Including Limitations in News Coverage of Cancer Research: Effects of News Hedging on Fatalism, Medical Skepticism, Patient Trust, and Backlash

Jakob D. Jensen , Nick Carcioppolo , Andy J. King , Jennifer K. Bernat , LaShara Davis , Robert Yale & Jessica Smith

Routledge
Taylor & Francis Group

Including Limitations in News Coverage of Cancer Research: Effects of News Hedging on Fatalism, Medical Skepticism, Patient Trust, and Backlash

JAKOB D. JENSEN

Department of Communication, and Oncological Sciences Center, Purdue University, West Lafayette, Indiana, USA

NICK CARCIOPPOLO, ANDY J. KING, JENNIFER K. BERNAT, LaSHARA DAVIS, ROBERT YALE, AND JESSICA SMITH

Department of Communication, Purdue University, West Lafayette, Indiana, USA

Past research has demonstrated that news coverage of cancer research, and scientific research generally, rarely contains discourse-based hedging, including caveats, limitations, and uncertainties. In a multiple message experiment (k = 4 news stories, N = 1082), the authors examined whether hedging shaped the perceptions of news consumers. The results revealed that participants were significantly less fatalistic about cancer (p = .039) and marginally less prone to nutritional backlash (p = .056) after exposure to hedged articles. Participants exposed to articles mentioning a second researcher (unaffiliated with the present study) exhibited greater trust in medical professions (p = .001). The findings provide additional support for the inclusion of discourse-based hedging in cancer news coverage and suggest that news consumers will use scientific uncertainty in illness representations.

The mass media serve as a central outlet for the dissemination of cancer information and research (Viswanath, 2005; Viswanath et al., 2006). A growing body of cancer control research has sought to better understand the content, distribution, and effects of cancer coverage. A significant criticism that has emerged from this research is that cancer news coverage is frequently streamlined (Brechman, Lee, & Cappella, 2009; Brody, 1999). That is, news stories are devoid of caveats, limitations, uncertainties, or other forms of discourse-based hedging. In fact, although science news coverage as a category is criticized for a lack of hedging (Pellechia, 1997; Tankard & Ryan, 1974), cancer news stories are routinely used as exemplars of this phenomenon (Reynolds, 2001; Russell, 1999).

Still, the frequency of this critique is tempered by the fact that researchers have not tested for streamlining effects. In response to this situation, Jensen (2008) recently conducted an experimental study of cancer news hedging that revealed that hedged news coverage significantly improved the trustworthiness of both scientists and journalists connected to the articles. Jensen argued that the results supported those who were concerned about streamlined news, but he also suggested that more research was needed to better evaluate the effects of hedging. Specifically, Jensen advocated for additional experimental studies exploring whether news hedging was related to other key constructs in cancer control (e.g., nutritional backlash).

For the present study, we carried out a replication of Jensen (2008) to examine the relation between news hedging and several cognitive constructs that could be central to cancer control, including cancer fatalism, medical skepticism, patient trust for medical professions, and nutritional backlash. To test these relations, a multiple message experiment was conducted using manipulated cancer news articles as stimuli. The study was designed to advance knowledge of news hedging as well as research on information processing (e.g., Lang, 2000; Shrum, 2009) and cancer control.

Hedging and News Coverage

News media are relied upon and positioned to induce change,[1] but past research has identified several problematic reporting practices. News media frequently report atypical examples or consistently report issues in a biased manner (Gans, 1979; Tuchman, 1972). For example, content analyses have revealed that cancer news coverage is heavily slanted toward treatment (Cohen et al., 2008; Slater, Long, Bettinghaus, & Reineke, 2008), and that some cancers are depicted disproportionately to their real-world incidence (Jensen, Moriarty, Hurley, & Stryker, 2010). Of particular interest to the present study, past research has demonstrated that media reporting of science routinely streamlines complex research findings. In fact, content analyses suggest that 36–40% of science news stories overstate the findings by omitting key conditional statements (Lai & Lane, 2009; Pellechia, 1997; Singer, 1990; Singer & Endreny, 1993; Tankard & Ryan, 1974), such as whether the sample was representative of the target population.

Streamlining is common, but little experimental work has examined whether the presence of scientific uncertainty affects news consumers' perceptions. Corbett and Durfee (2004) manipulated context and conflict in a news story about global warming to better understand how variations in scientific uncertainty affected lay perception of the highly contentious issue. In this study, context was operationalized as "the inclusion of a scientifically accurate paragraph that put the journal article

---

[1]As a key source of information, news media have the power to influence behavior. Consumption of cancer news coverage, for instance, has been linked to increased screening (Brown & Potosky, 1990; Cram et al., 2003; Fink et al., 1978; Lane, Polednak, & Burg, 1989), health information-seeking (Cooper, Mallon, Leadbetter, Pollack, & Peipins, 2005), participation in clinical trials (Pentz et al., 2002), and more informed treatment decisions (Lee, Weir, & Gelmon, 2001; Nattinger, Hoffmann, Howell-Pelz, & Goodwin, 1998; Sharf, Freimuth, Greenspon, & Plotnick, 1996). More generally, survey research suggests that people do acquire information about cancer from the media (Stryker, Moriarty, & Jensen, 2008), although there is some concern that individuals with higher education, knowledge, or community involvement reap greater knowledge gains (Jensen, in press; Niederdeppe, 2008; Slater et al., 2009).

findings in context with a wider body of research'' (Corbett & Durfee, p. 138) such as previous studies that offer supporting evidence. They found that additional context increased readers' perceptions of the certainty of global warming. Additional conflict had the opposite effect.

Corbett and Durfee's (2004) findings suggested that variations in scientific uncertainty can influence news consumers' perceptions; however, their results are limited to two sources of scientific uncertainty (context and conflict), and a single, context-specific dependent variable (certainty of global warming). Jensen (2008) extended this work by manipulating the amount of hedging (hedged vs. not hedged) and source of uncertainty (hedging attributed to scientists affiliated with the research or unaffiliated researchers) in news articles about cancer research. Hedged conditions were created by including scientific limitations described in the original research reports on which the news articles were based. The study found that scientists and journalists were perceived as more trustworthy when news consumers were exposed to stories with hedging attributed to scientists responsible for the research. In other words, increased uncertainty, expressed by the researchers involved, resulted in a more positive assessment of the scientists and journalists.

Model of Information Overload

Only a few studies have examined the possible effects of manipulating scientific uncertainty within news coverage. Although few, these studies have observed meaningful effects. Such findings raise questions both about the extent of the effects as well as the underlying mechanisms that might explain them. In other words, how does scientific uncertainty (or the lack thereof) affect receiver perceptions?

One explanation is that scientific uncertainty helps people, in some way, to handle the dense information environment that they typically struggle to process. Citizens have more access to information now than ever before (Viswanath, 2005). However, abundance of information is not, in and of itself, a virtue. In terms of cancer information, many people feel overwhelmed, confused, and fatalistic (Arora et al., 2008; Niederdeppe & Gurmankin Levy, 2007). For example, a national survey found that 47% of the American public believed that ''it seems like almost everything causes cancer'' and 71% agreed that ''there are so many recommendations about preventing cancer, it's hard to know which ones to follow'' (Niederdeppe & Gurmankin Levy, p. 999). Although problematic, this general feeling of overload is not surprising. Research on social cognition has long demonstrated that human beings have deep information storage capacity tempered by limited immediate processing ability (Fiske & Taylor, 1984; Lang, 2000; Shrum, 2009). Moreover, highly arousing content such as cancer information may require additional resources to process; a situation that facilitates cognitive or information overload (Lang, 2006).

Hindered by bottleneck processing, humans have learned to be cognitive misers that only devote time and energy to select information (Fiske & Taylor, 1984). For example, Lang (2000) argued that receivers are more likely to encode information to working memory that is consistent with their goals and/or indicative of change. On a similar note, Fiske, Lin, and Neuberg (1999) postulated that receivers favor content that can be used to categorize information. Category-focused content helps a receiver efficiently process information and facilitates information storage.

The present study builds on this research by proposing that one way health news consumers avoid information overload is by using scientific uncertainty to categorize

content. Health research can be categorized according to the certainty of existing knowledge. A finding could be preliminary (e.g., on the basis of a single study), unusual (e.g., contradictory to past research), emerging (e.g., several studies with the same result), or conclusive (e.g., a meta-analysis of existing research or a large randomized clinical trial). Just as health researchers use uncertainty to map the extent to which things are known, it is hypothesized that lay news consumers have the ability to categorize health information along an uncertainty continuum.

Not only does scientific uncertainty help news consumers to organize information, but it also reduces the likelihood that receivers will experience information overload. That is, information overload occurs when a receiver has insufficient content to categorize information effectively. Receivers experiencing information overload will respond negatively (Lang, 2006); in this case, receivers may categorize the information as representative of the content (i.e., all of this content is the same) and/or attack the message (i.e., backlash). Insufficient categorization information may trigger one or both of these responses in the same individual. In fact, it is possible that a person could cycle through these options searching for the best response.

In the case of cancer news coverage, the present study postulates that scientific uncertainty is used by news consumers to avoid information overload. Limitations, caveats, and uncertainties communicate the extent to which a thing is known and therefore how a person should categorize and ultimately react to the information. Whether the scientific uncertainty is attributed to the researchers responsible for the study or a researcher unaffiliated with the study is also manipulated. In practice, uncertainty is often inserted into news coverage via outside experts (to create balance, see Dearing, 1995) and Jensen (2008) found that news consumers' perceived scientific uncertainty differently based on the source. One reason source attribution might influence the processing of scientific uncertainty is that powerless language may be favored in contexts where power is not equated with control (Burrell & Koper, 1998; Jensen, 2008; Meyer, 1997). Power is not equated with control in science, therefore, uncertainty may be viewed more positively when attributed to the primary scientists (as powerless language may demonstrate control for the communicator). Another possibility is that receivers may view the uncertainty as more or less meaningful in their categorical judgments according to source. Uncertainty attributed to primary scientists might be viewed as meaningless, whereas, uncertainty espoused by unaffiliated scientists might be viewed as less biased and therefore more useful (or vice versa).[2]

We examined whether the presence and source of uncertainty in news coverage of cancer research were related to four outcomes: cancer fatalism, medical skepticism, patient trust in medical professionals, and nutritional backlash. A description of all four outcomes as well as why each might be triggered by the absence of scientific uncertainty follows.

---

[2]In a larger sense, the information overload model is consistent with research that suggests messages can produce unintended effects (such as obfuscation, see Cho & Salmon, 2007) and/or unintended construct activation (Byrne & Hart, 2009). That is, information overload is an unintended byproduct of the news streamlining process. Moreover, individuals' response to information overload may be akin to fear control as articulated by the extended parallel processing model (for a review, see Witte & Allen, 2000). Confronted with an unmanageable amount of cognitive processing, news consumers may be prone to fear control rather than danger control.

Cancer Fatalism
An individual is fatalistic if he or she thinks that nothing can be done to influence the results of a situation. Cancer fatalism is a specific type of fatalism wherein a person believes that there is nothing he or she can do to prevent or treat cancer (Powe & Finnie, 2003). Past research has found that cancer fatalism is related to several cancer beliefs and behaviors, including intentions to screen (Mayo, Ureda, & Parker, 2001), self-efficacy (Straughan & Seow, 1998), and adherence to prevention recommendations (Niederdeppe & Gurmankin Levy, 2007).

Most relevant to the present study, researchers have proposed that one cause of cancer fatalism is streamlined news coverage of cancer (Russell, 1999; Slenker & Spreitzer, 1988). Streamlined articles create a situation where new research seems to frequently contradict existing research, and it may overwhelm news consumers by cultivating the idea that all research findings are equal (Brody, 1999). Both of these situations could trigger fatalistic thinking, primarily as a coping mechanism for handling information overload.

> Research Question 1: In cancer news coverage, is the amount and source of hedging related to reader perceptions of cancer fatalism?

Medical Skepticism
Medical skepticism is a measure of the extent to which an individual believes that contemporary medicine can positively influence health outcomes (Fiscella, Franks, & Clancy, 1998). Previous research has suggested that medical skepticism is associated with lower health care utilization, lower adherence to prevention recommendations, and decreased screening (Fiscella et al., 1998). Medical skepticism is highest among the young, Caucasians, those with less education, and those lacking health insurance (Fiscella, Franks, Clancy, Doescher, & Banthin, 1999).

Despite all that is currently known about medical skepticism, little is understood about the variables that predict it (Jensen, 2008). A criticism of improperly hedged news coverage is that it engenders cynicism in the audience regarding scientific research, encouraging the contradiction of scientific claims (Parascandola, 2000). Similarly, it is also possible that insufficiently hedged news coverage, which decreases scientific credibility, can lead to increased levels of medical skepticism in the audience.

> Research Question 2: In cancer news coverage, is the amount and source of hedging related to reader perceptions of medical skepticism?

Patient Trust for the Medical Profession
Past research has revealed that the amount and source of hedging is related to news consumers' perceptions of scientists' and journalists' trustworthiness (Jensen, 2008). However, in the case of cancer news coverage, it is unclear whether news consumers perceive researchers as scientists, medical professionals, or both. This is a potentially important distinction, as people have more access to medical professionals (e.g., nurses, doctors) than research scientists.

Past work has focused on assessing patient trust in a specific medical professional (e.g., the patient's personal physician), but a recent measure targets general trust in medical professionals (Dugan, Trachtenberg, & Hall, 2005; Hall, Camacho,

Dugan, & Balkrishnan, 2002). Patient trust for medical professions in general has been related to both satisfaction with care and adherence to physician's recommendations (Hall et al.).

> Research Question 3: In cancer news coverage, is the amount and source of hedging related to reader perceptions of patient trust for medical professions?

Nutritional Backlash

Nutritional backlash refers to "a broad gamut of negative feelings about dietary recommendations" including "skepticism, anger, guilt, worry, fear, and helplessness" (Patterson, Satia, Kristal, Neuhouser, & Drewnowski, 2001, p. 38). Nutrition researchers have observed that nutritional backlash relates to unhealthy diet and poor nutrition behaviors (Patterson et al.). It has been suggested that nutritional backlash could be a response to sensationalized media coverage (Patterson et al.). More specifically, Jensen (2008) proposed that nutritional backlash could be a reaction to streamlined news coverage, perhaps because news audiences feel overwhelmed by countless nutrition recommendations.

> Research Question 4: In cancer news coverage, is the amount and source of hedging related to reader perceptions of nutritional backlash?

Methodology

Participants

College students ($N = 1082$) at a large Midwestern university participated in the study for extra credit. Participants were recruited from communication courses that serve students across campus, so a wide range of majors were included in the study. Of interest to this study, roughly one quarter of the students (24.8%) were science majors (e.g., biology, chemistry, biomedical engineering). Slightly more women (52.6%) participated than did men (47.3%). Participants ranged from 17 to 43 years of age, with a mean age of 19.8 years ($SD = 1.8$). The participants were predominantly Caucasian: 79.9% Caucasian, 4% African American, 3.5% Hispanic, Latino, or Spanish Origin, 12.4% Asian or Pacific Islander, 0.5% American Indian or Native American, and 2% described themselves as "other."

Procedure

All individuals ($N = 1082$) in a 2 (hedged vs. not hedged) $\times$ 2 (primary scientists versus unaffiliated scientists) $\times$ 4 (message) between-participants experiment were randomly assigned to 1 of 16 conditions. Participants were recruited to the study via a research participation system managed by the Department of Communication. Students taking a variety of communication courses (including introductory courses that serve students from all disciplines) can obtain extra credit by participating in research studies through the system. The research system directed participants to a Web-based survey for this study. Participants who visited the website encountered all of the following: a consent form (they clicked a button to express consent), a series of demographic questions, a news article (embedded in a *Chicago Sun-Times*

Web page; all news articles appeared to come from the online version of that news-paper), a series of questions measuring variables of interest, and a debriefing form.

Stimulus Materials

A detailed description of the stimulus materials used in this study can be found in Jensen (2008). The author used a search term and a random number generator to select four cancer news articles from the Lexis Nexis database. The articles reported on nanobombs (Lem, 2005), lung cancer surgery (Cortez, 2005), lycopene pills (Woods, 2003), and the Mediterranean diet study (Bering, 2003). The articles were manipulated in two ways. First, the amount of hedging in the article was varied to create two conditions: hedged and not hedged. Hyland (1996) argued that hedging could be lexical (e.g., single words or phrases like may, could, might) or discourse based (i.e., entire sentences describing limitations of a study). Scientists seem to be more concerned about the latter (e.g., Schwartz & Woloshin, 2004), thus, the present study added or subtracted discourse-based hedging from the manipulations.[3] Second, the source of the hedging was manipulated. The hedging was either attributed to the scientist(s) responsible for the research (the primary scientists condition) or to a contrived scientist unaffiliated with the project (the unaffiliated scientists condition).

Measures

Demographics
Participants reported their gender, age, race, and college major (recoded as science or nonscience major).

Cancer Fatalism
The Powe Fatalism Inventory is a 15-item questionnaire used to assess cancer fatal-ism. For this scale, cancer fatalism is conceptually defined as "the belief that death is inevitable when cancer is present," (Powe & Finnie, 2003, p. 454). Participants respond to each question with *yes, no,* or *don't know*. Sample items included the fol-lowing: "I believe that if someone is meant to have cancer it doesn't matter what they eat, they will get cancer anyway"; "I believe if someone gets cancer it was meant to be"; and "I believe cancer kills most people who get it." The Powe Fatalism Inventory has proven to be a reliable measurement instrument (Cronbach's

---

[3]The not hedged condition was constructed by adding a single sentence conveying scien-tific uncertainty, a stock phrase stating that "it was too early to make definitive claims and that more research needed to be done." This was thought to be an appropriate realization because researchers have noted that even news coverage of science that is not hedged occasion-ally includes single statements about the need for more research (Parascandola, 2000). The hedged condition was designed to mirror the actual scientific uncertainty desired by the primary researchers (in each of the news articles). That is, hedged coverage was defined as the level of scientific uncertainty the researchers wanted to convey. The level of scientific uncertainty desired by the researchers was assessed by examining the discussion section of the research report(s) on which the four news articles were based. The scientific uncertainty contained in the original article was crafted into an additional paragraph and added to the hedged versions of the news articles.

$\alpha = .84$; Powe, 1996). In the present study, the Powe Fatalism Inventory had acceptable reliability (Cronbach's $\alpha = .77$; $M = 8.47$, $SD = 5.33$).

Nutritional Backlash

The Nutritional Backlash Scale is an 11-item scale that measures negative feelings (e.g., skepticism, worry, guilt, fear, anger, and helplessness) about dietary recommendations (Patterson et al., 2001). Respondents answer each question on a 4-point scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). Sample items include the following: "I am annoyed when there are no healthful food choices at a restaurant" and "Scientists really don't know whether a low-fat diet is good for you." The Nutritional Backlash Scale has proved to be a reliable measurement instrument in the past (Cronbach's $\alpha = .72$). In the present study, the scale had acceptable reliability (Cronbach's $\alpha = .75$; $M = 2.36$, $SD = 0.39$).

Medical Skepticism

The Medical Skepticism Scale was developed to assess doubts that participants may harbor about the ability of conventional medicine to benefit their health (Fiscella et al., 1998; Fiscella et al., 1999). In the original measure, 10 items were used to assess two dimensions of medical skepticism: (a) attitude toward healthcare/physician; and (b) attitude toward health insurance (Fiscella et al., 1999). For this study, only the four items that composed attitudes toward health care/physician were used. A 5-point scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*) assessed each of the four items of medical skepticism. Sample items include the following: "I can overcome most illness without help from a medically trained professional"; "Home remedies are often better than drugs prescribed by a doctor"; and "If I get sick, it is my own behavior that determines how soon I get well again." Although the Medical Skepticism Scale has exhibited low reliability (Cronbach's $\alpha = .69$; Fiscella et al., 1998), past studies have established construct validity (Fiscella et al., 1998; Fiscella et al., 1999; Freburger, Callahan, Currey, & Anderson, 2003). In the present study, the Medical Skepticism Scale once again had low internal reliability (Cronbach's $\alpha = .63$; $M = 2.94$, $SD = 0.71$). Psychometric research has demonstrated that, all other things being equal, the internal reliability of a scale can be increased by adding items (i.e., the Spearman-Brown Prophecy Formulation, see DeVellis, 2003). In accord with this principle and on the basis of previously observed low reliability scores, two items were added to the original Medical Skepticism Scale: "Doctors prescribe medication more than they should," and "Pharmaceutical companies have too much influence over doctors." With the additional items, the reliability of the scale improved, but it was still low (Cronbach's $\alpha = .69$; $M = 3.07$, $SD = 0.64$). The modified version of the scale was used in all analyses.

Patient Trust for the Medical Profession

The Patient Trust for the Medical Profession Scale is a five-item scale measuring individuals' trust in doctors in general (Dugan et al., 2005). Participants respond to each item using 5-point scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), summed to create an index. Sample items include "Doctors are extremely thorough and careful," "A doctor would never mislead you about anything," and "You completely trust doctors' decisions about which medical treatments are best." In past research, the Patient Trust for the Medical Profession Scale has demonstrated moderate reliability (Cronbach's $\alpha = .77$), as well as construct and concurrent

validity with measures of trust, satisfaction with care, and following doctors' recommendations (Dugan et al.). In the present study, the scale had acceptable reliability (Cronbach's $\alpha = .81$; $M = 16.04$, $SD = 3.52$).

Power Analysis

A multiple-message design was used to allow researchers to examine the generalizability of all effects (Jackson & Brashers, 1994). A multiple-message design is, therefore, similar to a meta-analysis in that the stability of effects across conditions can be observed.

G*Power was used to identify the ideal sample size (Erdfelder, Faul, & Buchner, 1996). An a priori power analysis (numerator = 1, number of groups = 16) estimated that a sample size of 1053 was needed to achieve power = .90 for detecting effects as small as $f = .10$ (a small effect as classified by G*Power). The final sample size was slightly larger than this ($N = 1,082$), so the achieved power to detect a small effect ($f = .10$) was .91.

Fixed Versus Random Factors

There has been discussion in the field of communication about whether to treat certain factors as fixed or random (Hunter, Hamilton, & Allen, 1989; Jackson & Brashers, 1994). According to Jackson and Brashers, a factor is treated as fixed if a researcher is interested in the specific levels used in the study (e.g., the article includes discourse-based uncertainty or it does not). A factor is treated as random if a researcher is not interested in specific levels, but rather, views the levels as a random representation of a larger population (e.g., news articles in this study were randomly selected to represent all cancer news articles).[4] The present study treats the news article factor as random (as the articles were randomly selected to represent all cancer news articles), but also reports fixed findings as well as means and standard deviations for individual articles for readers interested in those results.

Results

Research Question 1: Cancer Fatalism

A three-way, mixed-model analysis of covariance—with participant cancer fatalism as the dependent variable, hedging and source attribution as fixed factors, message as a random factor, and major as a covariate—revealed a significant main effect for hedging, $F(1, 3) = 12.37$, $p = .039$, $r = .11$, Cohen's d = 22, but not for source attribution, $F(1, 3) = .40$, $p = .57$. The interaction between hedging and source attribution was also not statistically significant, $F(1, 3) = .007$, $p = .93$. An examination of the significant main effect for hedging (see Table 1) revealed that participants expressed less fatalistic thinking following exposure to the hedged articles as compared to the nonhedged articles.

---

[4]Mathematically, the key difference is that, for main effects, a fixed-factor approach divides the mean square of the predictor variable by the error sum of squares whereas a random factor approach divides by the mean square of the Predictor × Random Factor interaction. The latter tests whether the main effect is significant above and beyond the variance attributed to message-to-message variance.

Table 1. Cancer fatalism by hedging

	Not hedged	Hedged	*F*
Cancer fatalism (across articles)	8.72 (5.49)	8.23 (5.20)	12.37*
Article 1: Nanobombs	8.34 (5.29)	8.30 (4.91)	
Article 2: Lung cancer surgery	9.15 (5.68)	8.53 (5.44)	
Article 3: Lycopene pills	8.44 (5.37)	7.48 (5.04)	
Article 4: Mediterranean diet	8.90 (5.63)	8.51 (5.40)	
N	483	503	

Note. Summary of means (with standard deviations in parentheses). Higher scores indicate greater fatalistic thinking.
*$p < .05$.

In a multiple-message design, it is also valuable to consider the consistency of the effect across messages. There was no significant main effect for message, $F(3, 969) = 1.18$, $p = .44$, and there was no significant interaction between Hedging × Message, $F(3, 969) = .17$, $p = .90$, Source × Message, $F(3, 969) = 1.85$, $p = .31$, and Hedging × Source × Message, $F(3, 969) = 1.29$, $p = .27$. In other words, the significant main effect for hedging was very stable across message (i.e., the nonsignificant Hedging × Message interaction).

Even though messages were randomly selected to represent a category, the analysis was repeated with message treated as a fixed factor (for those who prefer to treat replications as fixed). The fixed-factor analysis revealed a marginally significant main effect for hedging, $F(1, 969) = 2.75$, $p = .09$, $r = .05$, Cohen's d $= .11$; and a marginally significant interaction between Source × Message, $F(3, 969) = .2.39$, $p = .06$, partial $\eta^2 = .007$. No significant main or interaction effects were found for source attribution, $F(1, 969) = .97$, $p = .32$; message, $F(3, 969) = 1.53$, $p = .20$; Hedging × Source, $F(1, 969) = .009$, $p = .92$; Hedging × Message, $F(3, 969) = .22$, $p = .88$; or Hedging × Source × Message, $F(3, 969) = 1.29$, $p = .27$. A simple main effects analysis revealed that, for those exposed to the lung cancer surgery article, the article attributing hedging to a primary scientist as opposed to an unaffiliated scientist elicited marginally greater cancer fatalism. Thus, the fixed-factor findings are relatively consistent with the random factor findings, save the marginal Source × Message interaction.

Research Question 2: Medical Skepticism

A three-way, mixed-model analysis of covariance—with medical skepticism as the dependent variable, hedging and source attribution as fixed factors, message as a random factor, and major (science vs. nonscience) as a covariate—revealed no significant main effect for hedging, $F(1, 3) = 4.65$, $p = .12$; source attribution, $F(1, 3) = 2.66$, $p = .20$; or the Hedging × Source interaction, $F(1, 3) = .002$, $p = .96$.

There was no significant main effect or interaction for message, $F(3, 1051) = .70$, $p = .60$; Hedging × Message, $F(3, 1051) = .76$, $p = .51$; Source × Message, $F(3, 1051) = .42$, $p = .73$; and Hedging × Source × Message, $F(3,1051) = 2.08$, $p = .10$. In other words, the null effect for hedging was stable across message replications (i.e., the nonsignificant Hedging × Message interaction), and the remaining null results were consistent across messages as well.

As before, the analysis was repeated with message treated as a fixed factor. The fixed-factor analysis revealed a significant main effect for hedging, $F(1, 1051) = 3.89$, $p = .04$, $r = .06$, Cohen's $d = .12$; but not for source attribution, $F(1, 1051) = .89$, $p = .34$; or message, $F(3, 1051) = 1.46$, $p = .22$. There were no significant interactions for Hedging $\times$ Source, $F(1, 1051) = .004$, $p = .95$; Hedging $\times$ Message, $F(3, 1051) = .83$, $p = .47$; Source $\times$ Message, $F(3, 1051) = .33$, $p = .80$; or Hedging $\times$ Source $\times$ Message, $F(3, 1051) = 2.07$, $p = .10$. A simple effects analysis of the main effect for uncertainty revealed that individuals in the nonhedged condition were more skeptical ($M = 3.11$, $SD = .62$) than those in the hedged condition ($M = 3.03$, $SD = .66$). Thus, the fixed-factor analysis yielded a different result than the random factor analysis; however, the main effect for hedging in the random factor analysis was not entirely inconsistent with this result (the mean difference is approaching significance, $p = .12$). Unlike the results for cancer fatalism, there are two causes for concern here. The lack of a statistically significant result in the random factor analysis leaves open the possibility that the effect was not greater than message-to-message variance. More important, this result should be viewed somewhat tentatively given the low reliability of the medical skepticism measure.

Research Question 3: Patient Trust for Medical Professions

A three-way, mixed-model analysis of covariance—with patient trust for medical professions as the dependent variable, hedging and source attribution as fixed factors, message as a random factor, and major as a covariate—revealed a significant main effect for source, $F(1, 3) = 265.18$, $p = .001$, $r = .45$, Cohen's $d = 1.02$; but not for hedging, $F(1, 3) = 3.02$, $p = .18$. The interaction between hedging and source attribution was also not statistically significant, $F(1, 3) = 1.18$, $p = .35$. Participants expressed greater trust in medical professions following exposure to articles that quoted an unaffiliated scientist as compared to those that just quoted a primary scientist (see Table 2).

There was no significant main effect for message, $F(3, 1048) = .15$, $p = .91$; and there was no significant interaction between Hedging $\times$ Message, $F(3, 1048) = .08$, $p = .96$; Source $\times$ Message, $F(3, 1048) = .01$, $p = .99$; and Hedging $\times$ Source $\times$ Message, $F(3, 1048) = 1.37$, $p = .24$. Thus, the source main effect was found to be very stable across replications (i.e., the nonsignificant Source $\times$ Message interaction).

Table 2. Patient trust for medical professions by source

	Primary scientist	Unaffiliated scientists	F
Patient trust (across articles)	15.82 (3.74)	16.27 (3.28)	265.18[**]
Article 1: Nanobombs	15.99 (3.61)	16.33 (3.25)	
Article 2: Lung cancer surgery	15.86 (4.02)	16.32 (3.43)	
Article 3: Lycopene pills	15.71 (3.71)	16.16 (3.32)	
Article 4: Mediterranean diet	15.76 (3.63)	16.27 (3.28)	
N	501	515	

Note. Summary of means (with standard deviations in parentheses). Higher scores indicate greater trust in medical professions.
[**]$p < .01$.

In fact, a closer examination of the means for each article in the study revealed a high level of consistency. This explains not only the significant main effect for source, but also the high F ratio. In a mixed-model analysis of variance, the F ratio is influenced by the stability of the effect.

Once again, the analysis was repeated with message treated as a fixed factor. The fixed-factor analysis revealed a marginally significant main effect for source attribution, $F(1, 1048) = 3.82$, $p = .05$, $r = .06$, Cohen's d $= .12$; but not hedging, $F(1, 1048) = .35$, $p = .55$, or message, $F(3, 1048) = .21$, $p = .88$. There were no significant interactions for Hedging × Source, $F(1, 1048) = 1.62$, $p = .20$; Hedging × Message, $F(3, 1048) = .11$, $p = .95$; Source × Message, $F(3, 1048) = .01$, $p = .99$; or Hedging × Source × Message, $F(3, 1048) = 1.37$, $p = .24$. Thus, the fixed-factor analysis was relatively consistent with the random factors analysis.

Research Question 4: Nutritional Backlash

For this analysis, message was not treated as a random factor, as specific levels of the message factor were of interest. Specifically, two of the cancer news articles were about nutrition research (i.e., lycopene pills and Mediterranean diet). Thus, the four messages were transformed into two message categories: nutrition articles and non–nutrition articles. A three-way fixed model analysis of covariance—with nutritional backlash as the dependent variable, hedging, source attribution, and message (dichotomized as nutrition articles or non–nutrition articles) as fixed factors, and major as a covariate—revealed a marginally significant main effect for hedging, $F(1, 3) = 3.65$, $p = .056$, $r = .06$, Cohen's d $= .12$; but not for source attribution, $F(1, 3) = .39$, $p = .84$. The interaction between hedging and source attribution was also not statistically significant, $F(1, 3) = .26$, $p = .60$. An examination of the significant main effect for hedging revealed that participants expressed less nutritional backlash following exposure to the hedged articles as compared to the nonhedged articles (see Table 3).

There was no significant main effect for message, $F(3, 3) = .23$, $p = .63$, and there was no significant interaction between Hedging × Message, $F(3, 3) < .001$, $p = .98$, Source × Message, $F(3, 3) = .32$, $p = .57$, and Hedging × Source × Message, $F(3, 3) = .73$, $p = .39$. In other words, the marginally significant hedging main effect was found to be stable across replications (i.e., the nonsignificant Hedging × Message interaction), a finding that is unexpected for nutritional backlash as it seemed plausible the effect would be different for those exposed to the nutrition articles.

Table 3. Nutritional backlash by hedging

	Not hedged	Hedged	F
Nutritional backlash (across articles)	2.40 (.40)	2.34 (.37)	3.65[†]
Nutrition articles	2.39 (.40)	2.33 (.36)	
Non–nutrition articles	2.40 (.39)	2.34 (.38)	
N	501	515	

Note. Summary of means (with standard deviations in parentheses). Higher scores indicate greater nutritional backlash.
[†]$p < .10$.

Discussion

Participants exposed to hedged news articles about cancer research were less fatalistic than their peers. This is consistent with past criticisms of cancer news reporting, which have argued that streamlining is potentially problematic to public health (Brody, 1999; Russell, 2001). It also suggests a potential cause of cancer fatalism, something that past research has only addressed at the theoretical level (Powe & Finnie, 2003). In fact, the results of the present study mirror emerging correlational evidence suggesting that local TV news consumption may cultivate fatalistic beliefs about cancer prevention (Niederdeppe, Fowler, Goldstein, & Pribble, 2010).

In addition to continued replication, future research should examine the cumulative effect of exposure to streamlined (vs. hedged) coverage. Panel studies could be conducted where researchers track the attitudes, beliefs, and media exposure of a group of individuals over a period of months or years (see, e.g., Graber, 1988). The purpose of the study would be to examine how news coverage trends relate to consumer perceptions. Alternatively, experimental research could manipulate exposure to streamlined articles within the context of a single session (e.g., exposed to 5 streamlined articles vs. 1 vs. none) or across several sessions (e.g., exposed to 5 streamlined articles a week for 3 weeks vs. 1 vs. none). Similar designs have been used to study the relation between depictions of race in the media and racial attitudes and beliefs (e.g., Dixon, 2006).

Regardless of the design, researchers should seek to identify if and how hedging relates to cancer fatalism. That is, research needs to focus on the underlying cognitive mechanism that explains connections between message content (e.g., hedged coverage) and perceptual outcomes (e.g., cancer fatalism). Possibilities include believability of news (Jensen, 2008), perceived conflict in media coverage, and feelings of information overload.

Patient trust for medical professions was higher for those exposed to news articles containing an unaffiliated researcher. Journalists will likely find this to be an unsurprising result, given that news norms favor multiple sources because they encourage (or at least suggest) balanced coverage (Tuchman, 1972). Past research has observed that balance is especially pronounced in news coverage of science (Dearing, 1995; Dunwoody, 1999). Put another way, it is consistent with the logic of news norms that greater trust in medical professionals was elicited from participants exposed to balanced stories.

Of course, this finding complicates past work by suggesting that balance is important in science coverage. Jensen (2008) found that attributing hedging to primary scientists was positively related to increased trustworthiness for scientists and journalists. The present study did not replicate this interaction, and found that the presence of unaffiliated researchers produced higher trust ratings. Perhaps a third variable is confounding these results. It may be possible that valence of the news article affects audience perceptions of the hedging agent. For instance, individuals might form credibility judgments differently for scientists who hedge potentially beneficial outcomes (e.g., promising treatments) than those who hedge potentially negative outcomes (e.g., causes of cancer). It is possible that individuals base these judgments on different criteria. Future research should explore the inconsistencies between Jensen (2008) and the present study, paying attention to variables that may explain these contradictory findings.

Nutritional Backlash was marginally related to hedging, where increased uncertainty lessened backlash. Surprisingly, this result was found across news articles regardless of their nutritional content. Then again, the effect was quite small, and researchers should consider it cautiously. Still, given the abundance of mediated content that most people are exposed to in a typical day, media researchers will want to devote more time to studying backlash (nutritional or otherwise) as an outcome. Backlash could be a type of reactance (e.g., Quick & Stephenson, 2008), a possibility that should be explored as it would suggest theoretical frameworks for grounding this research line (e.g., psychological reactance theory, see Brehm & Brehm, 1981).

In a larger sense, the present findings have implications for research on illness representations. Past work has shown that people actively construct their own perceptions of illness, including the frequencies, causes, features, and timelines for specific diseases (Orbell et al., 2008). Media coverage of illness is one force with the potential to shape these perceptions, in ways that are both consistent and inconsistent with actual features of the disease (Jensen et al., 2010). In line with this logic, participants in the present study used hedging (or the lack thereof) to formulate perceptions about the controllability of cancer (e.g., fatalism, backlash). Continued research explicating the relation between media content and illness representations will help to reveal when and how media shape perceptions of disease.

Limitations

One limitation of the present study is that the medical skepticism scale had low reliability. Past research has validated this measure, but it continues to exhibit relatively weak internal consistency. Additional items improved the reliability of the scale; however, it is clear that more psychometric research is needed in order to advance research on this construct. A second limitation of the study is the student sample. Students may not be representative of the population as a whole, notably because they have more education than the average resident of the United States. That said, education was addressed, to a certain extent, in this study by controlling for scientific major. Another drawback to the sample is that college students may report higher judgments for credibility than a general adult population (Metzger, Flanagin, & Zwarun, 2003). Third, stimuli in this study were all about news coverage of cancer research, a limitation for researchers interested in extrapolating the results to non–cancer contexts. It is possible that news consumers respond differently to hedging in cancer news coverage, a situation that future research should address. Last, the present study did not examine intermediary variables that might explain the relations between scientific uncertainty and the negative outcomes (e.g., cancer fatalism). Testing for these indirect relations is the only way to fully validate the model of information overload outlined previously. For example, it is important to know whether news processors actually categorize information according to uncertainty or whether they feel overloaded by the content (two processes that could be measured and used to test indirect relations).

Conclusion

For better or worse, media coverage of cancer has the potential to shape attitudes, beliefs, and behaviors. Past research has demonstrated that consumption of media stories about cancer can positively influence public behavior and health outcomes,

but routine biases in coverage can also negatively affect public health. The present study provides additional support for the notion that streamlining is an undesirable aspect of modern cancer reporting. Training journalists to identify, evaluate, and report scientific uncertainty appears to be a worthwhile endeavor, one that could have significant implications for cancer control.

References

Bering, S. (2003, July 15). Recent study reinforces benefits of Mediterranean diet. *Spokane Spokesman Review*, p. D3.

Brechman, J., Lee, C., & Cappella, J. N. (2009). Lost in translation? A comparison of cancer-genetics reporting in the press release and its subsequent coverage in the press. *Science Communication*, *30*, 453–474.

Brehm, S. S., & Brehm, J. W. (1981). *Psychological reactance: A theory of freedom and control*. New York: Academic Press.

Brody, J. E. (1999). Communicating cancer risk in print journalism. *Journal of the National Cancer Institute Monographs*, *25*, 170–172.

Brown, M., & Potosky, A. (1990). The presidential effect: The public health response to media coverage about Ronald Reagan's colon cancer episode. *Public Opinion Quarterly*, *54*, 317–329.

Burrell, N. A., & Koper, R. J. (1998). The efficacy of powerful/powerless language on attitudes and source credibility. In M. Allen & R. W. Preiss (Eds.), *Persuasion: Advances through meta-analysis* (pp. 203–215). Cresskill, NJ: Hampton Press.

Byrne, S., & Hart, P. S. (2009). The 'boomerang' effect: A synthesis of findings and a preliminary theoretical framework. In C. Beck (Ed.), *Communication yearbook 33* (pp. 3–37). Mahwah, NJ: Erlbaum.

Cho, H., & Salmon, C. T. (2007). Unintended effects of health communication campaigns. *Journal of Communication*, *57*, 293–317.

Cohen, E. L., Caburnay, C. A., Luke, D. A., Rodgers, S., Cameron, G. T., & Kreuter, M. W. (2008). Cancer coverage in general-audience and black newspapers. *Health Communication*, *23*, 427–435.

Cooper, C. P., Mallon, K. P., Leadbetter, S., Pollack, L. A., & Peipins, L. A. (2005). Cancer internet search activity on a major search engine, United States 2001–2003. *Journal of Medical Internet Research*, *7*, e36.

Corbett, J. B., & Durfee, J. L. (2004). Testing public (un)certainty of science: Media representations of global warming. *Science Communication*, *26*, 129–151.

Cortez, M. F. (2005, June 23). Lung cancer patients live longer with chemo. *Chicago Sun-Times*, p. 33.

Cram, P., Fendrick, A. M., Inadomi, J., Cowen, M. E., Carpenter, D., & Vijan, S. (2003). The impact of a celebrity promotional campaign on the use of colon cancer screening—The Katie Couric effect. *Archives of Internal Medicine*, *163*, 1601–1605.

Dearing, J. W. (1995). Newspaper coverage of maverick science: Creating controversy through balancing. *Public Understanding of Science*, *4*, 341–361.

Dixon, T. L. (2006). Psychological reactions to crime news portrayals of Black criminals: Understanding the moderating roles of prior news viewing and stereotype endorsement. *Communication Monographs*, *73*, 162–187.

Dugan, E., Trachtenberg, F., & Hall, M. A. (2005). Development of abbreviated measures to assess patient trust in a physician, a health insurer, and the medical profession. *BMC Health Services Research*, *5*. doi:10.1186/1472–6963–5–64

Dunwoody, S. (1999). Scientists, journalists, and the meaning of uncertainty. In S. Friedman, S. Dunwoody & C. Rogers (Eds.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 59–80). Mahwah, NJ: Erlbaum.

Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior Research Methods, Instruments, & Computers*, 28, 1–11.

Fink, R., Roeser, R., Venet, W., Strax, P., Venet, L., & Lacher, M. (1978). Effects of news events on response to a breast cancer screening program. *Public Health Reports*, 93, 318–327.

Fiscella, K., Franks, P., & Clancy, C. (1998). Skepticism toward medical care and health care utilization. *Medical Care*, 36, 180–189.

Fiscella, K., Franks, P., Clancy, C., Doescher, M., & Banthin, J. (1999). Does skepticism towards medical care predict mortality? *Medical Care*, 37, 409–414.

Fiske, S. T., Lin, M. H., & Neuberg, S. L. (1999). The continuum model: Ten years later. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 231–254). New York: Guilford Press.

Fiske, S. T., & Taylor, S. E. (1984). *Social cognition*. New York: Random House.

Freburger, J. K., Callahan, L. F., Currey, S. S., & Anderson, L. A. (2003). Use of the trust in physician scale in patients with rheumatic disease: Psychometric properties and correlates of trust in the rheumatologist. *Arthritis and Rheumatism*, 49, 51–58.

Gans, H. J. (1979). *Deciding what's news*. New York: Pantheon.

Graber, D. A. (1988). *Processing the news: How people tame the information tide*. New York: Longman.

Hall, M. A., Camacho, F., Dugan, E., & Balkrishnan, R. (2002). Trust in the medical profession: Conceptual and measurement issues. *Health Services Research*, 37, 1419–1439.

Hunter, J. E., Hamilton, M., & Allen, M. (1989). The design and analysis of language experiments in communication. *Communication Monographs*, 56, 341–363.

Hyland, K. (1996). Talking to the academy: Forms of hedging in science research articles. *Written Communication*, 13, 251–281.

Jackson, S., & Brashers, D. E. (1994). *Random factors in ANOVA*. Thousand Oaks, CA: Sage.

Jensen, J. D. (2008). Scientific uncertainty in news coverage of cancer research: Effects of hedging on scientists' and journalists' credibility. *Human Communication Research*, 34, 347–369.

Jensen, J. D. (in press). Knowledge acquisition following exposure to cancer news articles: A test of the cognitive mediation model. *Journal of Communication*.

Jensen, J. D., Moriarty, C. M., Hurley, R. J., & Stryker, J. E. (2010). Making sense of cancer news coverage trends: A comparison of three comprehensive content analyses. *Journal of Health Communication*, 15, 136–151.

Lai, W. Y. Y., & Lane, T. (2009). Characteristics of medical research news reported on front pages of newspapers. *PLoS One*, 4(7), e6103. doi:10.1371/journal.pone.0006103

Lane, D. S., Polednak, A. P., & Burg, M. A. (1989). The impact of media coverage of Nancy Reagan's experience on breast cancer screening. *American Journal of Public Health*, 79, 1551–1552.

Lang, A. (2000). Limited capacity model of mediated message processing. *Journal of Communication*, 50, 46–70.

Lang, A. (2006). Using the limited capacity model of motivated mediated message processing to design effective cancer communication messages. *Journal of Communication*, 56, S57–S80.

Lem, S. (2005, October 31). 'Bomb' blasts cancer: Tiny tubes deliver chemo directly to targeted cells. *The Toronto Sun*, p. 42.

Mayo, R. M., Ureda, J. R., & Parker, V. (2001). Importance of fatalism in understanding mammography screening in rural elderly women. *Journal of Women and Aging*, 13, 57–72.

Metzger, M. J., Flanagin, A. J., & Zwarun, L. (2003). College student Web use, perceptions of information credibility, and verification behavior. *Computers & Education*, 41, 217–290.

Meyer, P. G. (1997). Hedging strategies in written academic discourse: Strengthening the argument by weakening the claim. In R. Markkanen & H. Schröder (Eds.), *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts* (pp. 21–41). Berlin, Germany: de Gruyter.

Nattinger, A. B., Hoffmann, R. G., Howell-Pelz, A., & Goodwin, J. S. (1998). Effect of Nancy Reagan's mastectomy on choice of surgery for breast cancer by US women. *Journal of the American Medical Association, 279*, 762–766.

Niederdeppe, J. (2008). Beyond knowledge gaps: Examining socioeconomic differences in response to cancer news. *Human Communication Research, 34*, 423–447.

Niederdeppe, J., Fowler, E. F., Goldstein, K., & Pribble, J. (2010). Does local television news coverage cultivate fatalistic beliefs about cancer prevention? *Journal of Communication, 60*, 203–263.

Niederdeppe, J., & Gurmankin Levy, A. (2007). Fatalistic beliefs about cancer prevention and three prevention behaviors. *Cancer Epidemiology, Biomarkers, & Prevention, 16*, 998–1002.

Orbell, S., O'Sullivan, I., Parker, R., Steele, B., Campbell, C., & Weller, D. (2008). Illness representations and coping following an abnormal colorectal cancer screening result. *Social Science & Medicine, 67*, 1465–1474.

Parascandola, M. (2000). Health in the news: What happens when researchers and journalists collide. *Research Practitioner, 1*, 1–29.

Patterson, R. E., Satia, J. A., Kristal, A. R., Neuhouser, M. L., & Drewnowski, A. (2001). Is there a consumer backlash against the diet and health message? *Journal of the American Dietetic Association, 101*, 37–41.

Pellechia, M. G. (1997). Trends in science coverage: A content analysis of three U.S. newspapers. *Public Understanding of Science, 6*, 49–68.

Pentz, R. D., Flamm, A. L., Sugarman, J., Cohen, M. Z., Ayers, G. D., Herbst, R. S., et al. (2002). Study of the media's potential influence on prospective research participants' understanding of and motivations for participation in high-profile phase I trial. *Journal of Clinical Oncology, 20*, 3785–3791.

Powe, B. D. (1996). Cancer fatalism among African-Americans: A literature review. *Nursing Outlook, 44*(1), 18–21.

Powe, B. D., & Finnie, R. (2003). Cancer fatalism: The state of the science. *Cancer Nursing, 26*, 454–467.

Quick, B. L., & Stephenson, M. T. (2008). Examining the role of trait reactance and sensation seeking on perceived threat, state reactance, and reactance restoration. *Human Communication Research, 34*, 448–476.

Reynolds, T. (2001). News headlines feed on fear of cancer risk, experts say. *Journal of the National Cancer Institute, 93*, 9–11.

Russell, C. (1999). Living can be hazardous to your health: How the news media cover cancer risks. *Journal of the National Cancer Institute Monographs, 25*, 167–170.

Sharf, B. F., Freimuth, V. S., Greenspon, P., & Plotnick, C. (1996). Confronting cancer on *Thirtysomething*: Audience response to health content entertainment television. *Journal of Health Communication, 1*, 157–176.

Schwartz, L. M., & Woloshin, S. (2004). The media matter: A call for straightforward medical reporting. *Annals of Internal Medicine, 140*, 226–228.

Shrum, L. J. (2009). Media consumption and perceptions of social reality: Effects and underlying processes. In J. Bryant & M. B. Oliver (Eds.), *Media effects: Advances in theory and research* (pp. 50–73). New York: Routledge.

Singer, E. (1990). A question of accuracy: How journalists and scientists report research on hazards. *Journal of Communication, 40*, 102–116.

Singer, E., & Endreny, P. M. (1993). *Reporting on risk*. New York: Russell Sage Foundation.

Slater, M., Long, M., Bettinghaus, E. P., & Reineke, J. B. (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication, 13*, 523–537.

Slater, M., & Rouner, D. (1996). How message evaluation and source attributes may influence credibility assessment and belief change. *Journalism and Mass Communication Quarterly*, *73*, 974–991.

Slenker, S. E., & Spreitzer, E. A. (1988). Public perceptions and behaviors regarding cancer control. *Journal of Cancer Education*, *3*, 171–180.

Straughan, P. T., & Seow, A. (1998). Fatalism reconceptualized: A concept to predict health screening behavior. *Journal of Gender, Culture, and Health*, *3*, 85–100.

Stryker, J. E., Moriarty, C. M., & Jensen, J. D. (2008). Effects of newspaper coverage on public knowledge about modifiable cancer risks. *Health Communication*, *23*, 380–390.

Tankard, J. W., & Ryan, M. (1974). News sources' perceptions of accuracy in science coverage. *Journalism Quarterly*, *51*, 219–223.

Tuchman, G. (1972). Objectivity as a strategic ritual: An examination of newsmen's notions of objectivity. *American Journal of Sociology*, *77*, 660–679.

Viswanath, K. (2005). The communications revolution and cancer control. *Nature Reviews*, *5*, 828–835.

Viswanath, K., Breen, N., Meissner, H., Moser, R. P., Hesse, B., Steele, W. R., et al. (2006). Cancer knowledge and disparities in the information age. *Journal of Health Communication*, *11*, 1–17.

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education and Behavior*, *27*, 591–615.

Woods, M. (2003, November 5). Tomatoes outdo pills as cancer preventer. *Pittsburgh-Post Gazette*, p. A16.