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Content and Effects of News Stories About Uncertain Cancer Causes and Preventive Behaviors

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This article presents findings from two studies that describe news portrayals of cancer causes and prevention in local TV and test the effects of typical aspects of this coverage on cancer-related fatalism and overload. Study 1 analyzed the content of stories focused on cancer causes and prevention from an October 2002 national sample of local TV and newspaper cancer coverage ($n = 122$ television stations; $n = 60$ newspapers). Informed by results from the content analysis, Study 2 describes results from a randomized experiment testing effects of the volume and content of news stories about cancer causes and prevention ($n = 601$). Study 1 indicates that local TV news stories describe cancer causes and prevention as comparatively more certain than newspapers but include less information about how to reduce cancer risk. Study 2 reveals that the combination of stories conveying an emerging cancer cause and prevention behavior as moderately certain leads to an increased sense of overload, while a short summary of well-established preventive behaviors mitigates these potentially harmful beliefs. We conclude with a series of recommendations for health communication and health journalism practice.

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U.S. national surveys document widespread fatalism and feelings of information overload about what causes cancer and how to prevent it (Han, Moser, & Klein, 2007; Niederdeppe & Gurmnakin Levy, 2007). Specifically, 28% of Americans say "there's not much you can do to lower your chances of getting cancer," 54% agree that "it seems like everything causes cancer," and 75% note "there are so many different recommendations about preventing cancer, it's hard to know which ones to follow" (Health Information National Trends Survey [HINTS], 2007). While early studies referred to these three statements collectively as "fatalistic beliefs about cancer prevention" (e.g., Niederdeppe & Gurmankin Levy, 2007, p. 998), a recent validation study differentiated them into two distinct constructs: cancer prevention fatalism, and information overload (Jensen, Carcioppolo, King, Scherr, & Jones, 2012). These beliefs are particularly strong among Americans with low levels of education, but do not differ consistently by race/ethnicity or gender (e.g., Lee & Niederdeppe, 2011). People who hold fatalistic and overloaded beliefs (FOBs) about cancer's causes and prevention (CCP) are less likely to engage in risk-reducing behaviors like avoiding smoking, exercising regularly, eating fruits and vegetables, and using sunscreen (Han et al., 2007; Niederdeppe & Gurmnakin Levy, 2007).

Americans rate television (TV) as a primary source of health news (Pew Research Center, 2009a). Recent studies, however, suggest that exposure to local TV news is one possible cause of FOBs. Using a nationally representative cross-sectional survey, Niederdeppe, Fowler, Goldstein, and Pribble (2010) found that the number of days watching local TV in the past week was positively associated with an index of FOBs, controlling for a variety of demographic factors and other sources of news media exposure. Notably, newspaper reading and national TV news exposure were not associated with FOBs. Lee and Niederdeppe (2011), using a two-wave longitudinal survey, found that baseline local TV exposure predicted changes in FOBs over time (controlling for confounders that included newspaper reading and national TV news exposure, neither of which predicted FOBs). Baseline FOBs did not predict changes in local TV exposure, indicating that local TV exposure is antecedent to FOBs but not vice versa. These studies establish two criteria for causal claims: The variables are associated, and temporal order is established. However, while these studies did control for a variety of possible confounders, surveys cannot definitively rule out all possible third-variable explanations. Previous work also did not identify which aspects of local TV news might account for these possible effects.

Differential effects of local TV cancer news (versus other channels) on FOBs could be attributable to at least two factors. Repeated exposure to a high volume of local TV coverage of CCP behaviors over time could increase FOBs. Exposure to specific content characteristics of local TV's coverage of CCP could also contribute to FOBs. For the latter explanation to be plausible, one should expect differences in content characteristics between local TV CCP stories and coverage via other channels. However, studies have yet to identify content features that both distinguish local TV and newspaper coverage of CCP and appear likely to increase FOBs. If content differences do exist and are confirmed to be causally related to FOBs, this knowledge could provide health educators and journalists with guidance about how to mitigate them.

This article examines the extent to which both volume (number of stories) and content (specific story features) distinguish local TV news coverage of CCP from other sources, and the extent to which those differences (if any) matter in shaping FOBs. First, we conduct a content analysis of news stories about CCP in local TV and newspapers to identify salient content features that differentiate coverage between these channels (Study 1). We compare these two channels in the extent to which they (1) acknowledge scientific uncertainty about CCP (or fail to do so—called streamlining), and (2) include efficacy information about how to reduce cancer risk. These factors are likely to be consequential in shaping FOBs and could explain observed differences between effects of local TV news and newspaper exposure on FOBs. Second, we conduct a randomized experiment that examines effects of variations in news story content (modeled after content typical of local TV news stories, as identified in Study 1) on FOBs. We test the influence of (1) the volume of exposure to stories about uncertain cancer causes (one or two), (2) the presence or absence of response efficacy information within uncertain cancer cause stories, and (3) whether or not a respondent is exposed to a story reporting on scientifically uncertain or (comparatively) certain cancer prevention information, on FOBs.

STUDY 1

Overall Content of News about CCP

While cancer is a frequent news topic (Aldeman & Verbrugge, 2000; Viswanath et al., 2006) and several studies show positive effects of cancer news on health behaviors (e.g., Brown & Potosky, 1990; Yanovitzky & Blitz, 2000), the way that cancer is covered is not always optimal for public health. For instance, rates of reporting of specific cancers may not match their incidence, morbidity, or mortality rates; some cancers are overrepresented (e.g., breast cancer) and others are underrepresented (e.g., lung cancer; Cohen, Caburnay, Luke, Rodgers, Cameron, & Kreuter, 2008; Jensen, Moriarty, Hurley, & Stryker, 2010). Coverage focuses more on the treatment and causes of cancer than on ways to prevent it (Jensen, Moriarty, et al., 2010; Slater, Long, Bettinghaus, & Reineke, 2008; Stryker, Emmons, & Viswanath, 2007). Furthermore, only 6.5% of cancer stories in mainstream and ethnic newspapers from 2003 included

messages about the efficacy of cancer prevention behaviors (Moriarty & Stryker, 2008).

Cancer news is rife with complex, confusing, and conflicting information (e.g., Clarke & Everest, 2006; Gill & Babrow, 2007; Hurley, Kosenko, & Brashers, 2011; Lantz & Booth, 1998) yet also frequently streamlined so that it lacks mention of appropriate caveats, limitations, or ambiguity of scientific evidence (Jensen et al., 2011; Lai & Lane, 2009). The resulting content frequently leaves many people confused by scientific terms used in cancer news stories and likely compounds the extent to which viewers misinterpret or oversimplify scientific evidence about CCP (Mazor et al., 2010). While explicit statements that acknowledge the ambiguity of scientific evidence in cancer news stories (termed "hedging"; Jensen, 2008) can reduce FOBs (Jensen et al., 2011), these statements appear far less often in cancer news than other factors (e.g., use of ambiguous words to describe a cancer cause; omission of relevant scientific information) that may invite FOBs (Hurley et al., 2011).

Differences Between Local TV and Newspaper Coverage of CCP

Direct comparisons of the volume of local TV news devoted to CCP, relative to other channels (like newspapers), could be misleading because of the disparate amounts of sheer space. The number of discrete stories on a typical 30-minute newscast is far smaller than the number of stories carried in a daily newspaper. Thus, volume assessments have focused on the relative frequency of stories within each medium that discuss CCP. Using a subset of stories originally analyzed by Pribble et al. (2006), Niederdeppe et al. (2010) found that local TV stories (from October 2002) were more likely than newspaper stories (published the same month in the same media markets) to cover cancer causes and describe findings from scientific studies, but less likely than newspapers to provide extensive follow-up information. Using a subset of stories originally collected by Slater et al. (2008) from 2003, Lee, Long, and Slater (2010) found that local TV stories were shorter than national TV stories in length, less likely to report on prevention and screening, and less likely to reference groups (e.g., American Cancer Society; National Cancer Institute) that have made clear prevention recommendations. Combined, these studies suggest that local TV news covers cancer in ways that systematically differ from both newspapers and national TV news.

Beyond classifications of the story's basic focus (e.g., a focus on a cancer cause or preventive behavior), however, studies have yet to directly compare the specific content characteristics of local TV and other channel coverage of CCP. Informed by what is known from previous work, we propose and test a series of hypotheses about differences in specific content features, those likely to influence FOBs, between local TV and newspaper coverage of CCP.

Specific Hypotheses About Relative Frequency of Streamlining and Efficacy Information

Several studies have found that local TV news stories about health topics (Pribble et al., 2006; Wang & Gantz, 2007, 2010) and cancer (Gantz & Wang, 2009) are, on average, very short (between 30 and 60 seconds). Lee et al. (2010) also found that local TV stories about cancer were typically shorter than national TV stories. While we are unaware of studies that directly compare the length of local TV news and newspaper stories about cancer-related topics, it seems reasonable to predict the following:

> *Hypothesis 1 (H1):* Local TV news stories about CCP will be shorter than newspaper stories about these topics.

Short story duration, in and of itself, would not necessarily increase FOBs. However, if shorter stories lead to omission of important contextual details about CCP, the development of FOBs may be more likely. Jensen (2008) and Jensen et al. (2011) argue that acknowledging scientific uncertainty helps citizens to make sense of the volume of cancer information that is available to them (Viswanath et al., 2006). Explicit cues that label information about a particular cancer cause or preventive behavior as "uncertain" enable consumers to catalog that information accordingly, reducing the likelihood of FOBs. Without information about uncertainty, however, FOBs increase among viewers (Jensen et al., 2011).

Due in part to their short length constraining what can be included, local TV news would appear more likely than other sources of cancer news to streamline (e.g., omit details about) coverage of CCP by presenting this information as comparatively more certain (Russell, 1999). For example, Pribble et al. (2006) found that local TV health news stories (in October 2002) oversimplified interpretation of scientific research and omitted information that could have helped viewers interpret the risk and decide how to respond to it. Similarly, Wang and Gantz (2007) analyzed a different sample of local TV stations (in seven media markets in 2000) and found that local TV health stories included little follow-up information to allow readers to learn more about the issue being covered. They replicated the analysis on a larger sample in 2004 and 2005 with similar findings (Wang & Gantz, 2010). Gantz and Wang (2009) analyzed a subset of local TV stories about cancer from Wang and Gantz's (2007) sample and concluded that these outlets covered cancer in ways similar to other health issues, providing little contextual information. Niederdeppe et al. (2010) likewise found that local TV news stories were more likely than newspaper stories about cancer to describe findings from scientific studies.

Other types of evidence also suggest that local TV news may offer less contextual detail, and thus more certain portrayals of the science of CCP, than other sources. Local TV news, compared to both national network TV news and newspapers, relies more heavily on breaking news, in part to fulfill the need for new content on its broadcasts throughout

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the day (Graber, 2010, p. 279). This tendency was confirmed by the Viswanath et al. (2008) comparison of survey responses between print and broadcast journalists (the majority of whom worked for local TV news stations) who covered health news issues in 2005. The authors found that TV broadcast journalists were more likely than print journalists to cite "new information or development" as a criterion for deciding whether or not to cover a health issue (92 versus 75%; Viswanath et al., 2008, p. 770). An overemphasis on new research about uncertain cancer causes or prevention could increase FOBs if audiences are ill-equipped to make sense of ambiguous or confusing recommendations (Jensen et al., 2011). Thus, based on available evidence, we posit:

Hypothesis 2 (H2): Local TV news will be more likely than newspapers to streamline coverage by conveying a greater level of certainty about whether a particular agent causes cancer, or whether a preventive behavior is effective at reducing cancer risk.

Science values replication and uncertainty, whereas journalism values novelty, certainty, and controversy (Slater, Weeks, Friedenberg, & Southwell, 2012; Stryker, 2002). These values may lead news outlets to cover new, uncertain, and controversial cancer causes in ways that convey more certainty than supported by science. Scientific acknowledgment of the uncertainty of CCPs has even been framed by journalists as controversial, which, because it may generate audience interest (e.g., Slater et al., 2012), provides yet another reason for broadcasters to cover the story (see Graber, 2010, p. 85). Nevertheless, theory and research suggest that the inclusion of efficacy information in or after a threatening and fear-inducing news story could help to mitigate FOBs to these stories. The Extended Parallel Process Model (EPPM) posits that responses to threatening messages depend on the degree to which people have efficacy to avert the threat (Witte, 1992). Cancer news coverage is likely threatening for many people, since studies find that exposure to TV news about cancer is associated with increased fear of the disease (Lemal & Van den Bulck, 2009). If a person has sufficient efficacy to avert a threat, s/he is likely to engage in danger control by pursuing behaviors that can protect her/him from that threat. If a person does not have sufficient efficacy to avert a threat, however, s/he is likely to engage in fear control by denying or avoiding the threat. FOBs likely represent a form of denial and defensive avoidance of the threat of cancer risks, since these beliefs are associated with failure to engage in threat-reducing behaviors.

While efficacy statements are rare in newspaper stories about cancer (Moriarty & Stryker, 2010), studies have yet to compare local TV news to newspaper coverage of cancer (or CCP more specifically) in their likelihood of including efficacy information. We posit that they are likely to be even rarer in local TV news coverage of the issue due to the time constraints and content preferences associated with local TV stories discussed earlier.

Hypothesis 3 (H3): Local TV news stories about cancer causes will be less likely than newspapers to include efficacy information about how to reduce cancer risk.

It remains unknown, however, whether story length alone may explain the possible tendency for local TV stories to streamline coverage of cancer cause and prevention or fail to include response efficacy information. As discussed already, it is possible that limited time allocated to local TV news segments (compared to newspaper stories) could lead to the failure to include information about the level of scientific uncertainty and efficacy information. It is also possible that journalistic norms, economic pressure, or other factors unrelated to story length may produce differences in local TV versus newspaper coverage. We thus ask the following:

Research question 1 (RQ1): Do differences in the length of local TV and newspaper stories about CCP explain any observed differences in the level of certainty portrayed and their inclusion of efficacy information?

Methods

Procedure. We addressed H1 through H3 and RQ1 by comparing stories about CCP in (a) a national sample of local TV news stories ($n = 122$ TV stations) to (b) a national sample of newspaper stories ($n = 60$ newspapers) collected during the exact same time period (October, 2002) from the exact same markets (the top 50 media markets in the United States).

Local TV news data. Local TV cancer news coverage data were drawn from the University of Wisconsin (UW) NewsLab's sample of local TV news broadcasts from 2002. UW NewsLab collected evening news broadcasts between September 18 and November 4, 2002, from a random sample of 122 local TV stations drawn from a sampling frame of 200 stations (comprising the four major affiliates in each market) from the top 50 media markets, covering 67% of the nation's population. Up to two half-hour news broadcasts were sampled from each station every evening: the highest-rated half-hour of early-evening news and the highest-rated half-hour of late-evening news on each station. Although this data set was originally collected to assess the quantity and quality of local TV political coverage (see Fowler, Goldstein, Hale, & Kaplan, 2007, for more details on the methodology), all late-evening (usually 10 or 11 p.m.) news broadcasts from October 2002 were reanalyzed for health coverage (Pribble et al., 2006). Late-evening broadcasts were the focus of these analyses because they tend to include more health news than earlier broadcasts, often include segments originally aired earlier in the day, and attract a larger audience than morning or daytime local TV news (Dean & Pertilla, 2007). Of 2,795 captured broadcasts aired in October 2002, 1,799 health stories were identified, 258 (14%) of which were about cancer. A subsequent analysis identified a subset

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of 78 cancer news stories that mentioned causes or prevention (30% of cancer stories; κ for this judgment = .83; Niederdeppe et al., 2010). These stories comprise the local TV news sample used in all Study 1 analyses. Each story was transcribed, but coders also watched video for all TV coding decisions. Coders were asked to weigh visual, verbal, and on-screen text while coding TV stories.

Newspaper data. We used Lexis-Nexis to identify cancer news stories in major newspapers from each of the top 50 media markets in October 2002 (to match the local TV news sample). A validated search term, developed by Stryker, Wray, Hornik, and Yanovitzky (2006), was used to automate the retrieval of relevant newspaper articles about cancer. The search yielded 1,156 cancer news articles. A subsequent analysis identified 191 of these cancer stories focused on causes or prevention (17% of cancer stories; κ for this judgment = .83; Niederdeppe et al., 2010). These articles comprise the newspaper sample used in all Study 1 analyses.

Content analysis procedure and measures. In a previous content analysis (Niederdeppe et al., 2010), coders determined the primary cancer topic (e.g., cause, prevention, screening, diagnosis, treatment, etc.) of the story. Two (new) undergraduate coders analyzed the content of stories that were identified in the previous analysis as focusing on cancer causes or prevention ($n = 78$ local TV news stories; $n = 191$ newspaper stories). Through a series of training exercises (coding articles from a time period outside of October 2002) and iterative modifications to the codebook over a period of several months (clarifying concepts, providing examples, developing decision rules), we arrived at an instrument that we deemed ready for use on the analytic sample.

The first 55 stories of the newspaper analytic sample (randomly ordered) were double-coded to assess intercoder reliability for each coding judgment (Lombard, Snyder-Duch, & Bracken, 2002). Discrepancies were identified and discussed. If this subsample yielded a Krippendorf's alpha statistic greater than .80, the remainder of the sample was divided between the two coders and those stories were coded independently. If reliability did not exceed .80 for the first 55 stories (as was the case for response efficacy information), all remaining stories were double-coded independently, discussed, and then final-coded by consensus. All TV stories were double-coded for each judgment (since there were only 79 total).

Table 1 presents Krippendorff's alphas for each coding decision. Coding proceeded in four stages. In the first stage, the research team identified the specific cause or preventive behavior that was the focus of the study by consensus. In rare cases, stories described multiple causes or prevention behaviors; we focused on the cause or prevention behavior that was mentioned first. The previous content analysis of these data (described earlier) had already identified whether the article focused on a cause or preventive behavior and specified a focal cause or preventive behavior. However, since the original coding did not have perfect reliability, those codes were subject to some coding error. We removed that previous source of error from the subsequent coding process by consensus. For stories that focused on both CCP, we coded the topic that appeared first. The majority of stories focused on a cause (82% of TV; 79% of newspapers). A comparable proportion of stories focused on the topic of smoking, the cancer cause with the strongest scientific evidence (13% of TV; 14% of newspapers).

In the second stage, coders judged the direction and level of certainty conveyed about that cause/preventive behavior. On a scale from −4 (completely certain that an agent *is not* a cause or effective preventive behavior) to +4 (completely certain that an agent *is* a cause or effective preventive behavior), with 0 as the midpoint (completely uncertain either way), coders rated each story. This approach differs from the one used by Hurley et al. (2011), who coded for the presence or absence of several discrete indicators of different types of uncertainty, although we did take into consideration several elements measured in that study. Coders considered the extent to which the headline (for newspaper stories) or lead (for local TV stories) and body of the story (1) used definitive versus tentative language, (2) included discourse-based hedging (explicit caveats offered by a source; Jensen et al., 2011), (3) featured intense language or emotional cues on one side or the other, (4) described one study or a synthesis of multiple studies, and/or (5) indicated that the topic was controversial or subject to multiple interpretations (Hurley et al., 2011). Coders were reliable on this judgment for TV ($\alpha = .94$) and newspapers ($\alpha = .88$). We used this raw score to create two separate measures. We used the valence (positive, negative, or zero; see Table 1) to specify the direction of certainty (more certain than not, less certain than not, or completely uncertain) and the absolute value to specify the overall level of certainty conveyed.

In the third stage, coders identified whether or not each story about a cancer cause included response efficacy information about effective strategies to reduce cancer risk, either for that specific cause (e.g., using a hands-free headset for a cellular telephone to reduce brain cancer risk) or more generally (e.g., avoiding smoking or engaging in regular physical activity to reduce overall cancer risk). All prevention articles, by definition, offered response efficacy information because calling something a preventive behavior implies that it reduces cancer risk. Thus, coders did not identify additional response efficacy information in prevention-first articles. While coders were far less reliable on this judgment for both TV ($\alpha = .66$) and newspaper ($\alpha = .59$), they double-coded every story, discussed all discrepancies, and came to consensus.

In the fourth stage, we used Microsoft Word to count the number of words used in each newspaper story (including the headline but excluding descriptions of the story's source and

TABLE 1
Content Analytic Item Descriptions and Krippendorf's Alpha for Intercoder Reliability, Study 1

Variable description	*Local TV Stories, Krippendorf's α (n Double-Coded)*	*Newspaper Stories, Krippendorf's α (n Double-Coded)*
Level and direction of certainty		
On a scale from −4 to +4, rate both the direction of the conclusion (e.g., does the article say an agent IS a cause or IS NOT a cause of cancer or effective behavior to prevent cancer) and the level of certainty conveyed about it.		
For cancer cause stories, a rating of −4 means that the story argues that we are close to 100% certain that a particular item IS NOT a cancer cause. A rating of +4 means that the story argues that we are close to 100% certain that a particular item IS a cancer cause. A rating of 0 indicates that the story is framed as totally uncertain; the topic may be considered a debate with arguments from both sides being presented, or the topic may be presented as so new and speculative that no conclusions can be drawn.	0.94 ($n = 78$)	0.88 ($n = 55$)
For cancer prevention stories, a rating of −4 means that the story argues that we are close to 100% certain that a particular action IS NOT an effective cancer prevention method. A rating of +4 means that the story argues that we are close to 100% certain that a particular action IS an effective cancer prevention method. A rating of 0 indicates that the article is framed as totally uncertain; the topic may be considered a debate with arguments from both sides being presented, or the topic may be presented as so new and speculative that no conclusions can be drawn.		
Response efficacy mentioned		
Determine if response efficacy information is included. Response efficacy refers to the perceived effectiveness of a recommended behavior that a person at risk for cancer could perform to alleviate a health threat or problem. In the context of cancer-related stories, it refers to specific statements indicating or implying that engaging in a particular behavior would reduce one's risk of cancer.	0.66 ($n = 64$)	0.59 ($n = 151$)

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location) and number of words spoken in each local TV news story (using the story transcripts). We used this measure to compare the length of stories about CCP.

Results

Table 2 compares local TV and newspaper stories on each measure. We tested study hypotheses using either chi-squared tests (for dichotomous variables) or one-tailed, independent-samples *t*-tests (for continuous variables). Supporting H1, local TV stories were shorter than newspaper stories as measured by their word count ($M_{TV} = 150$, $M_{newspaper} = 273$, $t(267) = 4.12$, $p < .001$). Supporting H2, local TV stories portrayed CCP as more certain than newspaper stories ($M_{TV} = 2.08$, $M_{newspaper} = 1.82$, t (267) $= 1.70$, $p = .045$). This difference remained statistically significant after removing stories about cigarette smoking ($M_{TV} = 1.97$, $M_{newspaper} = 1.66$, $t(230) = 2.00$, $p = .024$). There were no differences in the level of certainty conveyed for cancer cause versus cancer prevention stories, perhaps due to low statistical power from few stories focused on prevention. There was no difference in the direction of that certainty; most local TV and newspaper stories focused on causes or prevention behaviors that were more certain than not (82 versus 73%, respectively; $\chi^2(1) = 2.57$, $p = .109$). The correlation between word count and the level of certainty was not statistically significant for local TV ($r = –.19$, $p = .09$) or newspaper stories ($r = –.08$, $p = .28$). Supporting H3, local TV stories were less likely than newspaper stories to offer response efficacy information within stories about a cancer cause (2 versus 16%, respectively; $\chi^2(1) = 8.98$, $p = .003$).

We tested RQ1, which asked whether differences in certainty and efficacy information by story source (TV versus newspaper) were driven by differences in story length, with stepwise regression. Specifically, we used stepwise ordinary least squares (OLS) regression to predict level of certainty as a function of story source (in step 1) and both story source and word count (in step 2). We used logistic regression to predict inclusion of response efficacy information as a function of story source (in step 1) and both story source and word count (in step 2).

In step 1 of the model predicting level of uncertainty, the β coefficient for local TV (vs. newspaper) was .10 ($t = 1.67$, $p = .048$, one-tailed), confirming previous tests of H1. In step 2, the β coefficient for word count was −.10 ($t = 1.61$, $p =$

TABLE 2
Comparing Local TV and Newspaper Coverage of Cancer Causes and Prevention, Study 1

Variable Description	*Local TV Stories, Mean (SD) or Proportion*	*Newspaper Stories, Mean (SD) or Proportion*
Word count (range 16 to 2208) (H1)	150*** (147)	273 (246)
Focus on cancer cause (versus prevention)	.82	.79
Focus on smoking, a certain cancer cause	.13	.14
Direction of certainty—more likely than not	.82	.73
Completely uncertain	.04	.10
Level of certainty (H2)	2.08* (1.08)	1.82 (1.13)
Level of certainty after removing stories focused on smoking as cancer cause	1.97* (1.05)	1.66 (1.06)
Level of certainty, causes only	2.11 (1.10)	1.86 (1.18)
Level of certainty, prevention only	1.92 (1.00)	1.68 (.92)
Response efficacy information (cause stories only) (H3)	.02**	.16

Note. Cells indicate the mean or proportion of stories that represent each category within each sample. Level of certainty ranges from 0 to 4. Asterisk denotes significant differences between TV and newspaper samples at $p < .05$ based on a chi-squared test (for dichotomous variables) or a one-tailed independent samples *t*-test (for continuous variables): $^{**}p < .01$; $^{***}p < .001$.

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.054, one-tailed) and the β coefficient for local TV (vs. newspaper) was reduced to .08 and became nonsignificant ($t = 1.23$, $p = .109$, one-tailed). We thus find limited evidence that the difference between local TV and newspapers in the level of certainty conveyed about cancer causes/prevention is partially explained by the fact that local TV stories tend to be shorter than newspaper stories about these topics.

In step 1 of the model predicting the presence of efficacy information, the odds ratio (OR) for local TV (vs. newspaper) was .13 (Wald score = 11.17, $p = .001$), confirming previous tests of H2. In step 2, the OR for word count (divided by 100 to render the OR interpretable) was 1.23 (Wald score = 7.56, $p = .006$) and the OR for local TV (vs. newspaper) was largely unchanged and remained statistically significant at .16 (Wald score = 8.48, $p = .004$). We thus find no evidence that differences between local TV and newspaper stories about CCP in the inclusion of response efficacy information are explained by differences in their length.

Summary of Study 1 Findings and Implications for Study 2

Relative to newspaper stories about CCP, local TV news stories were shorter (supporting H1), portrayed these issues as more certain (supporting H2), and were less likely to include response efficacy information about how to protect oneself from cancer (supporting H3). Differences in the length of these stories, however, did not account for differences in the presentation of response efficacy information and did not fully explain differences in the level of certainty conveyed (addressing RQ1). Thus, it may be possible for local TV stories to include more response efficacy information and include cues to reduce the level of certainty conveyed in a story even within the spatial constraints of local TV news formats. At the same time, while the benefits of acknowledging uncertainty in cancer news stories have been established (Jensen et al., 2011), the benefits of including response efficacy information in or after cancer cause stories remain unclear. Furthermore, we do not know the extent to which the inclusion of uncertain information about both cancer's causes and effective prevention behaviors may have different consequences than stories about cancer causes or prevention alone. Study 2 addresses both of these questions using a randomized experimental design.

STUDY 2

Differentiating Cancer Prevention Fatalism and Cancer Information Overload

Cancer fatalism has been defined as the belief that there is nothing that a person can do to prevent or treat cancer (Powe & Ramona, 2003). Previous work has labeled a series of three beliefs items about cancer prevention, measured on national surveillance surveys, as cancer prevention fatalism (e.g., Lee & Niederdeppe, 2011; Niederdeppe & Gurmankin Levy, 2007). A recent set of studies by Jensen et al. (2012), however, provide evidence that these three items comprise two distinct constructs: cancer prevention fatalism (the belief that nothing can be done to prevent cancer, which includes two of the three items previously labeled as cancer prevention fatalism) and cancer information overload (feeling overwhelmed by the volume of cancer information, including the item, "there are so many different recommendations . . . it's hard to know which ones to follow"). Jensen et al. (2012) established the predictive validity of cancer information overload by showing that greater overload at a baseline survey predicted a lower likelihood of colonoscopy screening 18 months later. The authors established that fatalism and overload are distinct and reliable constructs in a second study using confirmatory factor analysis.

Previous studies have argued that FOBs are important because they are associated with a lower likelihood of

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engaging in behaviors known to reduce cancer risk (e.g., Jensen et al., 2011; Niederdeppe & Gurmankin Levy, 2007). If this is the case, FOBs should also negatively predict intentions to engage in cancer risk-reducing behaviors. It has not yet been established, however, whether cancer prevention fatalism and information overload independently predict intentions to engage in cancer risk-reducing behaviors. Previous studies have shown that single items that are part of these constructs are indeed predictive of avoiding smoking, regular exercise, and consumption of fruits and vegetables (Niederdeppe & Gurmankin Levy, 2007), suggesting that they are likely to have independent associations with intentions. Thus, we posit:

Hypothesis 4 (H4): Cancer prevention fatalism and cancer information overload will negatively and independently predict intentions to (a) consume eat fruits and vegetables, (b) exercise regularly, (c) use sunscreen, and (d) avoid smoking.

Hypotheses About Effects of Cancer News Story Volume and Content on FOBs

Differences in local TV and other news channel effects on FOBs could be explained by differences in the volume or content of coverage about CCP. Local TV stories cover cancer causes at a greater relative frequency than other news outlets (Niederdeppe et al., 2010), and exposure to local TV news increases FOBs (Lee & Niederdeppe, 2011). Study 1 documents that this coverage on average describes cancer causes as moderately certain (near the midpoint of a 0–4 scale). Combined, these results lend credence to the suggestion that greater volume of exposure to short news stories conveying cancer causes as moderately certain could be a source of FOBs.

Hypothesis 5 (H5): Exposure to a single news story that describes an agent as moderately certain to cause cancer will increase prevention fatalism and information overload, relative to a control story.

Hypothesis 6 (H6): Exposure to two news stories that describe an agent as moderately certain to cause cancer will increase prevention fatalism and information overload, relative to a single story that conveys a possible cancer cause as moderately certain and a control story.

Previous work (Lee et al., 2010; Study 1) shows that local TV news is more likely to cover cancer causes than prevention. According to Study 1, this coverage tends to convey prevention behaviors as moderately certain to be effective (also near the midpoint of a 0–4 scale). This raises the question about whether exposure to coverage of both moderately certain CCP may have different effects on FOBs than exposure to stories about causes alone. Although not previously tested, it seems likely that conveying two domains of cancer knowledge as uncertain (cause and prevention) would be likely to increase FOBs. We thus predict the following:

Hypothesis 7 (H7): Exposure to a news story that describes an agent as moderately certain to cause cancer, combined with a story that depicts a behavior as moderately certain to prevent cancer, will increase prevention fatalism and information overload, relative to a control story.

Theory and research suggest that efficacy information could help to reduce FOBs that arise after exposure to stories about possible cancer causes (e.g., Witte, 1992). Fatalistic beliefs about cancer prevention are consistent with a general lack of efficacy about what to do to reduce one's risk of cancer (Niederdeppe & Gurmankin Levy, 2007). Overloaded beliefs about cancer also convey a lack of certainty about what should be (e.g., is recommended to be) done to reduce cancer risk. Thus, the provision of specific efficacy information would seem likely to counter FOBs. This information could come in at least two forms. A story could present information that explicitly describes how to reduce the *specific* threat (potential cancer cause) described in the message. A story could also present information that describes how to reduce the risk of cancer *more generally*, without focusing on the specific cause of cancer described in a story. We hypothesize that both strategies are likely to reduce FOBs, although we make no predictions about which strategy is likely to have a greater effect on these outcomes.

Hypothesis 8 (H8): Exposure to a news story that describes an agent as moderately certain to cause cancer, but includes specific information about how to reduce the threat, will reduce prevention fatalism and information overload, relative to a control story.

Hypothesis 9 (H9): Exposure to a short news story that conveys a possible cancer cause as moderately certain, and a second story that describes established recommendations for how to reduce risk of cancer more generally, will reduce prevention fatalism and information overload, relative to a control story.

Finally, it stands to reason that some people are likely to habitually encounter cancer cause and prevention information in the media with greater frequency than others. On the one hand, these individuals have likely encountered a high volume of moderately certain stories and could be more susceptible to their influence on FOBs. On the other hand, these individuals may have developed strategies for processing stories that reduce the likelihood of increasing FOBs. In light of two competing possibilities, we offer the following research question:

Research question 2 (RQ2): Does the volume or content of cancer news stories have different effects on those who pay attention to health topics versus those who do not?

Method

Procedure. We addressed H4 through H9 and RQ2 using data from a randomized experiment. The study sample consisted of 601 adults recruited in a public location

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in a small northeastern city. Shoppers in a local shopping mall were invited to participate in a study about how people respond to news stories about health issues. Data were collected between August 20 and September 4, 2011. Participants received $10 for participation. Adults aged 18 years and older who were interested in the study were asked to provide informed consent after reading the study procedures. Next, they were seated at one of 10 laptop computers that were set up within an open area of the mall and connected to the Internet. The study was administered using Qualtrics.

Participants began by reading one or two news stories about cancer causes, cancer prevention, or unrelated topics (control condition). Participants read the message(s) on their screen and were then asked a series of questions about the stories, their beliefs about CCP (including FOBs), behavioral intentions, and basic demographic information. The study was approved by the university's institutional review board (IRB).

News story content. Participants were randomly assigned to one of 15 news story conditions that were designed to test H5 through H9 (Table 3). All of the stories were text only (no video or audio) but modeled after a typical local TV cancer news story transcript from Study 1 and based on cancer news stories that had appeared in major U.S. news outlets in 2010 or 2011.

We held the length of each cancer cause story (cell phones and BPA [bisphenol A]), and the length of the uncertain prevention behavior story (coffee), constant at 81 words; efficacy statements (e.g, "You can reduce your amount of radiation exposure from cell phones by purchasing and using a hands-free headset, like an earpiece or headset, when talking on the phone") were each 27 words. The established prevention story was twice the length (162 words long) and described four behaviors: avoiding smoking, using sunscreen, eating fruits and vegetables while avoiding cholesterol and fat, and exercising regularly. All four are described by the American Cancer Society (ACS) as effective in reducing the risk of cancer (ACS, 2003). The established prevention story followed a doctor-interview format that we modeled after a story analyzed in Study 1. In all conditions involving a cause and prevention story, the cause story preceded the prevention story. The control condition had two stories (each 81 words long) unrelated to cancer.

Participants. Respondents' age ranged from 18 to 95 years ($M = 28.6$, $SD = 14.0$; 4 cases missing). About half (52%) were female (4 cases missing). Respondents were permitted to check more than one race; among those who responded ($n = 558$), 57% identified as White, 34% as Asian, 10% as Black, and 9% as Hispanic/Latino. Forty percent had a college degree, 43% attended some college, and 17% had less education (13 missing). Sex and White vs. non-White race differed by randomized condition ($p < .05$), indicating that the process of randomization produced unbalanced groups. Sensitivity analyses revealed that model coefficients were almost identical whether or not we included sex and race as control variables when testing study hypotheses; we thus excluded them from the models presented in the tables.

Measures. We measured prevention fatalism and information overload using measures developed and validated by Jensen et al. (2012). On a scale from 1 (*strongly disagree*) to 5 (*strongly agree*), respondents gauged the extent to which they agreed with a series of statements about the inevitability of getting cancer like, "If someone is meant to get cancer they will get it no matter what they do." We averaged the seven items into a single scale (Cronbach's $\alpha = .92$; $M = 2.21$, $SD = .87$). We measured information overload by

TABLE 3
Summary of Study 2 Conditions

Randomized Condition	*Story 1*	*Story 2*
Condition 1	Cause 1—Cell Phones, NE	—
Condition 2	Cause 2— BPA, NE	—
Condition 3	Cause 1—Cell Phones, EI	—
Condition 4	Cause 2— BPA, EI	—
Condition 5	Cause 1—Cell Phones, NE	Cause 2— BPA, NE
Condition 6	Cause 1—Cell Phones, EI	Cause 2— BPA, EI
Condition 7	Cause 1—Cell Phones, NE	Prevention 1—Coffee
Condition 8	Cause 1—Cell Phones, EI	Prevention 1—Coffee
Condition 9	Cause 2— BPA, NE	Prevention 1—Coffee
Condition 10	Cause 2— BPA, EI	Prevention 1—Coffee
Condition 11	Cause 1—Cell Phones, NE	Prevention 2—Established
Condition 12	Cause 1—Cell Phones, EI	Prevention 2—Established
Condition 13	Cause 2— BPA, NE	Prevention 2—Established
Condition 14	Cause 2— BPA, EI	Prevention 2—Established
Condition 15	Control 1— Top 10 List	Control 2—Honor Medal

Note. NE denotes "no efficacy statement included"; EI denotes "efficacy statement included."

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assessing (on the same 1 to 5 scale) respondents' agreement with seven statements about their perceptions of prevention recommendations like, "There are so many different recommendations about preventing cancer, it's hard to know which ones to follow," and "I feel overloaded by the amount of cancer information that I am supposed to know." We averaged the seven items into a single scale (Cronbach's $\alpha = .85$; $M = 2.84$, $SD = .71$). The prevention fatalism and information overload scales were only moderately correlated ($r = .27$, $p < .001$), suggesting they are distinct concepts.

We assessed intentions to engage in each of four established cancer prevention behaviors on a 5-point Likert scale from 1 (*very unlikely*) to 5 (*very likely*). Participants rated the likelihood that they would: (1) have five or more servings of fruits and vegetables most days ($M = 4.03$, $SD = 1.04$), (2) exercise at least three times in most weeks ($M = 4.08$, $SD = 1.06$), (3) apply sunscreen most times when they go outside ($M = 3.24$, $SD = 1.35$), and (4) avoid smoking completely ($M = 4.54$, $SD = 1.10$). These items were only modestly correlated (average $r = .24$).

We assessed habitual attention to health topics using two items: "In general, how much . . . [attention do you pay to health or medical information in the media?] and [do you search for health information to improve your health?]; response scale from 1 (*not at all*) to 5 (*a lot*)." The items were strongly correlated ($r = .55$) so we combined them into a scale ($M = 3.43$, $SD = 1.03$).

Results

We tested H4 using a series of ordinary least squares (OLS) regressions (Table 4). Each behavioral intention was predicted by fatalism (avoiding smoking), information overload (exercise and sunscreen), or both (fruits and vegetables). H4 thus received partial support.

We tested H5 through H9 with two OLS regression models (one for prevention fatalism and the other for information overload). Each model included a series of indicator variables to test each specific hypothesis. We did not simply compare all 15 conditions using analysis of variance (ANOVA) because several of our hypotheses could be tested in multiple conditions at the same time. Hypotheses were supported if the unstandardized OLS regression coefficient (B) was in the hypothesized direction (positive/negative) and was statistically significant at $p < .05$.

The reference group in the OLS model was the control group (C15). To test H5, we included an indicator for conditions that had only one cancer cause story. To test H6, we included an indicator for conditions that had two cancer cause stories. We also did a post hoc test to compare the coefficient for two versus one cancer cause story. To test H7, we included an indicator for conditions that included efficacy information. To test H8, we included an indicator for conditions that included the moderately uncertain prevention behavior, coffee drinking. To test H9, we included an indicator for conditions that included the established prevention behaviors. We controlled for any potential differences in response to the two distinct cancer causes by including an indicator for conditions that included the cause story that was focused on cell phones. Subsequent analyses included interaction terms to test whether the effect of efficacy information differed between conditions that included or did not include prevention information; none of these terms was significant so they were dropped from the model in Table 5.

Exposure to a single story about a potential cancer cause did not increase prevention fatalism or information overload. Exposure to two stories about multiple, potential cancer causes did not influence prevention fatalism or information overload relative to the control group (shown in table 5) or relative to a single cancer cause (prevention fatalism $B = .22$, $p = .07$; information overload $B = .13$, $p = .20$; not shown in Table 5). Thus, H5 and H6 were not supported. Including efficacy information did not reduce fatalism or information overload, rejecting H7. While exposure to a moderately certain cancer cause and an uncertain preventive behavior did not increase prevention fatalism, such exposure did increase information overload (providing partial support

TABLE 4
OLS Regression Models With Prevention Fatalism and Information Overload as Predictors of Intentions to Engage in Established Prevention Behaviors, Study 2

Independent Variable	*Model Predicting Intentions to Eat Fruits and Vegetables (n = 591)*	*Model Predicting Intentions to Exercise Regularly (n = 593)*	*Model Predicting Intentions to Use Sunscreen (n = 590)*	*Model Predicting Intentions to Avoid Smoking (n = 591)*
Prevention fatalism (H4)	−.14** (.005)	−.07 (.156)	−.07 (.279)	−.18*** (.001)
Information overload (H4)	−.16** (.008)	−.20*** (.001)	−.24** (.002)	.06 (.363)
Constant	4.78	4.08	4.08	4.78
Model R-squared,	.03	.03	.02	.02
F-statistic, and	$F(2,589) = 10.07$	$F(2,591) = 8.10$	$F(2,588) = 6.72$	$F(2,589) = 5.66$
p value	$p < .001$	$p < .001$	$p = .001$	$p = .004$

Note. Cells present unstandardized B coefficients and p values for each indicator variable. Asterisk denotes regression coefficients that were significantly different from zero at $p < .05$; $^{**}p < .01$; $^{***}p < .001$.

TABLE 5
OLS Regression Models Testing Specific Cancer News Volume and Content as Predictors of Prevention Fatalism and Information Overload, Study 2

Indicator Variable	*Model Predicting Prevention Fatalism (n = 598)*	*Model Predicting Information Overload (n = 600)*
Stories unrelated to cancer cause or prevention	Reference	Reference
Single emerging cancer cause (H5)	−.20 (.157)	−.05 (.676)
Multiple emerging cancer causes (H6)	.07 (.576)	.12 (.257)
Cause stories include response efficacy info (H7)	−.09 (.249)	−.06 (.326)
Cause story and uncertain prevention (H8)	−.01 (.961)	.21* (.020)
Cause story and established prevention (H9)	.00 (.974)	−.25** (.004)
Specific cause is cell phones	.08 (.313)	.08 (.198)
Constant	2.24	2.84
Overall model *R*-squared, *F*-statistic and *p* value	.01, $F(6,592) = .71$, $p = .64$	.06, $F(6,594) = 6.16$, $p < .001$

Note. Cells present unstandardized *B* coefficients and *p* values for each indicator variable. Asterisk denotes regression coefficients that were significantly different from zero at $p < .05$; $^{**}p < 0.01$.

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for H8). Exposure to a potential cancer cause along with a story on established cancer preventive behaviors did not reduce prevention fatalism, but such exposure did decrease information overload (providing partial support for H9).

We tested RQ2 using OLS regression with a series of interaction terms between habitual attention to health topics and each indicator variable described earlier. We considered statistically significant *B* coefficients ($p < .05$) to be evidence of differential effects by attention to health topics. None of the interaction terms were significant in predicting information overload. The interaction term between the uncertain prevention story and attention to health topics in predicting prevention fatalism, however, was negative and significant ($B = –.26$, $p = .02$). Combined with the coefficient for the uncertain prevention story itself ($B = .93$, $p = .03$), attention to health topics itself ($B = –.01$, $p = .95$), and the constant ($B = 2.28$), this model can be interpreted as indicating that as habitual attention to health topics increases, the effects of the uncertain prevention story on prevention fatalism decrease. Holding all other measures constant, at the lowest range of attention to health topics (attention = 1), the model predicts a significant effect of exposure to the uncertain prevention story and a predicted value of preventive fatalism of 3.20. At the mean score of attention to health topics (attention = 3.43), the model predicts a value of 2.29 for prevention fatalism (essentially equal to the constant and thus indicative of having no effect on prevention fatalism). In other words, the negative effects of combining a moderately certain cancer cause story with an uncertain prevention story on prevention fatalism are only apparent for those who do not routinely pay attention to health topics.

Summary of Study 2 Findings

Findings provide further evidence that prevention fatalism and information overload are distinct constructs, and each variable predicts a lower likelihood of engaging in behaviors that are known to reduce cancer risk. Contrary to study hypotheses, the volume of exposure to stories about potential cancer causes did not influence FOBs. Exposure to two stories about a potential cancer cause and a potential cancer prevention strategy, both moderately certain, did increase a sense of overload about CCP. Exposure to these two stories also increased prevention fatalism, but only among those with low habitual attention to health topics. While inclusion of information about ways to avert a specific cancer cause described in a single story (response efficacy information) did not influence FOBs, exposure to a second story describing a variety of behaviors that reduce cancer risk in general did reduce cancer information overload.

DISCUSSION

This paper addresses gaps in the literature concerning (1) whether content characteristics of local TV coverage of cancer differs from other news channels (e.g., newspapers) and (2) whether these differences are consequential for shaping prevention fatalism and information overload. The results of Study 1 provided a foundation for Study 2 to examine the causal effects of typical local TV news content features on FOBs. Although Study 2 did not directly compare local TV news to that of other media, combined with the insights obtained from Study 1, they suggest plausible explanations for the previously observed effects of local TV news viewing (but not other news channels) on FOBs (e.g., Lee & Niederdeppe, 2011).

Factors That Reduce Cancer Information Overload

This study adds to a growing literature on both positive and negative effects of news coverage on health-related cognitions and behavior. On the positive side, providing information about evidence-based prevention behaviors, following

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news coverage of a possible cancer cause, has the potential to reduce feelings of information overload. Our content analysis indicates, however, that coverage of established cancer prevention behaviors is rare on any news medium.

Overall, findings underscore the importance of public health communicators and health journalists conveying clear, evidence-based recommendations about cancer prevention, particularly in the wake of publicity surrounding emerging cancer causes. A challenge for health journalists, however, lies in reconciling the juxtaposition of journalistic goals (providing newsworthy coverage of new scientific developments) with the uncertainty and cumulative knowledge building of medical science. Stories exclusively focused on established prevention behaviors may not be newsworthy or perceived as credible among the audience. Thus, there appears to be a critical need to find ways to deliver evidence-based prevention recommendations in traditional news formats. Public health communicators should continue to convey the value of established prevention behaviors early and often, seeking to gain as much exposure for these messages as possible (see Hornik, 2002). They might also consider ways to frame established prevention behaviors that cater to factors that are valued by journalists, including localizing the information (e.g., Cohen et al., 2008; Viswanath et al., 2008) and partnering with celebrities (in the wake of a major cancer news event) to ensure that prevention information (consistent with evidence-based scientific recommendations) is part of their story (e.g., Brown & Potosky, 1990).

Scientists studying emerging cancer causes and novel preventive behaviors can also play a role. Scientists (and their academic institutions) are often cited in stories about their research (see Moriarty, Jensen, & Stryker, 2009). Emerging cancer causes are likely to remain newsworthy, but scientists studying these causes could help to shape the content of news stories by emphasizing (when appropriate) both the uncertainty of their findings (e.g., how certain is the evidence about an emerging cause) and what is known about the topic (e.g. describing preventive behaviors that are known to reduce the risk of cancer).

Factors That Increase Cancer Information Overload and Prevention Fatalism

On the negative side, we find that news coverage of possible cancer causes and uncertain prevention behaviors has the potential to create a sense of information overload among the audience. This finding is largely consistent with previous studies (e.g., Jensen et al., 2011; Lee & Niederdeppe, 2011; Niederdeppe et al., 2010). While both local TV news and newspapers are more likely to publish stories about cancer causes than cancer prevention, our content analytic data suggest that emerging prevention behaviors (when covered at all) are likely to be described in somewhat uncertain terms. The combination of moderate uncertainty about both cancer's causes and preventive behaviors appears to be a particularly undesirable combination for news audiences, increasing information overload about how to reduce cancer risk. In turn, information overload predicts lower intentions to engage in cancer prevention behaviors. The inclusion of information about how to reduce the risk of the specific, emerging cancer cause described in the story did nothing to mitigate these effects on information overload.

We also observed a conditional effect of the combination of moderate uncertainty about both cancer causes and preventive behaviors on increased prevention fatalism among those who did not report paying habitual attention to health topics. It is possible that this finding reflects a tendency for health-motivated individuals to have higher levels of formal education and greater general health knowledge. This may provide them with the literacy to make sense of complex scientific findings or to discover which studies are too preliminary to take to heart. It is also possible that people who habitually pay attention to health topics, regardless of education level, develop strategies to help them to decide which stories to ignore and which to take seriously, reducing the likelihood of news story effects on fatalistic beliefs about cancer prevention. Nevertheless, findings raise particular concern about the potential for highly publicized reports of preliminary studies to impact those who do not typically monitor health-related information.

From a practical perspective, results suggest caution to both scientists and journalists in publicizing research about uncertain cancer prevention behaviors. Explicitly acknowledging scientific uncertainty in news stories about CCP research appears to reduce FOBs (Jensen et al., 2011). Thus, both scientists publishing research about uncertain prevention behaviors and journalists reporting on this research could take particular care to emphasize the level of scientific certainty that underlies a particular preventive action. Doing so could mitigate some potential harm that may come from confusion and overload, beliefs that are associated with avoidance of evidence-based prevention behaviors (Niederdeppe & Gurmankin Levy, 2007).

Factors Unrelated to Cancer Information Overload and Prevention Fatalism

We failed to detect any effects of the dosage of cancer cause news stories on FOBs. Previous studies have suggested that repeated exposure to potential cancer causes could cultivate FOBs over time (Lee & Niederdeppe, 2011). The dose or timing of exposure delivered here (zero, one, or two stories in direct succession), along with features of the experimental treatment (print stories, delivered without the benefit of a trusted anchor through a computer screen at a local shopping mall), may explain the lack of a cultivation effect, which is thought to emerge from repeated exposure over time. We limited our "high-dose" manipulation to two stories to keep the duration of the study similar across experimental conditions. However, this decision could have reduced the

likelihood of our detecting an effect of cumulative exposure to cancer cause stories.

We also failed to detect overall (nonconditional) effects of any hypothesized variable on prevention fatalism, only on information overload. These findings, combined with a low correlation between the two scales and the fact that both (separately) predict intentions to engage in prevention behaviors, underscore the value in separating prevention fatalism from information overload (as Jensen et al. [2012] have argued). It may be that fatalistic beliefs are grounded in broader beliefs about locus of control (beliefs about the extent to which one can control life events) and thus are more resistant to change (e.g., Powe & Ramona, 2003). Future research should continue to separate fatalistic beliefs from overload and examine factors that influence both.

Limitations

The news story data analyzed in Study 1 are from 2002; the field of journalism has since changed dramatically. While some evidence suggests that the local TV news industry has been comparatively stable in the past decade (Project for Excellence in Journalism, 2012a), the newspaper industry has changed dramatically. Many newspapers have gone out of business, and the ones that have stayed afloat have witnessed dramatic declines in readership, reporting staff size, and advertising revenue (Project for Excellence in Journalism, 2012b). These changes surely have influenced the nature of newspaper coverage about CCP, most likely in the direction of decreased quality. Thus, differences between local TV and newspaper coverage of cancer may be less dramatic today. We doubt, however, that the quality of news coverage has improved since 2002 on any medium, meaning that the pattern of news coverage content and the effects reported here are likely still quite relevant today. Readership has increased of online news, the health content of which has been rarely studied (e.g., Hurley et al., 2011). Future work should examine the nature and effects of online news coverage of cancer, with a particular focus on CCP.

Previous research has focused particular attention on effects of local TV news coverage, but this study analyzed the effects of print stories (modeled after the content of local TV stories). We acknowledge that the textual nature of the local TV news transcripts may have influenced the way that respondents processed this information. The rich, pictorial affordances of TV news programs have been associated with increased attention to the news story, differential levels of recognition of information presented (e.g., Lang, Newhagen, & Reeves, 1996), and sensitivity to heuristic cues (e.g., source credibility or likeability; e.g., Chaiken, 1980). This decision was purposeful to isolate content effects from possible channel effects (e.g., the inclusion of audio and visual information). This decision also, however, prevents us from drawing conclusions about the extent to which previous findings related to local TV coverage are a function of content or medium. Future research should attempt to disentangle the two.

Conclusions

Many people feel overloaded with information about what causes cancer and what steps they can take to reduce their cancer risk. News coverage has the potential to reduce this sense of information overload, but also to increase these beliefs. Local television, as a primary and trusted provider of health information, is an important venue through which much health information is distributed. Its cancer coverage differs in important (and likely harmful) ways from other news sources but can be improved in ways that may reduce cancer information overload or fatalistic beliefs about cancer prevention. Future work should identify ways to create newsworthy and credible messages that convey effective, evidence-based cancer prevention recommendations. Failure to do so is likely to have negative implications for cancer risk and population health.

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