

Title: An Analysis of Media Dramatization on the News Reports of Five Major Japanese Newspapers on Radiation Protection for Workers in the 2011 Fukushima Nuclear Disaster

Author: Shojiro YASUI

Affiliation: Ministry of Health, Labour and Welfare, Japan

Abstract

During the emergency response to the accident at the Fukushima Daiichi Nuclear Power Plant in 2011, the protection of emergency workers from radiation exposure attracted continued media attention. However, a limited number of articles were published that analyzed media reporting on the health risks of the Fukushima nuclear disaster. Previous studies have presented a wide variety of arguments about the media's influence on health risk perceptions. The current paper aims to identify the factors explaining the variety of accusations against mass media by analyzing the articles of five major Japanese newspapers concerning radiation protection of workers involved in the nuclear disaster. This study extracted related articles from the databases of Asahi (ANP), Yomiuri (YNP), Mainichi (MNP), Sankei (SNP) and Tokyo (TNP) from March 11, 2011 to December 31, 2014. The results of this analysis of news reporting revealed differences among the editorial policies of the five major newspapers. Major findings of this study include the following: (a) frequencies of related articles in ANP, MNP and TNP were higher than in other papers. Front page articles in ANP, MNP and TNP accounted for approximately 20 % of all relevant articles, while in the other papers, front page articles accounted for no more than 2.6 %. (b) the same three papers published more articles than the other newspapers that drew public attention to the response of the government and TEPCO. (c) The three papers had editorial policies that gave radiation-related articles larger and more prominent spaces than did the other newspapers. (d) the three papers had editorial policies that stressed negative information for workers more than the other newspapers did. The results show that further study of media influence on health risk perception needs to take into account the different editorial policies of each news agency.

1. Introduction

During the emergency response to the accident at the Fukushima Daiichi Nuclear Power Plant in 2011, the protection of emergency workers from radiation exposure attracted considerable media attention. The accident at the affected plant accompanied the Great East Japan Earthquake of March 11, 2011 and released a significant amount of radioactive material, despite the fact that emergency workers had made every effort to prevent the expansion of the accident (Yasui, 2013) (Yasui, 2013). In response to this situation, the government of Japan declared a nuclear emergency on March 11, 2011 and, on March 14, 2011, increased radiation exposure dose limits from 100 mSv to 250 mSv during emergency work on the affected plant [Yasui, 2015].

The protection of decontamination workers from radiation hazards also gathered major attention from the mass media. Beginning in January 2012, the government of Japan decided to carry out decontamination work (e.g., clean-up of buildings and remediation of soils and vegetation) to rehabilitate the contaminated areas surrounding the affected plant; it also decided to manage the waste resulting from decontamination and unmarketable contaminated goods (Yasui, 2013) [Yasui, 2014]. To accomplish this decontamination work, thousands of workers were hired from all over Japan (11,058, 20,564 and 34,611 workers in 2012, 2013 and 2014, respectively) [Yasui, TBD].

However, a limited number of published articles have analyzed media reporting on the health risks of the Fukushima nuclear disaster. This is despite the important and almost dominant role of the mass media – from the very beginning of the accident – in disseminating information to the public on the risks posed by radiation exposure.

Previous studies have articulated a wide variety of arguments over the media's influence on health risk perceptions. Some studies have argued that the media's extensive coverage of the health risks of radiation exposure may serve as a risk amplifier due to its sensationalism and dramatization (Slovic, 1986) (Combs & Slovic, 1979) (Johnson & Covello, 1987). On the other hand, a different study shows that U.S. news articles were more likely to provide quantitative and factual information on, e.g., Chernobyl or Three Mile Island (Kim & Bile, 2013). Another study made the accusation that the systematic practices of U.S. news reporting minimized the presence of health risks, contributed to misinformation and exacerbated uncertainties (Pascale, 2016). In the Japanese case, a study of analyses of the relationship between media consumption and health-related anxiety reported that concern about the future was positively associated with regional newspapers and negatively with national newspapers (Sugimoto, et al., 2013).

This paper aims to identify the factors explaining the variety of accusations against mass media by analyzing articles from five major Japanese newspapers concerning the radiation protection of workers involved in the Fukushima Daiichi nuclear disaster.

1.1. Research Perspective

In previous studies, media coverage has been defined as “dramatizing” if it exaggerates existing risks, gives a disproportionate amount of attention to risks considering the actual relevance of the threat they pose (Vasterman, 2005), or if it covers the (health) threat primarily using emotional language or emotion-evoking formal features rather than factual ones (Aust & Zillmann, 1996) (Zillmann, 2006).

These definitions require an objective reference point as to what constitutes “too much” or “exaggerated” media coverage. Answering this question entails underlying “normative” and “scientific” assumptions, which suggest that research on dramatization seeks to contrast media

coverage with either a definition of “ideal journalism” or an objective quantification of the “actual risk” (Kitzinger, 1999). As for the former, it is hard to identify a common shared concept of “ideal journalism.” As for the latter, the risk of low dose exposure itself entails scientific controversy.

This article employs non-normative and objectively comparable indicators to analyze differences in the news stories produced by five major Japanese general newspapers: Asahi (ANP), Mainichi (MNP), Tokyo (TNP), Yomiuri (YNP) and Sankei (SNP). It is well known that there are significant differences in how news agencies report the same incidents, depending on their editorial policies. Most previous studies, however, analyze news stories produced by mass media as a whole. This could explain why media analysis has produced such a wide variety of observations and conclusions, from “exaggerating” to “minimizing” the risk of radiation exposure.

The current article aims to provide data to use as a baseline for further analysis of media dramatization of health risks in Japan. The paper focuses on news reporting concerning radiation protection for workers engaged in emergency response efforts at the affected plant and in decontamination/remediation work for the rehabilitation of contaminated areas; these workers were exposed to high doses of radiation. The paper analyzes the following items:

- a) The number of relevant articles: the current paper employs, as indicators, the frequency of the relevant articles out of a total number of articles and the frequencies of relevant articles out of the front-page articles published by newspapers each year. Dunwoody & Peters state that “giving too much or too prominent space or time to a certain risk may lead to sensationalism and dramatize risks” (Dunwoody & Peters, 1992). Kasperson et al. revealed that “extensive coverage may serve as risk amplifier, regardless of whether the risk portrayal is accurate (Kasperson, et al., 1988)”.
- b) The primary source of information: this paper categorizes the primary sources of articles (the subjects of the first sentence of the articles), such as government, Tokyo Electric Power Company (TEPCO), experts and workers, and compares their frequency in each newspaper. The source of information is an important indicator when analyzing the nature of news stories. Analyzing where reporters obtain information and whether the writers provide the information as direct quotations or add dramatized elements could explain the editorial policies of each news agency.
- c) Direct quotations and their sources: This paper counts the number of articles with direct quotations and categorizes the source of the quotations, such as government, TEPCO, experts or workers, and compares their frequencies in each newspaper. Utilization of direct quotations can change readers’ impressions even if the information content is the same. Previous studies have stated that “exemplars of victims in news, particularly when emotionally intense, can strongly and lastingly increase (health) risk perceptions” (Aust & Zillmann, 1996) (Zillmann, 2006). Additionally, Hendriks et. al “define vivid storytelling through concrete personal narratives or interviews with laypeople as a sensationalist or dramatic feature” (Hendriks, et al., 2005).
- d) Differences in headlines based on the same information: this paper selects articles based on the same information, such as press releases from the MHLW, and compares their headlines and space (front cover or multiple articles) in each newspaper using the method of discourse analysis. In newspapers, headlines can change readers’ impressions even if the contents of the article are the same.

2. Methodology

This paper extracted articles related to occupational radiation exposure from the databases of five major general newspapers in Japan: Asahi (ANP), Yomiuri (YNP), Mainichi (MNP), Sankei (SNP) and Tokyo (TNP). The keywords used for selection were “nuclear power plant & Ministry of Health, Labour and Welfare (MHLW)” or “decontamination & MHLW” because MHLW is the agency responsible for the radiation protection of emergency workers and is also a primary source of information about occupational exposure, as is the Tokyo Electric Power Corporation (TEPCO). As a supplement, articles that mainly describe the issue of worker radiation exposure were added even if they did not mention the MHLW. To focus on the health risk of radiation exposure, the paper excluded articles concerning general working conditions (wages and working hours) and employment issues.

The classification of articles was determined by the database of each newspaper. Even if an article was lengthy and included multiple headlines, if the database treated it as a single article, it was counted as one article. However, if the article was separated by individual bylines or was divided by borders, it was counted as separate articles.

Articles published between March 11, 2011 and December 31, 2014 were searched for and extracted. The research database was constructed with extracted articles and included the following items: date, name of newspaper, page numbers, headlines, names and affiliations of primary sources (the subjects of leading sentences), presence or absence of direct quotations, names and affiliations of source of direct quotations, presence and absence of bylines, and names of reporters. The development of the database and statistical analysis were performed using Microsoft Excel (Microsoft Corporation Ltd.).

Statistical testing using a chi-square test of independence was used to identify whether differences among newspapers affected the contents of their news reporting. The first categorical variable was names of newspapers, and the second categorical variable was selected from items in the database that represented the contents of news stories. The null hypothesis was that news agencies and the contents of news reporting were independent. The P-value employed as the significance level was 0.05.

3. Results

3.1. Frequency of articles relating to radiation exposure of workers

Table 1 shows the frequencies of articles related to radiation exposure of emergency and decontamination workers who responded to the nuclear accident and trends from 2011 to 2014. The articles from 2011 excluded articles published before March 11, the date of the outbreak of the nuclear accident. The total number of items in each newspaper was calculated using the edition distributed in the Tokyo region as the reference. As for ANP and YNP, local articles published solely in other regional editions were excluded. As for SNP, local sections of each regional edition and the evening edition of the Osaka region were excluded. (SNP does not publish an evening edition in the Tokyo region.) As for MNP and TNP, articles other than those of the Tokyo region edition were excluded.

Total numbers of related articles of ANP (89), MNP (70) and TNP (72) were higher than those of other newspapers (YNP: 52 and SNP: 39). The frequency of related articles in TNP was higher than in the other newspapers by one order (0.164%). Except for TNP, the frequencies of ANP (0.032%) and MNP (0.024%) were higher than the others (YNP: 0.013% and SNP: 0.019%). The chi-square test of independence revealed that the variable of the newspapers and the variable of the number of related articles have a statistically significant association ($p = 1.59 \times 10^{-31}$). To avoid the potential confounding of the scale of publication, a chi-square test was implemented for four papers

with the exception of TNP and showed statistical significance ($p = 0.037$). TNP is basically a regional paper of the Tokyo region and its total articles were fewer in number than the other newspapers by one order.

3.2. Frequency of front page articles

Table 2 shows the frequencies of the related articles printed on the front pages, out of the relevant articles on all pages of the five newspapers. The numbers of front page articles in the top three papers (ANP: 22, MNP: 11 and TNP: 16) were significantly higher than in the other papers (YNP: 0 and SNP: 1) ($p = 0.0004$). The frequency of front page articles in the top three newspapers was approximately 20%; in the other newspapers, less than 2.6%.

3.3. Distribution of affiliation of primary sources

Table 3 shows the distribution of primary sources (the subject of the leading sentence of each article), such as “the government,” “TEPCO” or “others”. In all newspapers, “government/TEPCO” accounted for 58% to 80% of primary sources; there was no significant difference ($p = 0.108$). This paper does not distinguish the government and TEPCO as different categories because the “joint emergency response headquarters,” at which the Nuclear and Industrial Safety Agency (NISA) and TEPCO made a joint press conference, was established on March 15, 2011, four days after the outbreak of the accident. The MHLW did not participate in the joint news conference but put out its own press releases. Primary sources categorized as “others” included articles whose primary sources were not identified.

3.4. Presence and absence of direct quotations and sources of the quotations

Table 4 shows the frequency of direct quotations among related articles. The frequencies of the top three newspapers (ANP, MNP and TNP) were from 56% to 66% while those of the others (YNP and SNP) were no more than 37%. The chi-square test over five newspapers showed statistical significance ($p = 0.002$).

Table 5 shows the frequencies of articles with direct quotations whose sources were the government or TEPCO among related articles. The frequencies of the top three newspapers (ANP, MNP and TNP) were between 32 % and 46%, while those of the others (YNP and SNP) were no more than 26%. A chi-square test over five newspapers showed statistical significance ($p = 0.014$).

Regarding the frequency of articles with direct quotations whose sources were experts and workers, there was no statistical significance among the newspapers ($p = 0.510$, $P = 0.274$, respectively).

3.5. Distribution of affiliations of directly quoted experts

Table 6 shows the distribution of the affiliations of experts directly quoted in related articles. The number of direct quotations that identified the names of experts was 41. Among them, 23 (56%) were researchers at universities or research institutes, 4 (10%) were clinicians, and 14 (34%) were members of NGOs. There was no significant difference in the frequencies of direct quotation from researchers over the five newspapers. However, as for quotations from NGOs, TNP and MNP quoted them in 7 out of 12 articles, and 5 out of 13 articles, respectively, which is clearly different from the other newspapers. The sub-categories of 14 members of NGOs were distributed as follows: nine from NGOs supporting occupational accident victims, and three from anti-nuclear activists, a labor journalist, and a labor lawyer. A chi-square test of independence between the

variable of affiliation and the variable of newspapers revealed a statistically significant association ($p = 2.89\text{E-}102$).

3.6. Discourse analysis of headlines of the related articles

Tables 7 to 12 show the headlines of five newspapers that reported on the same issues. All articles were written based on the same information provided and published within two days after press releases. This analysis of the differences among the headlines of the five newspapers can identify differences in the editorial policies of newspapers. In this section, a discourse analysis of the headlines is conducted and a comparison is made among the space and printing pages of the headlines.

Table 7 shows the list of headlines of articles that were written based on governmental documents disclosed by the NISA at the request of NGOs (Nuclear and Industrial Safety Agency, 2011). The document described the estimation of the number of emergency workers who would be exposed more than 50 mSv. Regarding discourse analysis, YNP and SNP simply described how the NISA estimated that 1,600 workers would be exposed to more than 50 mSv. On the other hand, ANP added the phrase “overestimated,” and MNP and TNP used the phrase “request for deregulation.” Those phrases implied that the estimation of the NISA could have adverse repercussions for workers. Additionally, TNP employed the phrase “allowing 350 mSv at the maximum”, which was not described in the documents and was calculated according to the original interpretation of TNP. As for the space and print pages of the articles, MNP and TNP provided wider spaces and more prominent places for the articles than the other newspapers. MNP and TNP put the articles on their front pages; TNP printed supplemental articles on the second page.

Table 8 shows the list article headlines based on the press release of the MHLW on October 30, 2012 concerning the fact-finding survey in response to the manipulation of personal alarm dosimeter collection efficiency (Ministry of Health, Labour and Welfare, 2012) (Yasui, 2015). YNP simply reported the fact that the MHLW had identified 19 inappropriate monitoring cases following the press release. MNP and SNP elected not to publish articles on the issue. On the other hand, ANP added the phrase “the survey ignored cases during the period when radiation dose was high,” which accused the MHLW of an insufficient inquiry. TNP used the phrases “the MHLW’s survey failed to expose the real situation” or “workers wouldn’t confess the truth”, which noted the limitations of the inquiry based on independent sources. As for the space and place of the articles, ANP and TNP provided a wider space and more prominent place than the others. ANP and TNP published the articles on their front pages. Additionally, TNP published related articles on another page.

Table 9 shows the list of article headlines based on the press release by the MHLW on July 5, 2013 concerning the governmental re-evaluation of the internal radiation dose received by emergency workers at the affected plant (Ministry of Health, Labour and Welfare, 2013) (Yasui, 2015). YNP and SNP simply reported that “calculation errors were found in radiation dose records for 479 workers” or “recorded doses for 479 workers were corrected” and did not mention whether doses were underestimated or overestimated. On the other hand, ANP, MNP and TNP employed phrases implying that re-evaluation had adverse effects on workers. ANP employed the phrase “6 workers were additionally beyond dose limits”, MNP used the phrase “dose records for 431 workers were revised upwardly”, and TNP reported that “doses for 452 workers were revealed to be higher than the reported record”. As for the space and place of articles, there was no significant difference across the five newspapers.

Table 10 shows the list of article headlines based on the report of the 16th session of the

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), published on August 7, 2013 (United Nations Scientific Committee on the Effects of Atomic Radiation, 2013). At first, ANP reported on October 12, 2013 that “radiation doses were underestimated, the internal dose could be 20 % larger”. On the next day, TNP and SNP published almost identical headlines. MNP and YNP selected not to follow ANP. ANP published its article on the front page of the evening issue, which was a more prominent location than the others.

Table 11 shows the list of article headlines based on the report of a research team funded by the MHLW, released on August 5, 2014, concerning a cross-sectional study on thyroid gland examinations for workers at the affected plant (Sobue, et al., 2014). YNP simply reported that “the research needs to be continued, the selection of research subjects was biased” in accordance with the release. On the other hand, ANP employed the phrase “there was a tendency for workers to have a relatively high frequency of nodules in their thyroid glands”, which emphasized the part of the report implying adverse health effects for workers. MNP, TNP and SNP refrained from publishing about the issue. As for space and place, there was no substantial difference between the two papers.

4. Discussion

4.1. Difference in the number and space of related articles

The results of this analysis of news reporting revealed differences in editorial policies among the five major newspapers. In the analysis of the number of related articles and their frequencies compared to all articles, the top three newspapers (ANP, MNP and TNP) revealed higher frequencies than the others (YNP and SNP). A statistically significant association was confirmed between the variable of newspapers and the variable of frequency (See Table 1). The results of a chi-square test did not change if TNP (in which the total number of articles was less than the others by one order) was excluded.

The differences among newspapers were more apparent in the articles published on the front page, which is the most prominent place in the paper (See Table 2). The top three papers (ANP, MNP and TNP) published 11 to 22 related articles on their front pages, which accounted for approximately 20 % of all relevant articles, while the others (YNP and SNP) published only one article on the front page over four years, which accounted for 2.6 % to 0.0 %. The frequencies of the front cover articles of the top three papers were one order larger than the others, while the difference in the frequency of the related articles over the five papers was less than three times.

The difference in editorial policies seems to be much larger than the difference in the awareness and sources of the reporters because the difference in the frequency of front page articles was much larger than that of total related articles. In Japanese newspapers, an editorial meeting organized by editorial managers decides the allocation of articles on the front page or other pages. Thus, the frequencies of the front page articles were highly influenced by the editorial policies of the newspapers rather than by the intent of reporters. On the other hand, the number of related articles was affected by the interests and awareness of the reporters.

4.2. Analysis of primary sources

A potential factor in this difference could be the difference in information sources. However, there was no significant difference in the primary sources – the subjects of the leading sentences of articles – among newspapers. References to government or TEPCO were higher than for other sources for all newspapers (See Table 3).

4.3. Analysis of the presence and absence of direct quotations and their sources

The top three papers (ANP, MNP and TNP) published more articles than others (YNP and SNP) that drew public attention to the response of the government and TEPCO. The frequencies of direct quotations in the top three papers (ANP, MNP and TNP) were consistently higher than in the other papers (YNP and SNP). A chi-square test of independence shows that the frequency of direct quotations had statistically significant associations with the newspapers (Table 4). However, in the analysis of the sources of direct quotations, only quotations from the government and TEPCO had statistically significant association with the variable of newspapers. No association was shown between the papers and the quotations from experts or workers (See Table 5).

The analysis of the affiliations of experts quoted in the related articles revealed that MNP and TNP had a tendency to draw public attention by contrasting the statements of the government with the voices of workers in the form of direct quotations. The affiliation of experts had a statistically significant association with the variable of newspapers. In particular, MNP and TNP had clearly higher frequencies of direct quotations from NGOs than did other papers (Table 6). Sub-categories of these organizations were organizations supporting occupational accident victims, anti-nuclear activists, a labor journalist and a labor lawyer who represented the voice of workers. At the same time, as mentioned above, MNP and TNP had a higher frequency of direct quotations from the government and TEPCO.

4.4. Analysis of headlines

The analysis of headlines of five cases revealed that the editorial managers of ANP, MNP and TNP had editorial policies that gave radiation-related articles larger and more prominent spaces than articles in YNP and SNP. In some cases, ANP, MNP and TNP published the relevant articles on the front page and issued multiple articles on the same date, while YNP and SNP had no such situations. At Japanese newspapers, editorial meetings consisting of editorial managers decide the allocation of the front page articles. (See Table 7 to 11)

The analysis also revealed that ANP, MNP and TNP had editorial policies that stressed information that was negative for workers. On the other hand, YNP and SNP had the tendency to employ neutral headlines, which avoided evaluating whether the information was an advantage or disadvantage for employees and refrained from challenging the validity of official statements. For example, ANP, MNP and TNP employed the following phrases in their headlines:

- a) criticisms of the government or TEPCO, such as “overestimation”, “the survey ignored cases during the period when radiation dose was high.”
- b) challenges to the validity of official statements based on independent information, such as “allowing 350 mSv at the maximum”, “it is uncertain that workers are confessing the truth,”
- c) emphases on negative information for workers, such as “beyond the limits,” “dose records were revised upwardly,” “workers had a relatively high frequency of nodules on the thyroid gland.”

In Japanese newspapers, headlines tend to reflect the editorial policies of each paper because they are written not by field reporters but by an editorial reporter who is responsible for organizing and allocating articles on the assigned page, including writing headlines. In five cases in which the contents of the articles of five papers were essentially the same, there was no case in which the headlines of the five newspapers were essentially identical.

5. Conclusion

Based on the results of this paper, it is essential that any analysis of media influence on health risk perception – such as the health effects of radiation exposure – takes into account the differences in editorial policies at each news agency. In particular, the differences among news agencies should be treated as a variable for statistical tests. The influence of mass media should not be treated as a single factor, as in “media information consumption”.

Further studies of media influence on health risk perceptions are warranted and should analyze the differences in risk perception among populations who read different newspapers that have different editorial policies. The current paper analyzed differences in mass media reporting but did not analyze the media’s influence on the populations who received information.

Furthermore, studies are needed to analyze the influence of other mass media channels such as television and radio. It is easily assumed that television has a significant influence on perception, and the effects of information disseminated via the internet should also be examined.

DISCLAIMER

The findings and conclusions in this article are those of the author and do not necessarily represent the views of the Ministry of Health, Labour and Welfare, Japan.

REFERENCE

- Aust, C. F. & Zillmann, D., 1996. Effects of Victim Exemplification in Television News on Viewer Perception on Social Issues. *Journal of Mass Communication Quarterly*, 73(4), pp. 787-803.
- Combs, B. & Slovic, P., 1979. Newspaper coverage of causes of death. *Journalism Quarterly*, Volume 56, pp. 837-843.
- Dunwoody, S. & Peters, H. P., 1992. Mass Media Coverage of Technological and Environmental Risks: A Survey of Research in the United States and Germany. *Public Understanding of Science*, Volume 1, pp. 199-230.
- Hendriks, V., Nuijiten, P. K. & Beentjes, J., 2005. News in an Age of Competition: The Case of Sensationalism in Dutch Television News. *Journal of Broadcasting & Electronic Media*, 49(3), pp. 1995-2001.
- Johnson, B. B. & Covello, V. T., 1987. Agenda-setting, group conflict, and the social construction of risk. In: B. B. Johnson & V. T. Covello, eds. *The social and Cultural Construction of Risk*. Dordrecht: D. Reidel Publishing, pp. 179-181.
- Kasperson, R. E. et al., 1988. The Social Amplification of Risk: A conceptual Framework. *Risk Analysis*, 8(2), pp. 177-187.
- Kim, J. & Bile, B. J., 2013. A dangerous neighbor: The news frames of the radiation effects from the Fukushima nuclear accident. *Risk Management*, Volume 15, pp. 180-198.
- Kitzinger, J., 1999. Researching Risk and the Media. *Health, Risk & Society*, 1(1), pp. 55-69.
- Ministry of Health, Labour and Welfare, 2012. *Survey on actual practices of radiation dose control at the TEPCO Fukushima Daiichi Nuclear Power Plant*. [Online] Available at: http://www.mhlw.go.jp/english/topics/2011eq/workers/ri/pr/pr_121030.html [Accessed 5 June 2016].
- Ministry of Health, Labour and Welfare, 2013. *Results of Re-evaluation of Committed Dose of Emergency Workers at the TEPCO Fukushima Daiichi Nuclear Power Plant*. [Online] Available at: http://www.mhlw.go.jp/english/topics/2011eq/workers/ri/pr/pr_130705.html [Accessed 5 June 2016].
- Nuclear and Industrial Safety Agency, 2011. *Points of statement about dose limit of radiation*

workers. [Online]

Available at: http://joshrc.info/?action=common_download_main&upload_id=517

[Accessed 5 June 2016].

Pascale, C.-M., 2016. Vernacular epistemologies of risk: The crisis in Fukushima. *Current Sociology*, pp. 1-18.

Slovic, P., 1986. Information and educating the public about risk. *Risk Analysis*, Volume 6, pp. 403-415.

Sobue, T. et al., 2014. *Report of the Research on Thyroid Gland Examinations, etc. of Workers at the TEPCO Fukushima Daiichi Nuclear Power Plant Has Been Released*. [Online]

Available

at:

http://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/ort/pr_140805.html

[Accessed 5 June 2016].

Sugimoto, A. et al., 2013. The Relationship between Media Consumption and Health-Related Anxieties after the Fukushima Daiichi Nuclear Disaster. *PLOS ONE*, 8(8), pp. 1-7.

United Nations Scientific Committee on the Effects of Atomic Radiation, 2013. *Report of the United Nations Scientific Committee on the Effects of Atomic Radiation: Sixtieth session (27-31 May 2013)*. [Online]

Available at: http://www.unscear.org/docs/GAreports/A-68-46_e_V1385727.pdf

[Accessed 5 June 2016].

Vasterman, P. L., 2005. Media-hype: Self-reinforcing News Waves, Journalistic Standards and the Construction of Social Problems. *European Journal of Communication*, 20(4), pp. 508-530.

Yasui, S., 2013. Establishment of New Regulations for Radiological Protection for Decontamination Work Involving Radioactive Fallout Emitted by the Fukushima Daiichi APP Accident.. *Journal of Occupational and Environmental Hygiene*, 10(9), pp. D119-D124.

Yasui, S., 2013. Lessons Learned: Radiological Protection for Emergency Workers at the TEPCO Fukushima Daiichi APP (Part 1). *Journal of Occupational and Environmental Hygiene*, 10(11), pp. D151-D158.

Yasui, S., 2013. Lessons learned: Radiological protection for emergency workers at the TEPCO Fukushima Daiichi APP (Part 2). *Journal of Occupational and Environmental Hygiene*, 10(12), pp. D163-D171.

Yasui, S., 2014. New Regulations for Radiation Protection for Work Involving Radioactive Fallout Emitted by the TEPCO Fukushima Daiichi APP Accident: Application Expansion to Recovery and Reconstruction Work.. *Journal of occupational and environmental hygiene*, 11[8], pp. D105-D114.

Yasui, S., 2015. 250 mSv: Temporary Increase in the Emergency Exposure Dose Limit in Response to the TEPCO Fukushima Daiichi NPP Accident and Its Decision Making Process.. *Journal of occupational and environmental hygiene*, 12[4], pp. D35-D42.

Yasui, S., 2015. Fact-finding survey in response to the manipulation of personal alarm dosimeter collection efficiency: lessons learned about post-emergency radiation protection from the TEPCO Fukushima Daiichi APP accident.. *Journal of occupational and environmental hygiene*, 12(6), pp. D96-D102.

Yasui, S., 2015. Governmental Re-evaluation of the Committed Effective Dose Received by Emergency Workers at the TEPCO Fukushima Daiichi NPP Accident. *Journal of Occupational and Environmental Hygiene*, 12(5), pp. D60-D70.

Yasui, S., TBD. Establishment of the Central Radiation Dose Registration System for Decontamination Work Involving Radioactive Fallout Emitted by the Fukushima Daiichi APP

Accident. *Journal of Occupational and Environmental Hygiene*.

Zillmann, D., 2006. Exemplification Effects in the Promotion of Safety and Health. *Journal of Communication*, Volume 56, pp. S221-S237.

Table 1. Frequency of article related to radiation exposure of workers

Number of articles	Total (2011-2014) ^a				b
	Related articles	Others	Total		
Asahi	89 (0.032%)	277,137	277,226		13
Mainichi	70 (0.024%)	288,771	288,841		2
Tokyo	72 (0.164%)	43,769	43,841		2
Yomiuri	52 (0.013%)	402,613	402,665		2
Sankei	39 (0.019%)	204,471	204,510		0
Total	322 (0.026%)	1,216,761	1,217,083		19
P-value for 5 papers			1.27E-74		
P-value for 4 papers ^c			1.30E-06		

a: The articles do not include those of earlier than March 11, 2011.

b: The number of multiple articles in a same page. The number of them are excluded from the number of related articles.

c: Asahi, Mainichi, Yomiuri and Sankei

Table 2. Frequency of the front page articles out of the relevant articles

Number of articles	Total (2011-2014) ^a			
	Front page			Total
	Yes	No		
Asahi	22	(21.6%)	80	102
Mainichi	11	(15.3%)	61	72
Tokyo	16	(21.6%)	58	74
Yomiuri	0	(0.0%)	54	54
Sankei	1	(2.6%)	38	39
Total	50	(14.7%)	291	341
P-value	0.0004			

a: The articles do not include those of earlier than March 11, 2011.

Table 3. Distribution of affiliation of primary sources

Number of articles	Total (2011-2014) ^a		
	Gov./TEPCO	Others	Total
Asahi	60 (58.8%)	42	102
Mainichi	51 (70.8%)	21	72
Tokyo	48 (64.9%)	26	74
Yomiuri	43 (79.6%)	11	54
Sankei	26 (66.7%)	13	39
Total	228 (66.9%)	113	341
P-value	0.108		

a: The articles do not include those of earlier than March 11, 2011.

Table 4. Frequency of presence of direct quotations among related articles.

Number of articles	Total (2011-2014) ^a			
	Direct quotation			Total
	Yes		No	
Asahi	60	(58.8%)	42	102
Mainichi	40	(55.6%)	32	72
Tokyo	49	(66.2%)	25	74
Yomiuri	20	(37.0%)	34	54
Sankei	14	(35.9%)	25	39
Total	183	(53.7%)	158	341
P-value	0.002			

a: The articles do not include those of earlier than March 11, 2011.

Table 5. Frequencies of articles with direct quotations whose source were the government or TEPCO

Number of articles	Total (2011-2014) ^a			
	Direct quotation from Gov./TEPCO			Total
	Yes	No		
Asahi	36 (35.3%)	66		102
Mainichi	23 (31.9%)	49		72
Tokyo	34 (45.9%)	40		74
Yomiuri	14 (25.9%)	40		54
Sankei	6 (15.4%)	33		39
Total	113 (33.1%)	228		341
P-value	0.014			

a: The articles do not include those of earlier than March 11, 2011.

Table 6. Distribution of the affiliations of experts directly quoted

Number of direct quotation	Experts						Total
	University/Institute		Physicians		NGOs/ Lawyers		
Asahi	6	(66.7%)	2	(22.2%)	1	(11.1%)	9
Mainichi	8	(61.5%)	0	(0.0%)	5	(38.5%)	13
Tokyo	5	(41.7%)	0	(0.0%)	7	(58.3%)	12
Yomiuri	2	(50.0%)	2	(50.0%)	0	(0.0%)	4
Sankei	2	(66.7%)	0	(0.0%)	1	(33.3%)	3
Total	23	(56.1%)	4	(9.8%)	14	(34.1%)	41
P-value	2.89E-102						

a: The articles do not include those of earlier than March 11, 2011.

Table 7. Headlines articles on the estimation of the number of workers who would be exposed more than 50 mSv

Newspaper	Date	Headlines*	Page
Asahi	July 28, 2011	TPCO overestimated that “1600 workers estimated to be exposed more than 50 mSv”. As the reference for deregulation of the emergency dose limits.	6
Mainichi	July 27, 2011	1600 workers to be exposed more than 50 mSv. The METI estimated.	1
Tokyo	July 28, 2011	“Deal the dose at Fukushima accident separately from normal dose” The NISA requested deregulating dose limits for workers to the MHLW in April. “The maximum dose should be 350 mSv.”	1
Tokyo	July 28, 2011	Request deregulation of dose limits. Prioritize to secure workers. TEPCO estimated “2000 workers to be exposed more than 50 mSv.”	2
Yomiuri	July 28, 2011	“1600 workers to be exposed more than 50 mSv” for response to the accident, the NISA estimated.	2
Sankei	July 27, 2011	Workers to be exposed more than 50 mSv were estimated to be 1600.	Social
Source	The document disclosed from the Nuclear and Industrial Safety Agency by the request of an NGO. (Nuclear and Industrial Safety Agency, 2011)		

* Translation to English was done by the author.

Table 8. Headlines of articles on the survey in response to the manipulation of dosimeter collection efficiency

Newspaper	Date	Headlines*	Page
Asahi	October 31, 2012	19 cases of “inappropriate” dose management were found. The MHLW requested TEPCO and primary contractors for conducting a survey.	1
	October 31, 2012	The survey untouched the cases during the period that radiation dose was high. Far from grasping conditions of “inappropriate” management.	3
Mainichi	-	-	-
Tokyo	October 31, 2012	The MHLW’s survey failed to expose the real situation. No “intentional impropriety” was observed. 19 inappropriate cases were found.	1
Tokyo	October 31, 2012	Workers would lose their jobs by exceeding dose limits. “Workers would not confess the truth.” Workers were cornered.	27
Yomiuri	October 31, 2012	Dose management of the Fukushima accident, 19 cases were inappropriate.	38
Sankei	-	-	-
Source	Press-release from the MHLW on October 31, 2012 (Ministry of Health, Labour and Welfare, 2012)		

* Translation to English was done by the author.

Table 9. Headlines of articles on the governmental re-evaluation of the internal radiation dose

Newspaper	Date	Headlines*	Page
Asahi	July 6, 2013	Calculation errors were found in internal exposure evaluation for 479 workers of Fukushima Daiichi NPP. 6 workers were additionally beyond dose limits.	38
Mainichi	July 6, 2013	Dose record for 431 workers was revised upwardly by the MHLW.	2
Tokyo	July 6, 2013	The dose for 452 workers revealed to be higher than the reported record. Internal dose at emergency work for the Fukushima accident.	20
Yomiuri	July 6, 2013	Calculation errors were founded in radiation dose records for 479 workers.	37
Sankei	July 6, 2013	Dose records for 479 workers were corrected.	24
Source	Press-release from the MHLW on July 5, 2013. (Ministry of Health Labour and Welfare, 2013)		

* Translation to English was done by the author.

Table 10. Headlines of articles on the UNSCEAR report.

Newspaper	Date	Headlines*	Page
Asahi	October 12, 2013	The dose of workers assumed to be underestimated. UNSCEAR reported on dose evaluations by the government and TEPCO. Radiation dose was underestimated, the internal dose could be 20 % larger.	E-1**
Mainichi	-	-	-
Tokyo	October 13, 2013	The dose of workers assumed to be underestimated by 20 %. UNSCEAR pointed out.	2
Yomiuri	-	-	-
Sankei	October 13, 2013	UNSCEAR reported, “Internal dose of workers was underestimated by 20 %.”	26
Source	UNSCEAR report of the meeting in 2013. [United Nations Scientific Committee on the Effects of Atomic Radiation, 2014]		

* Translation to English was done by the author.

**E-1: The front cover of evening issue.

Table 11. Headlines articles on the study on thyroid gland examination for workers.

Newspaper	Date	Headlines*	Page
Asahi	August 6, 2014	The tendency for a high frequency of nodule in the thyroid gland.	35
Mainichi	-	-	-
Tokyo	-	-	-
Yomiuri	August 6, 2014	The research continues for health effects on emergency workers. The MHLW said, “research subjects were biased.”	3
Sankei	-	-	-
Source	Press-release from the MHLW on August 5, 2014 (Sobue, et al., 2014)		