



# News Portrayal of Cancer: Content Analysis of Threat and Efficacy by Cancer Type and Comparison with Incidence and Mortality in Korea

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How the news media cover cancer may have profound significance for cancer prevention and control; however, little is known about the actual content of cancer news coverage in Korea. This research thus aimed to examine news portrayal of specific cancer types with respect to threat and efficacy, and to investigate whether news portrayal corresponds to actual cancer statistics. A content analysis of 1,138 cancer news stories was conducted, using a representative sample from 23 news outlets (television, newspapers, and other news media) in Korea over a 5-year period from 2008 to 2012. Cancer incidence and mortality rates were obtained from the Korean Statistical Information Service. Results suggest that threat was most prominent in news stories on pancreatic cancer (with 87% of the articles containing threat information with specific details), followed by liver (80%) and lung cancers (70%), and least in stomach cancer (41%). Efficacy information with details was conveyed most often in articles on colorectal (54%), skin (54%), and liver (50%) cancers, and least in thyroid cancer (17%). In terms of discrepancies between news portrayal and actual statistics, the threat of pancreatic and liver cancers was overreported, whereas the threat of stomach and prostate cancers was underreported. Efficacy information regarding cervical and colorectal cancers was overrepresented in the news relative to cancer statistics; efficacy of lung and thyroid cancers was underreported. Findings provide important implications for medical professionals to understand news information about particular cancers as a basis for public (mis)perception, and to communicate effectively about cancer risk with the public and patients.

**Keywords:** Incidence; Mortality; Risk; Newspapers; Television; Internet; Korea

## INTRODUCTION

How the news media cover cancer may bear significant implications for cancer prevention and control. Past studies suggest that the amount of news coverage of specific cancers does not correspond to the actual incidence or mortality rates (1-6) and that public perception of cancer risk is significantly related to distorted depictions in cancer news coverage (7,8). For example, Jenson and colleagues found that in comparison to cancer incidence rates in the United States, certain cancers (e.g., breast, lung, blood/Leukemia, pancreatic, and skin) were overreported in newspapers, whereas other cancers (e.g., male reproductive, female reproductive, kidney, and thyroid) were underreported (3). Also in Korea, research reported an incongruence between the amount of news coverage and the actual incidence and mortality – with breast, cervical, prostate, and skin cancer being overrepresented and lung, thyroid, liver, and stomach cancer being underrepresented (5). Distorted depictions in cancer news may in turn shape public misperception of cancer risk; for example,

the American public showed a tendency to overestimate the incidence rates of cancers which are overrepresented in the news and underestimate the incidence of underrepresented cancers, and such distorted perceptions were more prominent among heavy news consumers (8). Widespread discrepancies between individual perceptions of cancer incidence and survival rates and actual epidemiological data were also observed among Korean adults (9), meriting thorough investigation of news portrayal of specific cancers in Korea.

Extending past research on the incongruity between the “amount” of news coverage of specific cancers and actual cancer statistics, the present research aimed to examine the “content” of news stories by cancer type and its relation to cancer statistics. It is important to investigate not only “whether” particular cancer types are over- or under-represented in news coverage but also specifically “how” they are represented in the news. The latter is particularly significant because individuals’ exposure to cancer news may lead to either desirable outcomes, such as, increased knowledge and healthy lifestyles (10,11) or detrimental

consequences including fatalistic beliefs about cancer prevention (12), depending on the actual content of cancer news stories (13). Pertinent to specific cancers, more research is needed to examine how the content of cancer news differs by cancer type, as compared to the real world incidence and mortality rates. Understanding the representation of specific cancers in the news media—one of the primary sources for cancer risk information among the lay public—will help physicians and medical professionals to better apprehend public knowledge and perception of different cancers.

Considering the role of cancer news in shaping—and often distorting—cancer risk perception, the present research focused on two particular elements of the content of cancer news: threat and efficacy. These two elements are emphasized in theoretical frameworks for health risk messages, including the Extended Parallel Process Model (EPPM). The EPPM posits that messages about risk issues can grab attention if strong threat information is contained but that it is critical for threat to be accompanied by efficacy information in order to lead people to take proper actions to cope with the threat (14,15). The EPPM has been used to examine the mechanism of fear appeals (16), to guide campaign message design (17), and to evaluate the effectiveness of communication campaigns (18). The EPPM has also been applied in research concerning health risk messages in which threat and efficacy information is not included on purpose but may nonetheless be present, such as news articles (19,20), in line with the present research.

The purpose of this research was two-fold. First, we aimed to examine how the news portrayal of cancer may differ by cancer type in Korea, focusing on threat and efficacy information in the news. In particular, this study examined the ways in which news stories contain threat information about the severity of the harm expected from getting cancer and efficacy information about the ways of lowering cancer risk. Second, we aimed to investigate how such news portrayal of cancer is related to cancer statistics in the real world. We were interested in whether there were discrepancies between portrayed threat/efficacy and actual statistics (including the overall incidence and mortality rates, and yearly incidence trends). If news stories depict certain cancers as more (or less) severe than what they actually are, or describe certain cancers with less (or more) reference to efficacious means to cope with them, then news coverage may further distort lay individuals' perception of cancer incidence or mortality pertaining to those particular cancers.

## MATERIALS AND METHODS

### Data

Two data sets were used in this study: 1) news data for portrayed threat and efficacy in cancer news and 2) government data for cancer incidence and mortality statistics. More information on

data can be found in a study previously published by the research team (5).

Cancer news data included 1,138 news stories about cancer risks—a representative sample of TV, newspapers, and other news media in Korea over a 5-year period from January 1, 2008 to December 31, 2012. News stories were obtained from four different types of news media, counting a total of 23 news outlets, including 16 general newspapers (e.g., Chosun-Ilbo, Joong-Ang-Ilbo, Dong-A-Ilbo, Hankyoreh-Sinmun, Kyonghyang-Sinmun, Hankuk-Ilbo), 3 major television news (KBS, MBC, SBS), 3 medical newspapers (Dailymedi, Medical Times, Yeihyub-Sinmun), and 1 news agency (Yonhap News). The Eyesurfer (ver 3.0.) was used to gather news stories, which is an online database news scrap service system in Korea. Search terms were entered with a combination of a primary keyword, “cancer,” with sub-keywords including “cause,” “occurrence,” “carcinogenesis,” and “engenderment.” A total of 13,583 news stories were retrieved at first, and of them 1,438 stories were selected through systematic stratified sampling considering the quota of ratio by the amount of news articles in each media outlet. The final sample size was 1,138 after excluding articles irrelevant to cancer risks.

Cancer statistics data were obtained from the Korean Statistical Information Service. Specifically, this study examined three types of cancer statistics: cancer incidence rates, mortality rates, and temporal changes in cancer incidence (i.e., annual percentage change or APC). For the period corresponding to that of news data (2008-2012), we calculated the rank and proportion of incidence by cancer type, using the Korean Cancer Registry data (21). Those of cancer mortality were obtained with information on the Cause of Death statistics in Korea for the same period (22). Temporal changes in cancer incidence were assessed with the APC from when the government cancer data were available (1999-2012). For the APC, we used age-standardized incidence rates based on the WHO world standard population (21), and calculated  $100(\text{Exp}(b)-1)$  where  $b$  is the slope coefficient of the regression of log age-standardized rates on years (23).

### Coding procedure and measures

A content analysis of cancer news data was conducted, with respect to the primary cancer type, threat, and efficacy information. The unit of analysis was the entire news article. Six graduate student coders participated in coding. Pilot coding was conducted with one hundred articles (not included in the final sample) for training and refinement of the coding scheme. Coding disagreements were resolved by discussion, and the resolution was noted for future coding. Then, another set of one hundred articles were double-coded to establish intercoder reliability, with Krippendorff's alphas ranging from 0.88 to 0.95. The remainder of the sample was divided between the coders and coded independently.

As for the cancer type, coders first read the title and the lead of each news article to identify whether any specific cancer types were mentioned. If coders were unsure, they continued to read the entire story. When two or more cancer types were addressed in one news story, the most primary one was coded. The types of cancer sites coded included general cancer (i.e., not mentioning any specific cancer types), thyroid, stomach, colorectal, lung, liver, breast, prostate, pancreas, cervical, skin, and others (i.e., those not covered within top 10 ranks, including mouth, larynx, mesothelioma, kidney, bladder, tonsil, brain, ovary, gallbladder, esophagus, testis, and corpus uteri cancer).

Threat was operationally defined as any reference to the severity or magnitude of the harm expected from getting cancers (19,20). Each news story was coded to indicate whether any reference was explicitly made to threat, e.g., the cancer caused by cellphone radiation is lethal. In addition, if such threat information was present, we additionally coded whether specific details accompanied the reference, such as detailed depictions of death, hospitalization, and serious symptoms of illness. The coding categories were: 1 = no presence of threat, 2 = presence of threat at a general level, 3 = presence of threat with specific details.

Efficacy was assessed by looking at whether news stories explicitly referenced any ways to reduce cancer risk (13,19,20). We coded whether each news story mentioned any actions to reduce one's risk of getting cancer, such as physical activities. And if so, we coded whether specific details about recommended actions were offered, e.g., guidelines on the specific frequencies or intensity levels of physical activities, and strategies to reduce one's exposure to cellphone radiation. The coding categories were: 1 = no presence of efficacy, 2 = presence of efficacy at a general level, 3 = presence of efficacy with specific details.

### Statistical analysis

To examine the content of cancer news (threat and efficacy) by specific cancer types, we ran cross-tabulations, and conducted analysis of variance (ANOVA) for the mean differences in the degree of portrayed threat and efficacy by cancer type. To compare news portrayal (threat and efficacy) with cancer statistics (overall incidence, mortality, and APC in incidence), we exam-

ined the differences between their respective rank scores, a widely used method in past research (3). We additionally investigated Kendall rank correlations ( $\tau$ ) between them. We conducted all analyses using SPSS 21.0, with significance accepted for  $P < 0.05$  except where stated otherwise.

## RESULTS

### Threat and efficacy by cancer type in news coverage

The first goal of this research was to investigate how news portrayal of cancer may differ by cancer type in Korea. Table 1 presents the cross-tabulations on news portrayal of threat and efficacy by cancer type over a 5-year period from 2008 to 2012. Overall, the findings reveal that cancer news coverage emphasized the threat of getting cancer over efficacy to alleviate cancer risk. With respect to threat, about 18 percent of cancer news stories did not mention any threat component, 28% included threat information at a general level, and 54% contained threat information with specific details. By contrast, about 52% of news stories contained no efficacy information, 15% mentioned efficacy at a general level, and only 33% of news stories included efficacy with specific details. In particular, comparing across different cancer types, threat information with specific details was most commonly included in news stories on pancreatic cancer (87%) and liver cancer (80%), followed by lung cancer (70%) and breast cancer (60%), whereas it was least present in news on stomach cancer (41%). Efficacy information with specific details was included most often in news articles on colorectal cancer (54%), skin cancer (54%), and liver cancer (50%), and least often in articles on thyroid cancer (17%).

In a related vein, we examined the mean differences in the degree of portrayed threat and efficacy by specific cancer types, and conducted one-way ANOVA to see whether the mean differences were statistically significant. Table 2 presents the top 10-most covered cancers in news stories in a period from 2008-2012, and in the column entitled "News coverage," their rank is reported in terms of the percentages of the amount of news coverage each cancer received (with a lower score indicating a larger amount of coverage). The next two columns, entitled "News

**Table 1.** Cross tabulations of news portrayal of threat and efficacy by cancer type

News content coding		Cancer type												
		General (n = 673)	Thyroid (n = 23)	Stomach (n = 17)	Colorectal (n = 79)	Lung (n = 33)	Liver (n = 20)	Breast (n = 80)	Prostate (n = 42)	Pancreatic (n = 15)	Cervical (n = 67)	Skin (n = 24)	Others (n = 65)	Total (n = 1,138)
Threat	1	18.9	17.4	29.4	11.4	12.1	10.0	15.0	26.2	0.0	20.9	12.5	20.0	17.9
	2	26.6	30.4	29.4	35.4	18.2	10.0	25.0	31.0	13.3	34.3	33.3	33.8	27.7
	3	54.5	52.2	41.2	53.2	69.7	80.0	60.0	42.9	86.7	44.8	54.2	46.2	54.4
Efficacy	1	59.0	69.6	35.3	31.6	45.5	35.0	46.3	42.9	46.7	29.9	45.8	44.6	51.7
	2	14.1	13.0	23.5	13.9	12.1	15.0	18.8	9.5	26.7	25.4	0.0	15.4	14.9
	3	26.9	17.4	41.2	54.4	42.4	50.0	35.0	47.6	26.7	44.8	54.2	40.0	33.4

Values are column percentages for each cancer type, with respect to either portrayed threat or efficacy in the news. News content coding categories were: 1 = no presence, 2 = presence at a general level, 3 = presence with specific details.

threat” and “News efficacy,” report the mean scores of threat and efficacy contained in news articles by each cancer, and the corresponding rank. Threat severity was prominent in news stories in the order of pancreatic, liver, lung, breast, colorectal, skin, thyroid, cervical, and stomach cancers. The mean differences in portrayed threat across cancers were statistically significant,  $F(df=9) = 2.40, P = 0.012$ . Efficacy information was prominent in cancer news in the order of colorectal, liver, cervical, skin, stomach, prostate, lung, breast, pancreatic, and thyroid cancers, and their mean differences were borderline significant,  $F(df=9) = 1.89, P = 0.052$ .

For better interpretation of the aforementioned results, Fig. 1 depicts the rank scores of news content on each cancer type, relative to the rank of the amount of news coverage. Cancers marked in the gray space indicate those having higher rank scores in

news portrayal of threat/efficacy, in comparison to the rank in news coverage amount. For example, liver cancer, which was ranked the 8th in terms of news amount, ranked much higher on both news depiction of threat (2nd) and efficacy (2nd).

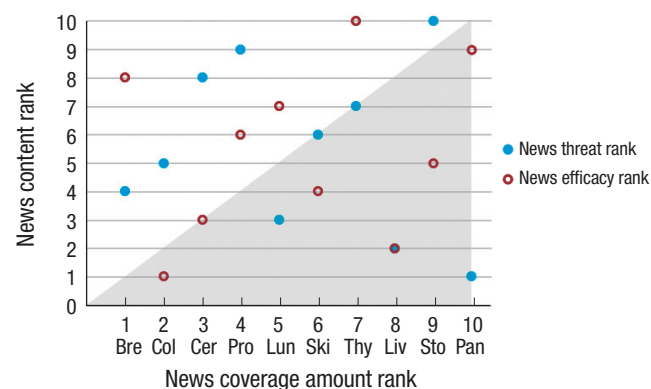
**Comparison of news portrayal of threat and efficacy with actual cancer statistics**

The second objective of this research was to examine whether or not news content of cancer is congruent with actual cancer statistics in Korea. Table 3 presents five different types of rank scores: news threat, news efficacy, cancer incidence (2008-2012), cancer mortality (2008-2012), and incidence changes (APC, 1999-2012). Cancer statistic rates are also reported in Table 3. The last six columns indicate the rank difference between news portrayal and reality—that is, the cancer statistics rank minus

**Table 2.** Means and ranks of news portrayal of threat and efficacy, for top 10 most-covered cancers in the news

Cancer type	News coverage		News threat		News efficacy	
	Rank	%	Rank	Mean (SD)	Rank	Mean (SD)
Breast	1	17.2	4	2.45 (0.74)	8	1.89 (0.90)
Colorectal	2	17.0	5	2.42 (0.69)	1	2.23 (0.91)
Cervical	3	14.4	8	2.24 (0.78)	3	2.15 (0.86)
Prostate	4	9.0	9	2.17 (0.82)	6	2.05 (0.96)
Lung	5	7.1	3	2.58 (0.71)	7	1.97 (0.95)
Skin	6	5.2	6	2.42 (0.72)	4	2.09 (1.02)
Thyroid	7	4.9	7	2.35 (0.78)	10	1.48 (0.79)
Liver	8	4.3	2	2.70 (0.66)	2	2.15 (0.93)
Stomach	9	3.7	10	2.12 (0.86)	5	2.06 (0.90)
Pancreatic	10	3.2	1	2.87 (0.35)	9	1.80 (0.86)

Number of news stories = 465 (excluding stories on general cancer without specifying a cancer type). Cancers coded as “others” are omitted in the Table, which account for the remaining 14.0% of news coverage. Rank is a hierarchical score among each category, from the highest to the lowest. Percentage (%) indicates column percentages. SD, standard deviation.



**Fig. 1.** The rank of news content on each cancer type, in comparison to the rank of the amount of news coverage. X-axis indicates the rank of the amount of news coverage on each cancer type: 1, breast; 2, colon; 3, cervical; 4, prostate; 5, lung; 6, skin; 7, thyroid; 8, liver; 9, stomach; 10, pancreatic cancer. Y-axis indicates the rank of the content of cancer news, respectively for threat and efficacy.

**Table 3.** Comparison of threat and efficacy in news with cancer statistics, for top 10 most-covered cancers in the news

Cancer type	News threat	News efficacy	Incidence		Mortality		Incidence change (APC)		Rank difference					
	Rank	Rank	Rank	%	Rank	%	Rank	Δ%	I-TH	M-TH	C-TH	I-EF	M-EF	C-EF
Breast	4	8	6	7.2	6	2.7	4	6.0	+2	+2	0	-2	-2	-4
Colorectal	5	1	3	12.9	4	10.5	5	5.3	-2	-1	0	+2	+3	+4
Cervical	8	3	9	1.9	8	1.3	10	-4.2	+1	0	+2	+6	+5	+7
Prostate	9	6	7	3.9	7	1.8	2	13.0	-2	-2	-7	+1	+1	-4
Lung	3	7	4	10.2	1	21.8	7	0.0	+1	-2	+4	-3	-6	0
Skin	6	4	10	1.9	9	0.6	3	6.5	+4	+3	-3	+6	+5	-1
Thyroid	7	10	1	17.6	10	0.5	1	22.3	-6	+3	-6	-9	0	-9
Liver	2	2	5	7.9	2	15.7	9	-1.9	+3	0	+7	+3	0	+7
Stomach	10	5	2	14.7	3	13.9	8	-0.3	-8	-7	-2	-3	-2	+3
Pancreatic	1	9	8	2.3	5	6.0	6	1.5	+7	+4	+5	-1	-4	-3

Number of news stories = 465. Rank is a hierarchical score among each category, from the highest (1) to the lowest (10). Rank difference was calculated by subtracting news rank from actual cancer statistics rank. For example, a positive score means that threat of getting a particular cancer was over-emphasized in the news in comparison to its actual incidence, mortality, or APC.

I, incidence; M, mortality; C, incidence change (APC); TH, threat; EF, efficacy.

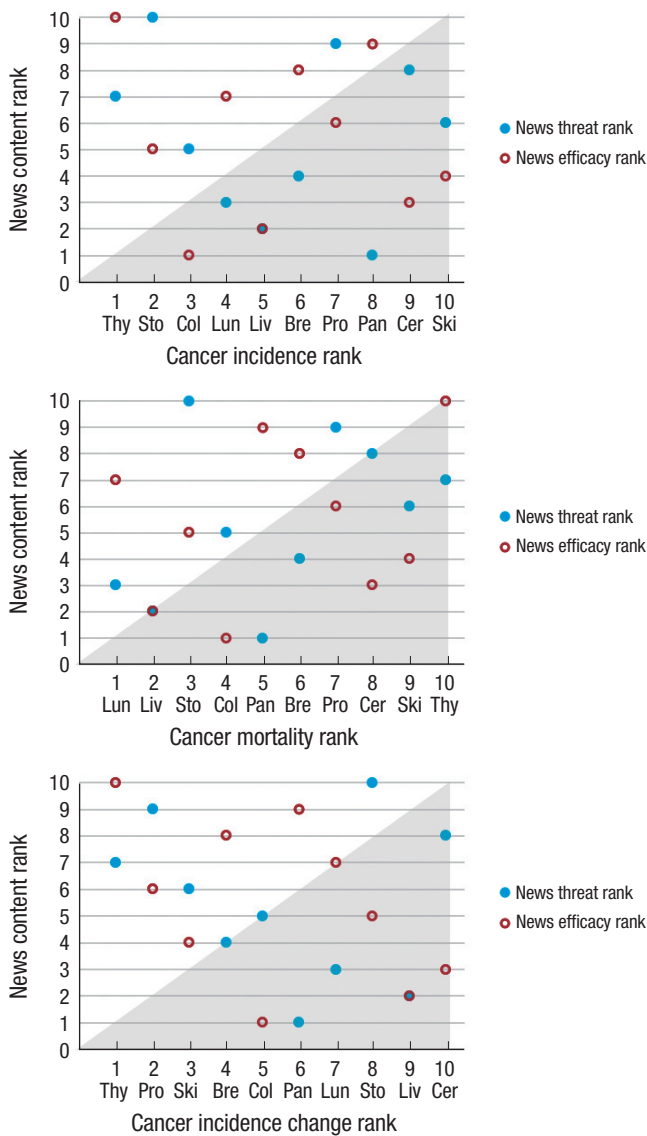
the news portrayal rank. This rank difference score reflects the degree of distortion between news portrayal and actual cancer statistics; a positive score indicates that threat or efficacy was over-represented in the cancer news in comparison to the reality.

Specifically, threat severity of getting cancers was depicted more frequently in news stories of pancreatic cancer (+7, +4, +5) and liver cancer (+3, +0, +7), as compared with the cancer epidemiological data, whereas threat of getting stomach cancer (-8, -7, -2) and prostate cancer (-2, -2, -7) was relatively under-reported in the news. Threat of getting skin cancer seemed to be overreported based on incidence and mortality (+4, +3), but

it was not so compared to the APC (-3). Results on thyroid cancer were mixed: its threat was underrepresented relative to incidence and APC (-6, -6) but overrepresented relative to mortality (+3).

Efficacy information on how to alleviate the risk of getting cancers was contained relatively more in news stories on cervical cancer (+6, +5, +7) and colorectal cancer (+2, +3, +4) relative to epidemiological data. Efficacy to cope with skin cancer risk was overreported relative to incidence and mortality (+6, +5), but not so relative to APC (-1). By contrast, efficacy was relatively less included in news articles on lung cancer (-3, -6, 0) and thyroid cancer (-9, 0, -9). Taken together, the comparisons showed numerous discrepancies between the news portrayal of cancer and the realities of the disease in Korea. These disparities between news reports and cancer statistics are visualized in Fig. 2.

We further examined Kendall rank correlations between the news and cancer statistic variables, supporting the discrepancies between the two. The rank of threat in the news had no significant associations with the ranks of incidence ( $\tau = -0.16$ , ns, not significant), mortality ( $\tau = 0.24$ , ns), and APC ( $\tau = -0.20$ , ns), respectively. The rank of news efficacy was also not statistically associated with any of the cancer statistics: incidence ( $\tau = -0.07$ , ns), mortality ( $\tau = 0.16$ , ns), and APC ( $\tau = -0.38$ , ns).



**Fig. 2.** The rank of news content on each cancer, relative to the rank of cancer statistics (incidence rates, mortality rates, and yearly incidence change). X-axis indicates the rank of cancer statistics, and the name of cancer sites was shortened: thy, thyroid; sto, stomach; col, colon; lun, lung; liv, liver; bre, breast; pro, prostate; pan, pancreatic; cer, cervical; ski, skin. Y-axis indicates the rank of the content of cancer news, respectively for threat and efficacy.

**DISCUSSION**

The aims of the present research were to examine the content of cancer news coverage by cancer type and to explore its relationships with incidence and mortality of the diseases in Korea. Several patterns were found, with the potential to shape illness representations of cancer. To summarize, our findings indicate: 1) cancer news stories contained more threat than efficacy information; 2) threat was most prominent in news stories on pancreatic cancer, followed by liver, lung, and breast cancers, and least in stories on stomach cancer; 3) efficacy was conveyed most often in articles on colorectal, skin, and liver cancers, and least in thyroid cancer; 4) there were numerous disparities between cancer news content and realities; 5) threat about pancreatic cancer and liver cancers was overreported relative to cancer statistics, whereas threat of stomach and prostate cancers was underreported; 6) efficacy information regarding cervical and colorectal cancers was overrepresented in the news relative to cancer statistics, whereas that regarding lung and thyroid cancers was underreported.

This research has several important implications. First, we applied the EPPM (14,15) to a context of news articles, which are not intentionally crafted for the purpose of persuasive campaigns, and examined the degree to which cancer news stories contained threat and efficacy elements. Overall findings reveal that threat was more prevalent in the cancer news coverage than was efficacy. While more than 8 in 10 news articles conveyed

threat information (either general or specific), less than 50% contained efficacy information, and those containing specific details on efficacy accounted for only one third of news stories. Our findings are consistent with past research on news coverage of other health risks, such as the H1N1 virus in the USA (19) and a medication contamination crisis in Panama (20). Similarly, past research found that cancer news coverage focuses more on cancer treatment and conveys relatively little information on prevention, detection, or coping (3,6,24). The findings imply that the news is successful at communicating the threat of getting various cancers, and perhaps evoking fear, but may be less successful at informing people of doable actions to alleviate their risks. It may be sensible that news articles contain threat information relatively more than efficacy because threat may reflect newly reported medical findings and thus be more newsworthy; however, it should be noted that exposure to news stories focusing primarily on threat is likely to cultivate fatalistic beliefs about cancer prevention and coping among lay people and patients. This possibility raises a caution for health journalists in writing cancer news stories, and suggests increasingly important roles of physicians and medical professionals in conveying efficacy information simultaneously in communicating about cancer risk with patients.

Second, this research extends past findings on the amount of news coverage by cancer type (1-6) by examining how the specific content of news coverage may vary across cancer type. One notable finding concerns the pattern of news stories of pancreatic and liver cancers. These cancers had similarities in terms of the amount and threat-related content of the news coverage. Both cancers showed a relatively small amount of news coverage, but once they were reported in the news, threat information was very likely to be included. Every article on pancreatic cancer conveyed threat, and almost 9 in 10 stories on liver cancer contained threat, which may be attributable to low survival rates. The coverage of efficacy regarding the two cancers was different, such that news stories on liver cancer highly covered efficacy, whereas news stories on pancreatic cancer did not. Therefore, news reports on pancreatic cancer may be particularly problematic given the coverage of high threat and low efficacy, possibly enhancing fatalism about pancreatic cancer. On the other hand, there is a possibility that the problem may not be that serious because the absolute amount of the news on pancreatic cancer was not high. Future research is needed to see how the quantity of news coverage and the specific content of news (the presence or absence of threat and efficacy) may jointly determine risk perception about particular cancers.

Another interesting finding concerns news stories of breast cancer. Breast cancer has been consistently found to be the most covered cancer site in both the U.S. and Korea (3,4,25). In this study, breast cancer was ranked 4 out of 10 in the degree of threat in the news (with 85% of stories conveying either general or spe-

cific-level threat information), and ranked 8 in terms of efficacy conveyed in the news. The disproportionately high amount of coverage of breast cancer, coupled with the relatively strong portrayal of threat, can also be problematic, especially if efficacy information is not offered together. Researchers have attributed the large amount of breast cancer news coverage to successful advocacy efforts for breast cancer (3,5,6), and it seems that the breast cancer community now needs to focus not only on increasing the awareness of breast cancer but also on leading people to take doable actions for prevention and early detection.

Efficacy information was more prevalent in news stories of colorectal, liver, and cervical cancers than other cancer news, which may be explained by their higher preventive potential. Efficacy was the least mentioned in news of thyroid cancer, and this finding may be due to the issue of over-diagnosis in Korea, which could have been the primary focus of news articles, thereby rarely covering efficacious methods of reducing the risk. The association between individual perception of different cancers and portrayed efficacy in the news coverage is also worth investigation, awaiting future research.

Most notably, we examined the possible discrepancies between news portrayal of specific cancers and actual incidence or mortality in the real world. It is meaningful that we compared cancer news coverage not only with the overall incidence and mortality rates but also with the changes in incidence over the years. Our findings suggest that news coverage of threat and efficacy on cancers, more often than not, does not accurately mirror the statistics for these cancers. Overrepresentation of threat in the news is problematic, as shown with pancreatic and liver cancer, but underrepresentation of threat is also undesirable. For example, in news stories of stomach cancer, threat information was underreported, relative to all three cancer statistics. The 5-year relative survival rate for stomach cancer was 71.5% in Korea in 2012, which was lower than the rates of colorectal, cervical, and breast cancers, and stomach cancer was more common in Korea than other countries, implying an urgent need to include threat information in the news in Korea. Additionally, despite well-identified risk factors for stomach cancer, we saw a relatively weak emphasis on specific preventive actions to cope with stomach cancer in the news. Regarding efficacy content, news coverage of lung cancer showed a similar pattern; although smoking cessation is the undoubted solution for prevention of lung cancer and various programs for cessation are being implemented, more than half of the articles did not suggest any concrete strategy. On the contrary, for skin cancer, both threat and efficacy were over-reported relative to incidence and mortality, although such news report may not be sufficient to reflect its high increase in the incidence over the years.

Our findings on the discrepancies between news portrayal and realities are consistent with past studies regarding the amo-

unt of news coverage by cancer type (3-6,24,25). Indeed, portrayed threat and efficacy did not have significant rank-order correlations with any of the cancer statistics used in this research. Taking together our findings and past research findings, it seems that the amount of cancer news coverage does not correspond properly to the realities, and furthermore, the specific threat or efficacy elements conveyed in cancer news do not also reflect these realities accurately. Cancers that were more frequent and more deadly were not always depicted as involving a corresponding degree of threat in news stories. Similarly, cancers that needed more efficacy information on how to reduce the risk were not always covered in news as needed. Overall, the patterns of cancer news coverage in Korea with the potential to cultivate misrepresentations of illness (8) raise concerns, and it is necessary to identify ways to convey cancer news in ways that avoid distortion in terms of both the volume and content of news coverage.

This study has several limitations that need to be acknowledged. First, the time period of data collection was limited to the period from 2008 to 2012, and does not include an assessment of more recent news coverage or longer range trends since 1999 when a nation-wide cancer control policy started in Korea. Secondly, the coding categories of threat and efficacy were somewhat simple having only three levels, thereby possibly missing more nuanced tones and implications embedded in news stories. Lastly, this study included news data only on cancer risk. Any varying trends in news portrayal of threat and efficacy across the cancer control continuum await future research.

In conclusion, this research sheds lights on the way particular cancer types are portrayed in news coverage relative to cancer incidence and mortality in Korea. The findings offer important implications for health journalists to convey cancer risk in the news media. The content of cancer news in Korea needs to be improved, to better mirror the reality and to strike a balance between threat and efficacy information in news stories. The findings also provide implications for physicians and medical professionals to understand the content of cancer risk information in the news widely available to lay people and patients, and to utilize it for the education and consultation for them. Building on the present research offering a snapshot of cancer news coverage in Korea, future research is warranted to examine the possible effects of cancer coverage patterns on lay individuals' perceptions, efficacy, and behaviors.

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## DISCLOSURE

The authors have no potential conflicts of interest to disclose.

## AUTHOR CONTRIBUTION

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