *Epidemic intelligence – systematic event*
679 *detection*. [Online]. WHO. Available from:
680 <http://www.who.int/csr/alertresponse/epidemicintelligence/en/> Accessed 05 December 2017.

681 WHO (World Health Organisation). (2015). *Health topics – Foodborne diseases*. [Online].
682 Available from: http://www.who.int/topics/foodborne_diseases/en/ Accessed 13 August
683 2018.

684
685 Wright, M.S. (2016). Manufacturing food safety incidents and the role of food safety culture.
686 In: Soon, J.M., Manning, L. and Wallace, C.A. ed. *Foodborne diseases: case studies of out*
687 *breaks in the agri-food industries*. Boca Raton: CRC Press.

688 Wu, X., Lu, Y., Xu, H., Lv, M., Hu, D., He, Z., Liu, L., Wang, Z & Feng, Y., (2018).
689 Challenges to improve the safety of dairy products in China. *Trends in Food Science &*
690 *Technology*, 76, 6-14

691 Wu, H. (2011). Yi fen xiang shi. Zhongguo shipin anquan zhuangkuang diaocha. Working
692 Paper (<http://www.zccw.info/report>. Accessed 10 June 2018).

693 Xiu, C & Klein, K.K. (2010). Melamine in milk products in China: examining the factors that
694 led to deliberate use of the contaminant. *Food Policy*, 35(5), 463-470.

695 Yang, G. (2013). Contesting food safety in the Chinese media: Between hegemony and
696 counter-hegemony. *The China Quarterly*, 214, 337-355.

697 Young, M. N., Peng, M. W., Ahlstrom, D., Bruton, G. D & Jiang, Y. (2008). Corporate
698 governance in emerging economies: A review of the principal–principal perspective. *Journal*
699 *of management studies*, 45(1), 196-220.

700 Yuan, H. (2016). Measuring media bias in China. *China Economic Review*, 38, 49-59.

701 ZCCW (Zhichuchuangwai). (2011). *The research of Chinese food safety condition (2004 –*
702 *2011)*. [Online]. ZCCW. Available from: <http://www.zccw.info/report> [Accessed 10 April
703 2018].

704 ZCCW (Zhichuchuangwai). (Not dated). *Online searching*. [Online]. ZCCW. Available from:
705 <http://www.zccw.info/query> [Accessed 40 April 2018].

706 Zhang, L., Xu, Y., Oosterveer, P & Mol, A.P. (2016). Consumer trust in different food
707 provisioning schemes: evidence from Beijing, China. *Journal of Cleaner Production*, 134,
708 269-279.

709 Zhang, W & Xue, J. (2016). Economically motivated food fraud and adulteration in China:
710 An analysis based on 1553 media reports. *Food Control*, 67, 192-198.

711 Zhang, M., Qiao, H., Wang, X., Pu, M., Yu, Z & Zheng, F. (2015). The third-party regulation
712 on food safety in China: A review. *Journal of Integrative Agriculture*, 14(11), 2176-2188.

713 Zhou, G. (2017). *The regulatory regime of food safety in China: Governance and*
714 *segmentation*. Basingstoke: Palgrave Macmillan.

715
716

717 **List of Abbreviations used in the paper**

Abbreviations	
AQSIQ	Administration of Quality Supervision, Inspection and Quarantine
BRC	British Retail Consortium
CFDA	China Food and Drug Administration
FSL	Food Safety Laws
GAP.	Good Agricultural Practices
MOA	Ministry of Agriculture
MOH	Ministry of Health
NFSC	National Food Safety Commission
NGOs	Non-Governmental Organisations
NHCPRC	National Health Commission of the People's republic of China
ZCCW	Zhichuchuangwai (the database)

718

719

720

721 **Table 1. Comparison of databases of reports on food incidents in China**

	Zhichuchuangwai (ZCCW)	Food Safety Information Database for Greater China (FSIDfGC)
Web address	http://www.zccw.info	http://kwanlab.bio.cuhk.edu.hk/FS/
Year database was launched	2011	2015
Geographical area covered	Mainland China	Greater China (China, Hong Kong, Macau and Taiwan)
Methods of data collection	Manual	Web-crawling
Relevance to food safety incidents	Filtered to include only reports on food safety incidents)	May include information about food safety incidents as well as policy, trend, scientific research reports, trade association reports and regulations)
Number of reports on food safety incidents included	2107 (between 2004 and 2011) 3500 (between 2004 and 2017)	Not available

722

723

724 **Table 2. Levels of coding and sources of codes**

Level 1	Level 2	Source(s)
Original sources of information	Government inspections Media instigated by consumers Media instigated by government Media instigated by journalists	Liu, Liu, Zhang & Gao, (2015)
	Media instigated by trade associations Media instigated by dairy companies Other sources	Authors' own
Types	Milk powder Fresh milk Milk beverage Yogurt Cheese and cream Other dairy products	ZCCW (not dated)
Causes	Microbial contamination <i>Substandard nutrition</i> <i>Non-food raw material contamination</i> Foreign bodies (debris) Food additives Reprocessed products Others	Liu, Liu, Zhang & Gao, (2015)
	Counterfeit products (fake) Out of date/expired products Insect contamination	Authors' own
Provinces	There are 34 provinces in China. No previous study has compared the provinces of incidents. Hence, this research is the first to compare the nature of incidents by provinces.	
Location	Home	McCarthy, Brennan, De Boer & Ritson (2008) / Chen, Huang, Nong & Kwan, (2016)
	Schools	Chen, Huang, Nong & Kwan, (2016)
	Not specified Factories Farms Retailers	Authors' own
Other areas of information included	Reaction of the government Knowledge about the incidents Linking with previous incidents Reaction of dairy companies Comments on the government Suggestions for consumers Market research Others	Authors' own (This research is the first to compare other areas of information included.)

725

726

727 **Table 3. The original sources of information on dairy related food safety incidents vs**
 728 **types of channels**

Information source		Both government and media	Government only	Media only	Total incidents (Total reports)
Government inspections	Count	22	27	0	49 (55)
	% within the source	44.9%	56.3%	0.0%	100.0%
	% within incidents published by the channel	91.7%	100.0%	0.0%	29.7%
Media instigated by consumers	Count	0	0	50	50 (59)
	% within the source	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	43.9%	30.3%
Media instigated by government	Count	2	0	25	27 (39)
	% within the source	7.4%	0.0%	92.6%	100.0%
	% within incidents published by the channel	8.3%	0.0%	21.9%	16.4%
Media instigated by journalists	Count	0	0	23	23 (33)
	% within the source	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	20.2%	13.9%
Media instigated by trade associations	Count	0	0	7	7 (21)
	% within the source	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	6.1%	4.2%
Media instigated by dairy companies	Count	0	0	3	3 (17)
	% within the source	0.0%	0.0%	75.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	2.6%	1.8%
Other sources	Count	0	0	6	6 (9)
	% within the source	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	5.3%	3.6%
Total	Count	24	27	114	165 (233)
	% within the source	14.5%	16.4%	69.1%	100.0%
	% within incidents published by the channel	100.0%	100.0%	100.0%	100.0%

731 **Table 4. Types of incidents on different dairy product types vs. reporting channels**

Product type		Both government and media	Government only	Media only	Total incidents (Total reports)
Milk powder	Count	11	14	47	72 (99)
	% within the type	15.3%	18.1%	66.7%	100.0%
	% within incidents published by the channel	45.8%	51.9%	41.2%	43.6%
Fresh milk	Count	2	5	50	57 (93)
	% within the type	3.5%	8.8%	87.7%	100.0%
	% within incidents published by the channel	8.3%	18.5%	43.9%	34.5%
Milk beverage	Count	3	3	6	12 (15)
	% within the type	25.0%	25.0%	50.0%	100.0%
	% within incidents published by the channel	12.5%	11.1%	5.3%	7.3%
Yogurt	Count	4	3	5	12 (14)
	% within the type	33.3%	25.0%	41.7%	100.0%
	% within incidents published by the channel	16.7%	11.1%	4.4%	7.3%
Cheese and cream	Count	0	1	2	3 (3)
	% within the type	0.0%	33.3%	66.7%	100.0%
	% within incidents published by the channel	0.0%	3.7%	1.8%	1.8%
Other dairy products	Count	4	1	4	9 (9)
	% within the type	44.4%	11.1%	44.4%	100.0%
	% within incidents published by the channel	16.7%	3.7%	3.5%	5.5%
Total	Count	24	27	114	165 (233)
	% within the type	14.5%	16.4%	69.1%	100.0%
	% within incidents published by the channel	100.0%	100.0%	100.0%	100.0%

732

733

734

Table 5. The causes of dairy related food safety incidents vs. reporting channels

Cause		Both government and media	Government only	Media only	Total incidents (Total reports)
Microbial contamination	Count	3	10	18	31 (39)
	% within the cause	9.7%	32.3%	58.1%	100.0%
	% within incidents published by the channel	12.5%	37.0%	15.8%	18.8%
Substandard nutrition	Count	4	3	18	25 (38)
	% within the cause	16.0%	12.0%	72.0%	100.0%
	% within incidents published by the channel	16.7%	11.1%	15.8%	15.2%
Counterfeit products	Count	4	1	18	23 (33)
	% within the cause	17.4%	4.3%	78.3%	100.0%
	% within incidents published by the channel	16.7%	3.7%	15.8%	13.9%
Product adulteration	Count	5	5	10	20 (47)
	% within the cause	25.0%	25.0%	50.0%	100.0%
	% within incidents published by the channel	20.8%	18.5%	8.8%	12.1%
Out of date/ expired products	Count	2	0	10	12 (13)
	% within the cause	16.7%	0.0%	83.3%	100.0%
	% within incidents published by the channel	8.3%	0.0%	8.8%	7.3%
Foreign body contamination	Count	0	0	10	10 (11)
	% within the cause	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	8.8%	6.1%
Insect contamination	Count	0	0	10	10 (11)
	% within the cause	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	8.8%	6.1%
Food additives	Count	2	3	4	9 (10)
	% within the cause	22.2%	33.3%	44.4%	100.0%
	% within incidents published by the channel	8.3%	11.1%	3.5%	5.5%
Reprocessed	Count	1	1	2	4 (8)

products	% within the cause	25.0%	25.0%	50.0%	100.0%
	% within incidents published by the channel	4.2%	3.7%	1.8%	2.4%
Others	Count	3	4	14	21 (23)
	% within the cause	14.3%	19.0%	66.7%	100.0%
	% within incidents published by the channel	12.5%	14.8%	12.3%	12.7%
Total	Count	24	27	114	165 (233)
	% within the cause	14.5%	16.4%	69.1%	100.0%
	% within incidents published by the channel	100.0%	100.0%	100.0%	100.0%

736

737 Note: in this work *product adulteration* is considered to be the intentional addition or substitution of a material
738 within a food product for the perpetrators to derive economic benefit from doing so. *Counterfeit products* are
739 considered to be those products that are made to look like or be an exact replica or imitation of another product
740 with the motive of deceiving or defrauding to provide an economic benefit for the perpetrators.

741

742

743 **Table 6. The provinces of dairy related food safety incidents vs. reporting channels**

Province		Both government and media	Government only	Media only	Total incidents (Total reports)
Multiple provinces	Count	7	8	26	41 (63)
	% within the area	17.1%	19.5%	63.4%	100.0%
	% within incidents published by the channel	29.2%	29.6%	22.8%	24.8%
Guangdong	Count	3	5	13	21 (27)
	% within the area	14.3%	23.8%	61.9%	100.0%
	% within incidents published by the channel	12.5%	18.5%	11.4%	12.7%
Shanghai	Count	3	2	11	16 (21)
	% within the area	18.8%	12.5%	68.8%	100.0%
	% within incidents published by the channel	12.5%	7.4%	9.6%	9.7%
Beijing	Count	0	4	12	16 (20)
	% within the area	0.0%	25.0%	75.0%	100.0%
	% within incidents published by the channel	0.0%	14.8%	10.5%	9.7%
Zhejiang	Count	1	0	10	11 (22)
	% within the area	9.1%	0.0%	90.9%	100.0%
	% within incidents published by the channel	4.2%	0.0%	8.8%	6.7%
Shandong	Count	1	0	6	7 (7)
	% within the area	14.3%	0.0%	85.7%	100.0%
	% within incidents published by the channel	4.2%	0.0%	5.3%	4.2%
Hebei	Count	1	1	3	5 (9)
	% within the area	20.0%	20.0%	60.0%	100.0%
	% within incidents published by the channel	4.2%	3.7%	2.6%	3.0%
Jiangsu	Count	1	0	4	5 (6)
	% within the area	20.0%	0.0%	80.0%	100.0%
	% within incidents published by the channel	4.2%	0.0%	3.5%	3.0%
Hunan	Count	1	0	3	4 (6)

	% within the area	25.0%	0.0%	75.0%	100.0%
	% within incidents published by the channel	4.2%	0.0%	2.6%	2.4%
Guangxi	Count	0	0	1	1 (10)
	% within the area	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	0.9%	0.6%
Other provinces	Count	6	7	25	38 (42)
	% within the area	15.8%	18.4%	65.8%	100.0%
	% within incidents published by the channel	25.0%	25.9%	21.9%	23.0%
Total	Count	24	27	114	165 (233)
	% within the area	14.5%	16.4%	69.1%	100.0%
	% within incidents published by the channel	100.0%	100.0%	100.0%	100.0%

744

745

746

747 **Table 7. The location of dairy related food safety incidents vs types of channels**

Location		Both government and media	Government only	Media only	Total incidents (Total reports)
Not specified	Count	22	26	48	96 (136)
	% within the location	22.9%	27.1%	50.0%	100.0%
	% within incidents published by the channel	91.7%	96.3%	42.1%	58.2%
Home	Count	2	1	46	49 (53)
	% within the location	4.1%	2.0%	93.9%	100.0%
	% within incidents published by the channel	8.3%	3.7%	40.4%	29.7%
Factories	Count	0	0	7	7 (15)
	% within the location	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	6.1%	4.2%
Farms	Count	0	0	2	2 (14)
	% within the location	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	1.8%	1.2%
Retailers	Count	0	0	8	8 (11)
	% within the location	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	7.0%	4.8%
Schools	Count	0	0	3	3 (4)
	% within the location	0.0%	0.0%	100.0%	100.0%
	% within incidents published by the channel	0.0%	0.0%	2.6%	1.8%
Total	Count	24	27	114	165 (233)
	% within the location	14.5%	16.4%	69.1%	100.0%
	% within incidents published by the channel	100.0%	100.0%	100.0%	100.0%

748

749

750

751

752

753 **Table 8. Other areas included in reporting of dairy related food safety incidents.**

Other areas included	Government reports		Media reports	
	Number	Proportion	Number	Proportion
Reaction of the government	45	81.8%	35	19.7%
Knowledge about the incidents	8	14.5%	59	33.1%
Linking with previous incidents	0	0.0%	36	20.2%
Reaction of dairy companies	2	3.6%	29	16.3%
Comments on the government	0	0.0%	23	12.9%
Suggestions for consumers	3	5.5%	15	8.4%
Market research	0	0.0%	15	8.4%
Others	0	0.0%	4	2.2%

754

755

756
757

Table 9. The features of the dairy related incidents reported by both government and media

Feature of the incidents		Government earlier	Media earlier	Total
Type	Milk powder	10	1	11
	Fresh milk	2	1	3
	Milk beverage	2	1	3
	Yogurt	3	0	3
	Cheese and cream	0	0	0
	Other dairy products	4	0	4
	Total	21	3	24
Cause	Non-food raw material	3	2	5
	Microbial contamination	3	0	3
	Substandard nutrition	4	0	4
	Counterfeit products	3	1	4
	Out of date/expired products	2	0	2
	Foreign bodies	0	0	0
	Insect contamination	0	0	0
	Food additives	2	0	2
	Reprocessed products	1	0	1
	Others	3	0	3
Total	21	3	24	
Province	Multiple provinces	4	3	7
	Guangdong	3	0	3
	Zhejiang	1	0	1
	Shanghai	3	0	3
	Beijing	0	0	0
	Guangxi	0	0	0
	Hebei	1	0	1
	Shandong	1	0	1
	Hunan	1	0	1
	Jiangsu	1	0	1
	Others	6	0	6
Total	21	3	24	
Location	Not specified	19	2	21

Home	1	0	1
Factories	1	1	2
Farms	0	0	0
Retailers	0	0	0
Schools	0	0	0
Total	21	3	24

758

759

760

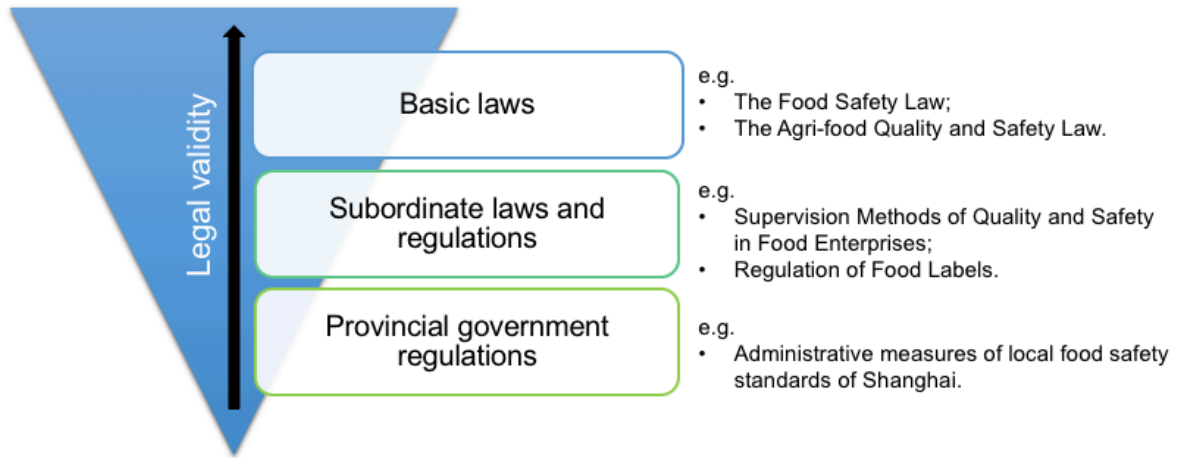
761

762

763

764

765

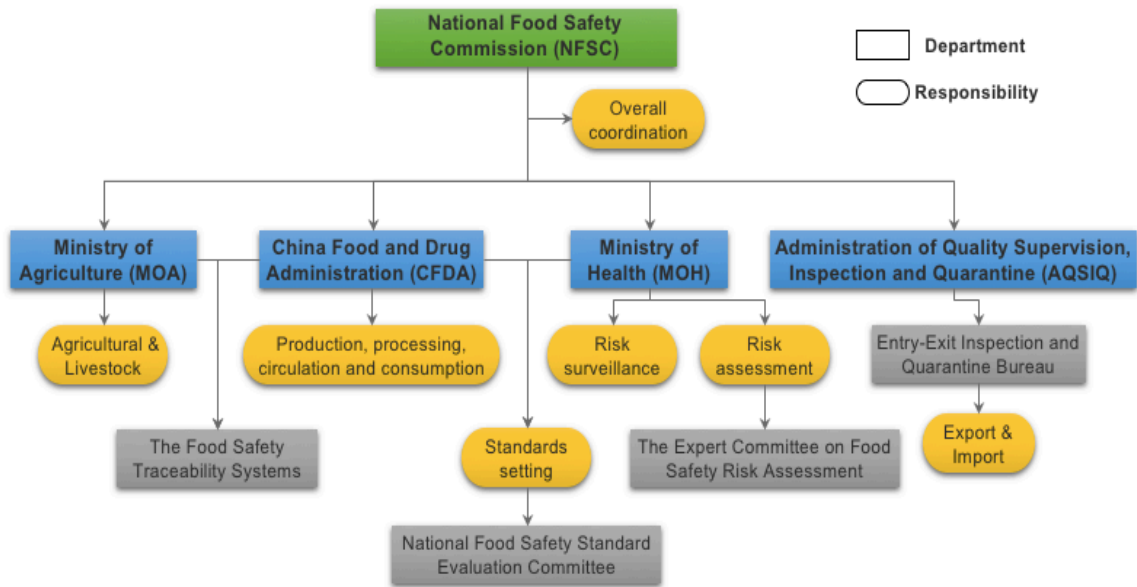


766

767 **Figure 1. Pyramid of laws and regulations in China (Adapted from Jia & Jukes, 2013 p. 238)**

768

769



770

771 **Figure 2. The current government authorities involved in food safety supervision and**
772 **management in China (Source: Chen, Wang & Song, 2015 p. 2207)**

773

774

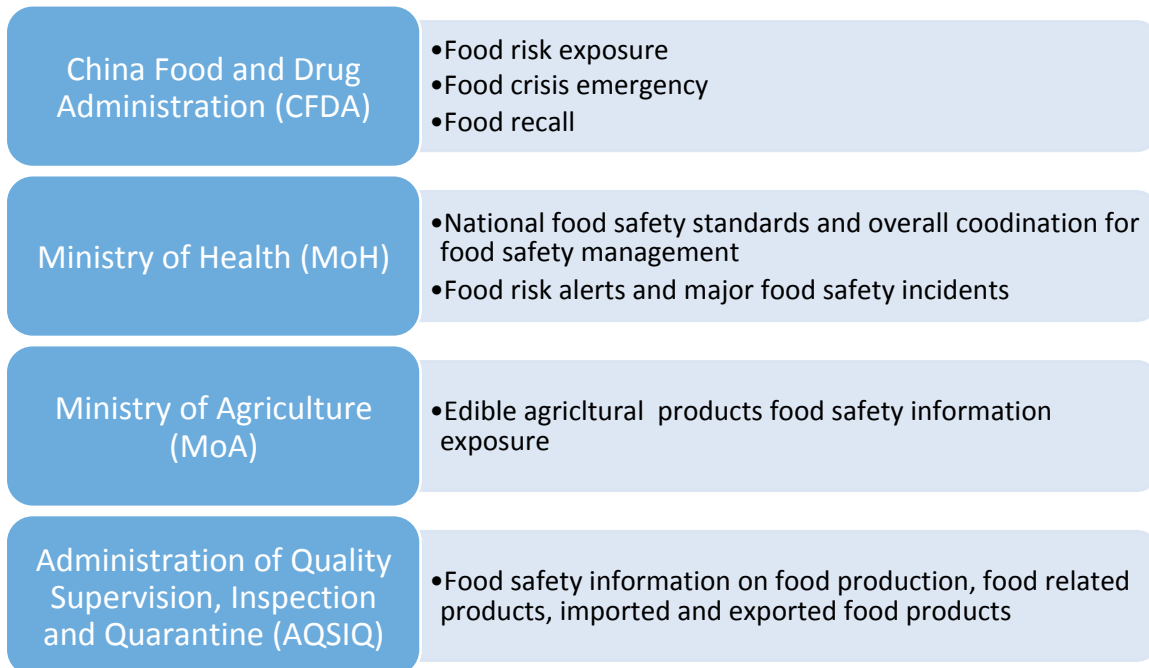
775

776

777

778

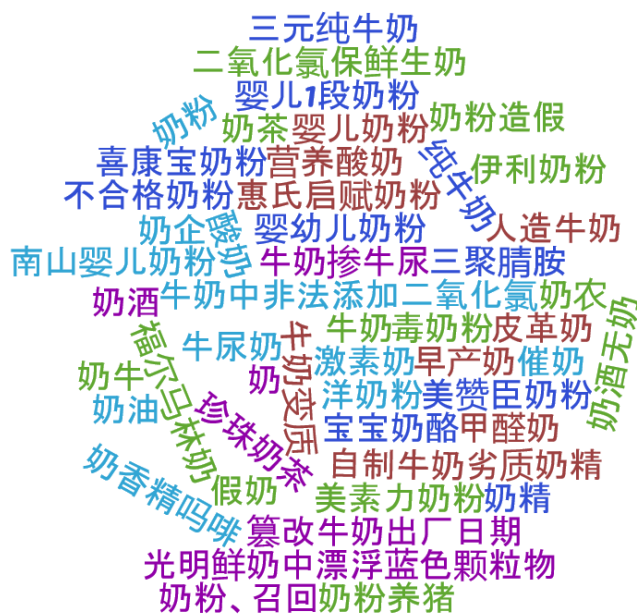
779



780

781 **Figure 3. Government food safety information disclosure system in China (Adapted**
 782 **from Jia & Jukes, 2013; Zhou, 2017)**

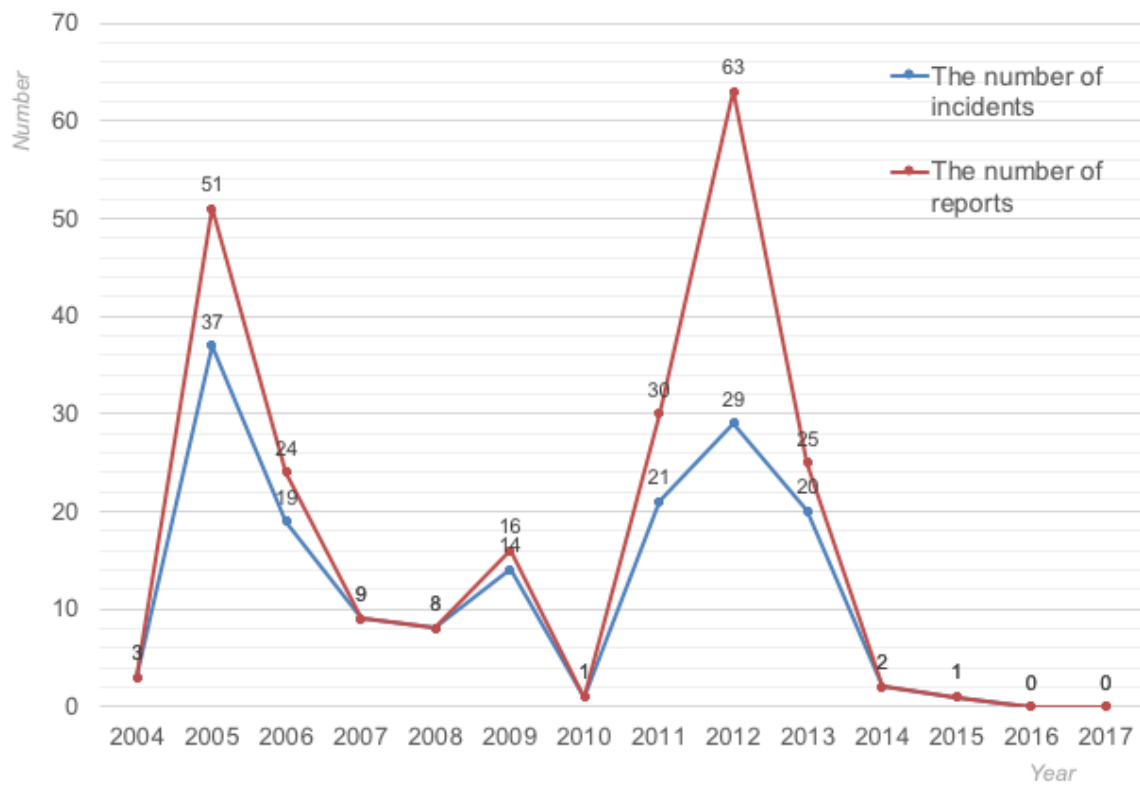
783



784

785 **Figure 4. Search terms used**

786

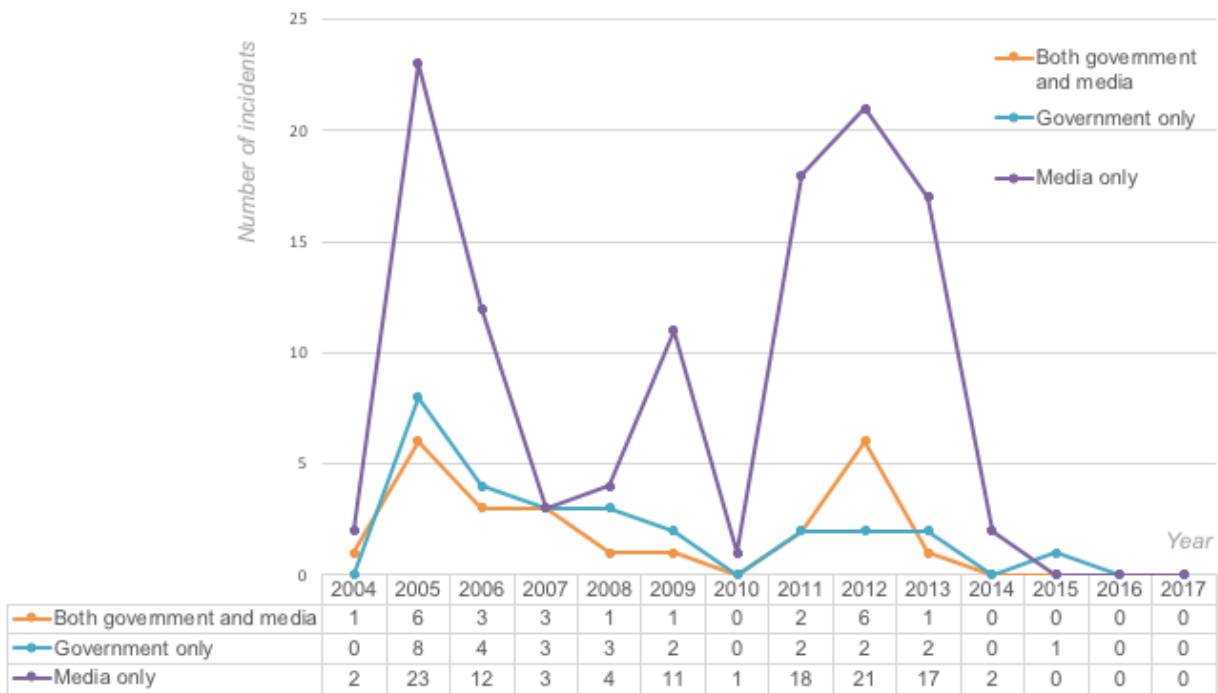


787

788

789 **Figure 5. The total number of incidents and reports exposed by government and media**
 790 **between 2004 and 2017**

791



792

793

794 **Figure 6. The number of dairy related food safety incidents by government and media**
 795 **between 2004 and 2017**

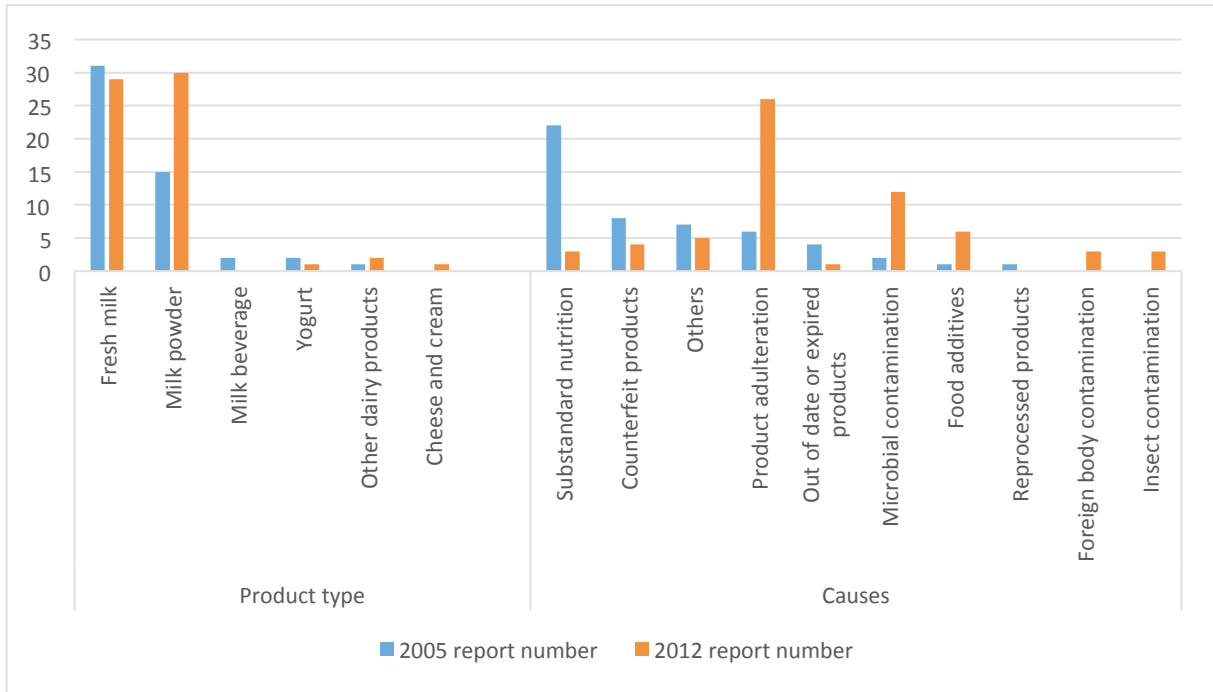


Figure 7. Features of dairy food incidents and reports in 2005 and 2012

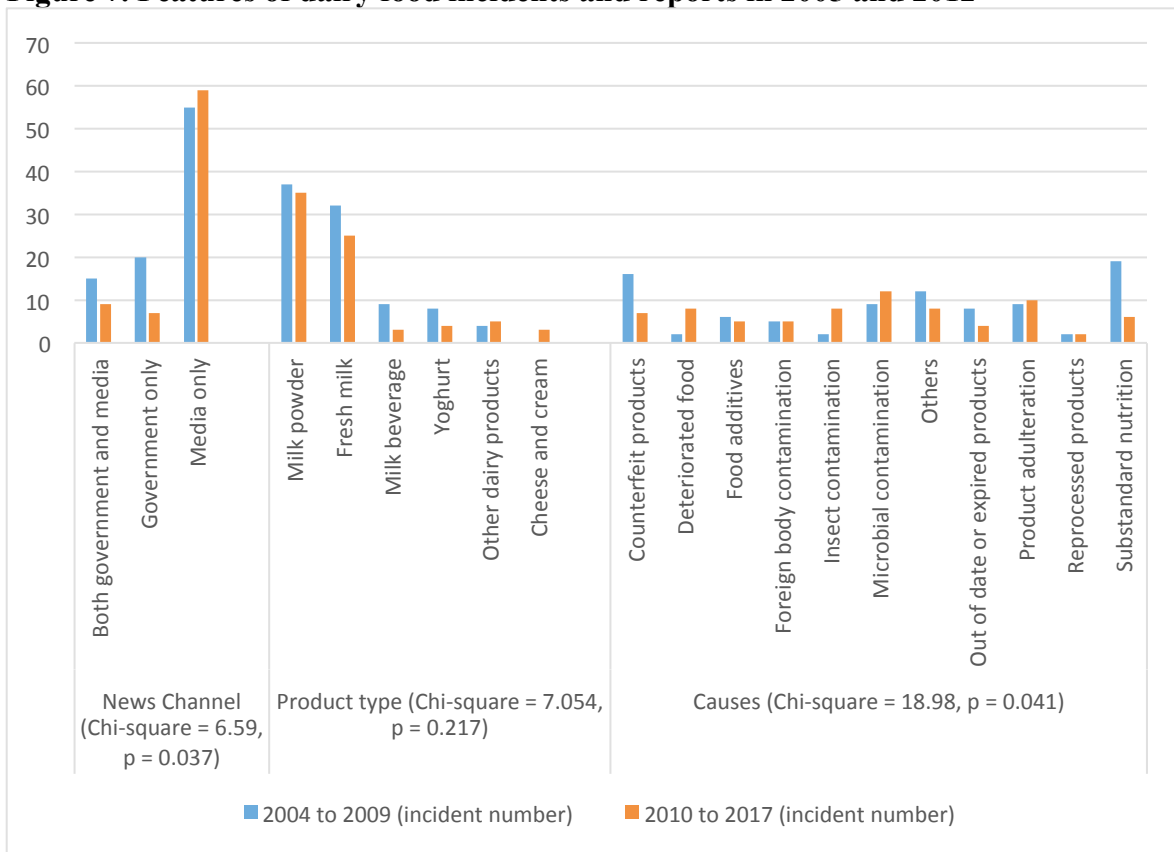


Figure 8. Comparison of features of dairy food incidents in 2004-2009 and 2010-2017

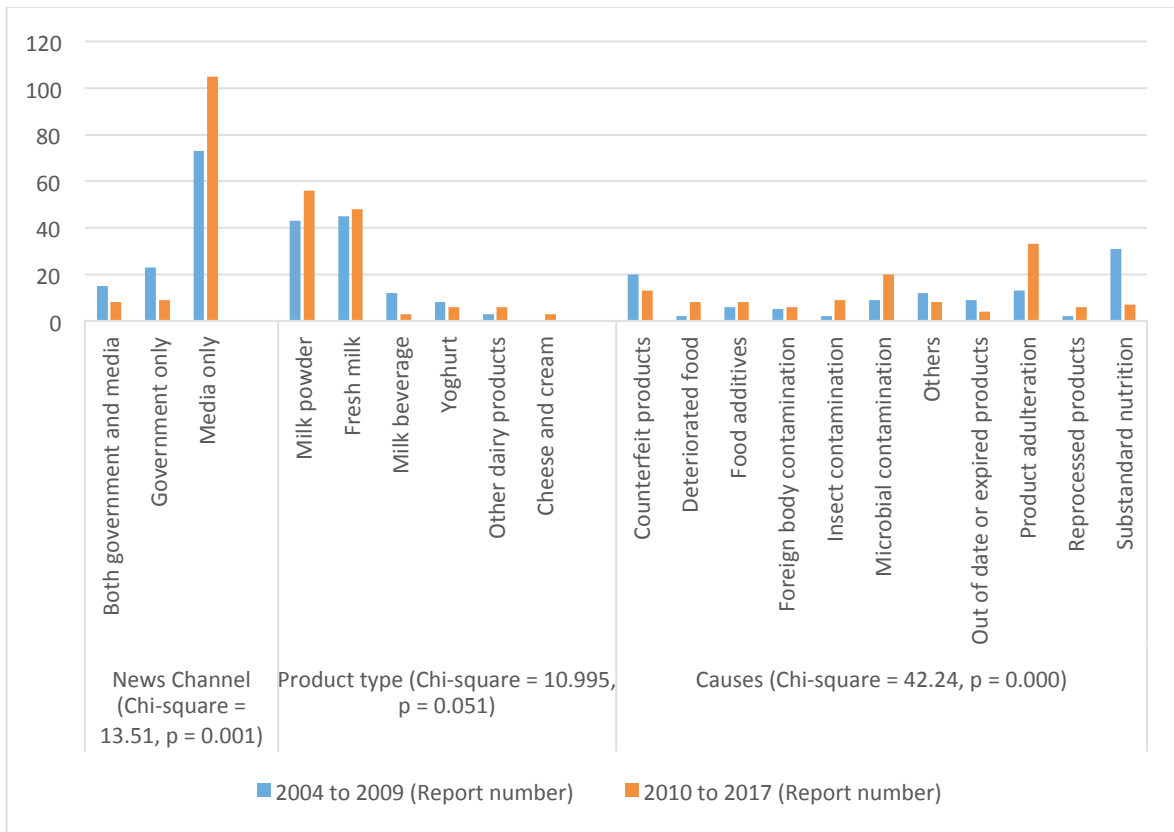


Figure 9. Comparison of features of dairy food safety reporting in 2004-2009 and 2010-2017

798

799

800 **Appendix: Search terms used**

三元纯牛奶 Sanyuan pure milk	婴儿奶粉 baby formula
不合格奶粉 unqualified milk powder	婴幼儿奶粉 baby formula all stages
二氧化氯保鲜生奶 chlorine dioxide fresh milk	宝宝奶酪 baby cheese
人造牛奶 artificial milk	惠氏启赋奶粉 Wyeth illumina milk powder
伊利奶粉 Yili milk powder	早产奶 milk power for
假奶 fake milk	毒奶粉 toxic milk powder
催奶 lactation	洋奶粉 imported milk powder
光明鲜奶中漂浮蓝色颗粒物 floating blue particles in Guangming milk	激素奶 milk with hormone
劣质奶精 inferior creamer	牛奶 milk
南山婴儿奶粉 Nanshan baby formula	牛奶中非法添加二氧化氯 illegal addition of chlorine dioxide to milk
喜康宝奶粉 Xikangbao milk powder	牛奶变质 milk deterioration
奶 milk	牛奶掺牛尿 milk mixed with cow urine
奶企 dairy enterprise	牛尿奶 cow urine milk
奶农 dairy farmer	珍珠奶茶 pearl milk tea
奶油 cream	甲醛奶 formaldehyde milk
奶牛 cow	皮革奶 leather milk
奶粉 milk powder	福尔马林奶 formalin in milk
奶粉、召回 milk powder recall	篡改牛奶出厂日期 tampering with date of milk production
奶粉养猪 milk powder pig feed	纯牛奶 pure milk
奶粉造假 milk powder fraud	美素力奶粉 Frisolac milk powder
奶精 creamer	美赞臣奶粉 Mead Johnson milk powder
奶茶 milk tea	自制牛奶 homemade milk
奶酒 cream wine	三聚氰胺 melamine
奶酒无奶 cream wine no cream	营养酸奶 nutritious yogurt
奶香精吗啡 cream morphine	酸奶 yogurt
婴儿 1 段奶粉 baby formula 1	

801

802

803

804