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Predictors of Perceived Ambiguity About Cancer Prevention Recommendations: Sociodemographic Factors and Mass Media Exposures

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Abstract

Cancer prevention recommendations reaching the public today are often ambiguous—that is, of uncertain reliability, credibility, or adequacy—yet little is known about the factors that influence public perceptions of this ambiguity. We used data from the 2005 Health Information National Trends Survey, conducted by the U.S. National Cancer Institute, to explore how sociodemographic characteristics and self-reported mass media exposures relate to perceptions of ambiguity regarding recommendations for the prevention of colon, skin, and lung cancer. Various sociodemographic characteristics (age, education, race) and mass media exposures (television, radio, Internet, health news) were found to be associated with perceived ambiguity about cancer prevention recommendations, and many of these associations varied by cancer type. These findings have important implications for future health communication research and practice.

The public today is confronted by an ever-broadening array of mixed messages about health. Diverse, often contradictory, health claims and research findings draw widespread media attention, and conflicts in scientific opinion and evidence are increasingly publicized by

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health professionals in their efforts to make health care more evidence-based and to promote informed and shared decision making. As a consequence of these trends, health information reaching the public has come to epitomize what decision theorists have termed *ambiguity*—uncertainty regarding the "reliability, credibility, or adequacy" of the information at hand (Ellsberg, 1961, p. 102). Ambiguity is high whenever risk information is unreliable, conflicting, or incomplete, or when expert knowledge is contested—conditions that characterize much of the health information in the public sphere.

The increasingly ambiguous nature of health information is a matter of critical public health significance because ambiguity may have important psychological and behavioral effects. Specifically, decision-making research has shown that when confronting ambiguous information about risks and the potential outcomes of decisions, people tend to judge these risks and outcomes pessimistically and avoid decision making (Camerer & Weber, 1992; Ellsberg, 1961). This phenomenon, known as "ambiguity aversion," pertains to information concerning various risks, including those related to health. Experimental studies, for example, have shown that ambiguous information about environmental health risks leads to heightened perceptions of these risks (Viscusi, Magat, & Huber, 1991, 1999), and that ambiguity concerning the outcomes of health-protective measures such as immunizations makes people less willing to adopt these measures (Meszaros et al., 1996; Ritov & Baron, 1990). Intervention studies have demonstrated that informing people about uncertainties surrounding cancer screening measures decreases their interest in screening (Frosch, Kaplan, & Felitti, 2001; Wolf, Nasser, & Schorling, 1996). Perceptions of ambiguity regarding cancer prevention and screening recommendations have also been shown to be negatively associated with both cancer-protective behaviors (Han et al., 2007; Rimer, Halabi, Strigo, Crawford, & Lipkus, 1999) and perceptions that may influence these behaviors (Han et al., 2007).

Given these potential effects of ambiguous health information, it is important to understand which factors determine the extent to which people perceive ambiguity in the first place. Previous research has not directly addressed this issue, although several factors might be influential. For example, individual factors, including sociodemographic characteristics, may influence perceptions of ambiguity (Kreuter, Holt, & Skinner, 2004), as may sociocultural factors, including exposure to mass-mediated health information (Brodie, Hamel, Altman, Blendon, & Benson, 2003; Kreuter & McClure, 2004) and the extent to which such exposure is passive or the result of active information seeking (Dutta-Bergman, 2006).

In this study we explored how these factors relate to the public's perceived ambiguity of health information, focusing specifically on ambiguity surrounding cancer prevention recommendations. Ambiguity in this domain has grown in prominence in recent years, with the emergence of scientific controversies over interventions to prevent various cancers (e.g., tamoxifen for breast cancer, nonsteroidal anti-inflammatory drugs for colon cancer, human papilloma virus vaccination for cervical cancer). Expert recommendations for preventive interventions such as these are ambiguous; however, little is known about the factors that influence the public's perceptions of this ambiguity. We used data from the 2005 Health Information National Trends Survey (HINTS), conducted by the U.S. National Cancer

Institute, to examine the associations between various sociodemographic factors, mass media exposures, and perceived ambiguity regarding recommendations for preventing different cancers. Because the cross-sectional nature of the dataset limits causal inferences, our goal was to describe these associations, and to identify key questions for future research.

Based on findings from earlier studies, we predicted that greater ambiguity perceptions would be associated with several sociodemographic factors, including older age, non-White race, and lower education. We also speculated that greater exposure to mass media and health news would be associated with higher perceived ambiguity; we did not predict specific differences by cancer type.

METHODS

Data Source and Study Population

The HINTS is a biennial telephone-based survey designed to monitor the impact of the information environment on the public's cancer-related knowledge, attitudes, and behaviors. The HINTS surveys a nationally representative sample of U.S. adults age 18 and older, utilizing a complex stratified sampling design. For HINTS 2005, interviews were completed with 5,586 adults; response rates for the household screener were 34%, whereas those for the extended interview were 61%. Details about the HINTS are published elsewhere (Nelson et al., 2004) and are available on the Web (http://hints.cancer.gov/hints/).

Data Collection

The 2005 HINTS collected data on several cancer-related cognitions, and survey participants were randomly assigned to respond to items pertaining to one of three specific cancer types: colon (n = 1,788), skin (n = 1,594), and lung (n = 1,777). These groups represent the samples used for this study.

Perceived ambiguity—The dependent variable for all analyses was *perceived ambiguity about cancer prevention recommendations*, which was assessed by the question, "There are so many different recommendations about preventing [colon/skin/lung] cancer, it's hard to know which ones to follow." Response categories were "agree" and "disagree."

Sociodemographic characteristics—Various sociodemographic factors were analyzed as independent variables. Age was coded using three response categories (18–49, 50–69, and 70 and older), to reflect age-based differences in scientific evidence and expert consensus regarding cancer prevention and screening in average-risk adults. Relatively few interventions are recommended for all adults before age 50, whereas routine screening for colon, breast, and prostate cancer is recommended for average-risk adults at age 50, and individualized screening is recommended for adults over age 70 (Walter & Covinsky, 2001). Race was coded using three response categories (White, Black, and other), and education level used four response categories (less than high school, high school graduate, some college, and college graduate). Gender was also included in our analyses. Income was highly correlated with education level, and was not analyzed in order to avoid multicollinearity.

Mass media exposure—Self-reported exposure to various mass media was operationalized by several variables. Television exposure was a composite variable created by combining responses from two items: “On a typical weekday, about how many hours do you watch television?” and “During a typical weekend, about how many hours do you watch television?” Total hours from these two items were added (number of weekday hours was multiplied by 5). Values ranged from 0 to 136 (M = 20.4, SD = 15.2), with Mdn = 17, which was used to dichotomize responses into “Low” and “High” categories.

Radio exposure combined responses from two items: (a) “On a typical weekday, about how many hours do you listen to the radio?” and (b) “During a typical weekend, about how many hours do you listen to the radio?” Total hours from these two items were summed (number of weekday hours was multiplied by 5). Values ranged from 0 to 168 (M = 13.8, SD = 17.1), with Mdn = 7, which was used to dichotomize responses into “Low” and “High” categories.

Internet exposure combined responses from two items: (a) “On a typical weekday, about how many hours do you use the Internet for personal reasons?” and (b) “During a typical weekend, about how many hours do you use the Internet for personal reasons?” Total hours from these two items were summed (number of weekday hours was multiplied by 5). Values ranged from 0 to 130 (M = 5.8, SD = 8.8) with Mdn = 5, which was used to dichotomize responses into “Low” and “High” categories. Respondents who reported not using the Internet (n = 2,460) were imputed a response of 0 hr for the Internet exposure questions.

Newspaper exposure was measured by a single item asking respondents “In the past seven days, how many days did you read a newspaper?” Values ranged from 0 to 7 (M = 3.6, SD = 3.0) with Mdn = 3, which was used to dichotomize responses into “Low” and “High” categories.

Health news exposure—Exposure to mass-mediated health news was measured with respect to various media sources. Print health news exposure was assessed by combining responses to two items: (a) “Some newspapers or general magazines publish a special section that focuses on health. In the past 12 months, have you read health sections of the newspaper or of a general magazine?” (response options were “Yes” and ”No”), and (b) “About how often have you read such health sections in the past 12 months? Would you say …” (response options were “Less than once per week” and “Once or more per week”). Responses to these two items were combined to form a composite variable with three response categories, “None”(0), “Less than once per week” (1), and “Once or more per week”(2).

A similar procedure was used to create composite variables for both television health news exposure and Internet health news exposure, using the items “Some local television news programs include special segments of their newscasts that focus on health issues. In the past 12 months, have you watched health segments on the local news?” and “Some people notice information about health on the Internet, even when they are not trying to find out about a health concern they have or someone in the family has. Have you read such health information on the Internet in the past 12 months?” Both items were followed by questions asking respondents how often they had engaged in the activity in the past 12 months.

Cancer information seeking—To ascertain the potential influence of routine, normal patterns of exposure to both mass media and health news on perceived ambiguity, we adjusted for exposures occurring specifically as a result of respondents' active and purposive information seeking. We included in our analyses a single item measuring active health information seeking specific to cancer: "Have you ever looked for information about cancer from any source?" Response options were "Yes," "No," and "Don't know."

Data Analysis

To adjust for the complex sampling design of the HINTS (Nelson et al., 2004), we used the statistical program SUDAAN (version 9.0.2, Research Triangle Institute, Research Triangle Park, NC) in all analyses (Shah, Barnwell, & Bieler, 1997), utilizing sample weights poststratified to 2005 U.S. Census distributions by age, sex, and race/ethnicity to provide representative population estimates. Variances of parameter estimators were calculated using a jackknife method.

We excluded individuals with "not ascertained," "no opinion," "don't know," or "refused" responses to any of the survey items examined. For items measuring mass media exposures we imputed "0" values for "not applicable" responses, which signified respondents' inability to utilize these media—for example, because of being blind or not having Internet access. The proportion of excluded or missing data in the study sample was less than 5% for all independent variables except for race (7.3%).

Descriptive, univariate, and multivariate analyses were performed. Chi-square tests were used to examine associations between the independent variables and perceived ambiguity. Separate multivariate logistic regression models were then used to identify significant predictors of perceived ambiguity regarding the prevention of each of the three cancers (colon, skin, lung).

RESULTS

Distributions and U.S. population-weighted percentages for the independent variables are shown in Table 1. Most respondents were less than age 70, White, non-Hispanic, and reported high school or greater education and no personal history of cancer; approximately half reported seeking cancer information. Weighted proportions of respondents reporting perceived ambiguity about cancer prevention recommendations were 52.8%, 42.4%, and 43.0% for colon, skin, and lung cancer, respectively.

Univariate Analyses

Univariate associations between the independent variables and perceived ambiguity are shown in Table 2. Older age and lower education level were associated with perceived ambiguity regarding all three cancer types, whereas non-White race was associated with perceived ambiguity regarding the prevention of skin and lung cancer. With respect to mass media variables, television exposure was positively associated, whereas past cancer information seeking and exposure to both Internet and Internet health news were negatively associated with perceived ambiguity for all 3 cancer types. Other associations were cancer-specific. Radio exposure was positively associated with perceived ambiguity about

recommendations for the prevention of colon and skin cancer only. Health news exposure from both television and print sources was associated with perceived ambiguity about skin and lung cancer prevention, but in opposite directions; the associations were positive for television health news and negative for print health news.

Multivariate Analyses

Table 3 shows the multivariate associations between perceived ambiguity about cancer prevention recommendations and the independent variables. Among sociodemographic factors, older age remained a strong predictor of perceived ambiguity for all three cancer types, whereas lower education remained a strong negative predictor of perceived ambiguity about the prevention of skin and lung cancer. Non-White race remained significantly associated with perceived ambiguity about the prevention of skin cancer only.

Among media exposure variables, past active cancer information seeking remained negatively associated with perceived ambiguity regarding colon cancer prevention recommendations only, whereas television exposure remained positively associated with perceived ambiguity regarding skin cancer only. Newspaper exposure was positively associated with perceived ambiguity regarding colon cancer prevention, although it showed no significant univariate associations. Finally, Internet exposure remained negatively associated with ambiguity perceptions regarding the prevention of skin cancer only.

DISCUSSION

In this nationally representative survey of U.S. adults, we found significant relationships between perceived ambiguity regarding cancer prevention recommendations and various sociodemographic factors and mass media exposures. These findings have several implications for our understanding of cancer-related ambiguity perceptions, and raise important questions for future research and health communication efforts.

The associations between perceived ambiguity and older age, lower education, and non-White race corroborate findings from previous studies (Han et al., 2007; Kreuter et al., 2004), and the convergence of evidence suggests that these characteristics are key factors in the genesis of ambiguity perceptions. Because these same characteristics also identify population groups at risk for poor health outcomes, it is important to understand the mechanisms—both direct and indirect—underlying the associations observed. Advancing age, for example, may be a marker of greater cumulative exposure to mixed messages about cancer prevention, which in turn may increase perceived ambiguity. Education might influence perceived ambiguity more directly by enhancing people's capacity to make sense of conflicting health information—accounting for the association between lower education and perceived ambiguity. Non-White race may be a marker of other unmeasured variables—for example, access to health care, exposure to health information, cultural values, health literacy, and numeracy—that may influence how people perceive and interpret ambiguous information about cancer prevention.

Elucidating these mechanisms is a future research need that requires examining a broader range of factors at a sociocultural level of analysis. Not only do unmeasured moderating and

mediating variables need to be accounted for, but ambiguity perceptions need to be understood in relation to other cognitive variables also associated with sociodemographic factors. Perceived risk and worry related to cancer, for example, have shown significant associations with age and education (Honda & Neugut, 2004; Hughes, Lerman, & Lustbader, 1996), as well as race (Consedine, Magai, & Neugut, 2004; Haggstrom & Schapira, 2006) in other studies. These findings highlight the need to consider ambiguity perceptions as part of a larger whole of cancer-related cognitions shaped by diverse social and cultural factors.

These factors include various mass media exposures, which were also significantly associated with ambiguity perceptions in our study. In univariate analyses, exposure to television, television news, radio, and television health news all showed strong positive associations with perceived ambiguity regarding multiple cancers, whereas exposure to the Internet, Internet health news, and print health news all showed negative associations (Table 2). These findings raise the possibility that mass-mediated information influences public perceptions of ambiguity, and that the strength and direction of this influence depends on the media channel. Specifically, information communicated through television and radio may increase perceived ambiguity, whereas information in Internet and print news may decrease it.

These inferences, however, assume that the media exposures ascertained in our study represented causes, rather than effects of perceived ambiguity about cancer prevention recommendations. We cannot rule out the latter as an explanation for some observed associations—that is, pre-existing ambiguity perceptions could have caused greater media exposure, perhaps by motivating people to seek information to resolve ambiguity. However, the fact that several mass media variables remained significantly associated with ambiguity perceptions in multivariate analyses suggests that media exposures do influence ambiguity perceptions, because these analyses controlled for the confounder of active cancer information seeking. The remaining associations likely reflect the outcomes of what communication researchers have termed *information scanning*—that is, information acquisition that may not be completely passive but which occurs within normal, routine patterns of exposure to mass media sources (Hornik, 2002; Niederdeppe et al., 2007).

At the same time, our data imply that causal pathways in these relationships are complex. Significant univariate associations for various predictor variables were attenuated in multivariate analyses, suggesting that their influence is confounded or mediated by other factors. The remaining significant predictors—television and Internet health news exposure in the case of skin cancer perceptions, newspaper exposure in the case of colon cancer perceptions—likely have more direct influence. Their associations with perceived ambiguity may be attributable to media-specific differences in the content of information pertaining to cancer prevention. For example, some evidence suggests that newspaper coverage of skin, colon, and other cancers tends to focus on disease risks, to the exclusion of presenting information about effective prevention and screening strategies (Moriarty & Stryker, 2007; Stryker, Solky, & Emmons, 2005). Further content-focused research is needed to explore how these and other aspects of the way in which different media sources present information may influence ambiguity perceptions.

It is not clear, however, whether the observed associations resulted from media exposures themselves, or from personal characteristics that predispose individuals to these exposures in the first place. For example, people who watch television frequently may differ from those who frequently access the Internet or read newspapers (Dutta-Bergman, 2006). Because the latter activities require more effort and skill, Internet users and newspaper readers may represent biased samples of individuals with greater motivation or capacity to process complex health information—and lower predisposition toward interpreting such information as ambiguous. Furthermore, interest in health concerns may prompt individuals to seek out and use more interactive media such as the Internet in a manner that reinforces their informational needs, preferences, and competencies (Dutta-Bergman, 2004). Individual differences in motivation or capacity to process complex information may also explain why cancer information seeking was negatively associated with perceived ambiguity, and why controlling for sociodemographic characteristics attenuated several associations between perceived ambiguity and mass media variables.

The cancer-specific differences in these associations were also noteworthy. Perceived ambiguity about skin cancer prevention was uniquely associated with several factors—for example, non-White race, television exposure, and Internet health news exposure—that were not associated with perceptions of ambiguity regarding the other malignancies (Tables 2 and 3). At the same time, perceived ambiguity about colon cancer prevention was uniquely associated with newspaper exposure, whereas perceived ambiguity regarding lung cancer prevention was not related to any media exposures (Table 3).

These differences may have various sources. For example, the extent and content of the mass media's coverage of different diseases have varied historically in response to such factors as scientific controversies (Holmes-Rovner & Charles, 2003) and the health experiences of prominent celebrities. Recent examples include debates over interventions such as antioxidant vitamins and aspirin for cancer prevention (Rubin, 2005), and the televised colon cancer screening of Katie Couric (Cram et al., 2003). Mass media coverage of such events may influence the public's awareness of particular diseases and controversial health-care issues (Haas et al., 2007), thereby affecting perceptions of ambiguity. At the same time, the media's potential influence may depend on the content and stability of the public's existing mental models of disease, which may differ by cancer type, moderating the impact of ambiguous health information.

Further research is necessary to explore these possibilities and to address various study limitations. Our study did not ascertain other important factors, including respondents' experiences with health care. Methodological limitations also qualify our findings. The relatively low response rate for the HINTS reflects a trend with survey research (de Leeuw & de Heer, 2002; Goyder, Warriner, & Miller, 2002), and in spite of efforts to obtain a diverse sample, most respondents reported White race and relatively high education. The ascertainment of media exposure also relied on self-report, the accuracy of which is unknown. Furthermore, the survey item used to measure perceived ambiguity had unknown reliability and validity, and had only two response categories, which may have limited our ability to detect meaningful individual differences with respect to this construct. The measure may also have conflated the perception of ambiguity—that is, belief in the

existence of “many different recommendations”—with a psychological outcome of ambiguity—that is, the feeling that “it’s hard to know which ones to follow.”

Regardless of whether this item measured perceptions or outcomes of ambiguity, however, its association with factors measured in this study is a finding of great public health significance. Both perceptions of ambiguity and the confusion that may result from these perceptions may have important effects—heightening perceptions of vulnerability to health risks while diminishing beliefs in the effectiveness of health-protective behaviors and the actual uptake of these behaviors (Han et al., 2007; Rimer et al., 1999). The possibility that sociodemographic characteristics and exposure to mass media increase people’s susceptibility to ambiguity has further implications for understanding intergroup disparities in health behaviors and outcomes. It raises the need to identify underlying mechanisms and other potential intervening variables, including individual personality differences that may influence people’s tolerance of ambiguity (Kruglanski & Webster, 1996).

Critical questions emerge regarding when ambiguity perceptions are warranted or unwarranted, and how ambiguity should be communicated. People are often insufficiently aware of ambiguity surrounding estimates of health risks and the outcomes of medical interventions (Nekhlyudov, Ross-Degnan, & Fletcher, 2003; Schwartz & Woloshin, 2002; Woloshin et al., 2000). Thus, there is a strong ethical justification for increasing public awareness of ambiguity in health care; heightened ambiguity perceptions for certain groups are not necessarily inappropriate. In elderly persons, for example, perceptions of ambiguity regarding cancer prevention recommendations are arguably rational, given the incomplete scientific evidence in this domain. Likewise, it may be appropriate for non-White persons to perceive ambiguity about skin cancer prevention—as shown in our study—because existing recommendations acknowledge that skin-protective behaviors may be a higher priority for lighter-skinned populations at increased cancer risk (U.S. Preventive Services Task Force, 2003).

Yet ambiguity perceptions may also be unwarranted if based on misunderstanding or misinformation, a concern raised by the higher prevalence of perceived ambiguity in lower-education individuals. Ambiguity perceptions might be either heightened or diminished as a result of inaccurate information and the way that the press communicates health messages (Nelkin, 1996). Numerous factors intrinsic to these messages—for example, their content, balance, and presentation—and the media channels through which they are delivered—for example, their sensory appeal, credibility, and reach (Kreuter & McClure, 2004)—may promote biased perceptions of ambiguity. Furthermore, many other mass-mediated health messages, encountered only incidentally and unintentionally by the public, are delivered by nonpress sources whose goals—for example, entertainment, persuasion—are not to provide accurate information. For these reasons, ambiguity perceptions originating from mass media exposures might be unwarranted.

Our study endorses the value of additional research not only to determine the origins of health-related ambiguity perceptions but to define the circumstances in which these perceptions are warranted, and to develop optimal strategies for communicating ambiguity to the public. We need to know how to promote a public awareness of ambiguity based not

on misinformation or misunderstanding but on knowledge of the real uncertainties that pertain to medical decision making. This requires a much more complete understanding of how social, cultural, and individual factors influence the public's capacity to acknowledge and cope with these uncertainties.

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TABLE 1

Distribution and Weighted Percentages of Sociodemographic and Mass Media Exposure Characteristics of HINTS Respondents

Sociodemographic variables	n[a]	%[b]
Age		
18–49	2,527	61.1
50–69	1,929	28.0
70+	1,112	10.9
Gender		
Female	3,657	51.9
Male	1,929	48.1
Race		
White	4,378	79.9
Black	462	11.3
Other	339	8.8
Education level		
Less than high school	687	14.5
High school graduate	1,643	33.8
Some college	1,349	28.3
College graduate	1,696	23.4
Cancer information-seeking		
Yes	2,925	48.7
No	2,647	51.3
Television exposure		
High	2,705	46.7
Low	2,812	53.3
Television news exposure		
High	2,667	43.1
Low	2,756	56.9
Radio exposure		
High	2,554	48.8
Low	2,994	51.2
Internet exposure		
High	2,711	51.9
Low	2,846	48.1
Newspaper exposure		
High	2,617	40.0
Low	2,963	60.0
Television health news exposure		
≥Once/week	2,761	46.4
<Once/week	1,296	24.5
None	1,448	29.1

Sociodemographic variables	n[a]	%[b]
Internet health news exposure		
≥Once/week	1,382	25.8
<Once/week	716	13.2
None	3,471	60.9
Print health news exposure		
≥Once/week	2,369	35.5
<Once/week	1,241	22.7
None	1,943	41.8

Note. HINTS, 2005 Health Information National Trends Survey; $N = 5{,}586$.

[a] Decreased and unequal *n*s for individual variables are due to excluded and missing data.

[b] Percentages weighted to the 2005 U.S. Census.

TABLE 2

Univariate Associations Between Perceived Ambiguity Regarding Cancer Prevention Recommendations and Independent Variables (HINTS 2005)

	Colon Cancer Perceived Ambiguity				Skin Cancer Perceived Ambiguity				Lung Cancer Perceived Ambiguity			
	N (%)[a]	Total[b]	χ^2	p	N (%)[a]	Total[c]	χ^2	p	N (%)[a]	Total[d]	χ^2	p
Age			20.22	.0002			26.93	<.00001			20.52	.0002
70+	229 (67.4)	351			174 (63.5)	277			199 (59.2)	350		
50–69	316 (51.9)	632			211 (46.3)	518			244 (41.6)	629		
18–49	389 (50.6)	799			275 (38.1)	792			284 (40.7)	794		
Gender			0.36	.55			0.04	0.85			2.48	0.12
Male	336 (54.0)	634			228 (42.0)	556			248 (45.8)	590		
Female	601 (51.6)	1,154			434 (42.8)	1038			481 (40.7)	1187		
Race			2.58	.28			19.87	.0002			7.05	.04
White	729 (50.4)	1,434			455 (36.0)	1219			527 (38.2)	1427		
Black	71 (51.5)	148			79 (62.0)	141			87 (52.4)	152		
Other	63 (61.1)	103			53 (50.3)	111			59 (51.6)	114		
Education level			26.53	.0001			187.75	<.00001			117.35	<.00001
Less than high school	160 (61.3)	230			155 (70.9)	207			153 (74.0)	202		
High school graduate	328 (58.0)	534			242 (49.3)	476			283 (54.8)	522		
Some college	210 (52.7)	423			163 (38.9)	397			145 (32.3)	444		
College graduate	210 (39.7)	556			78 (15.2)	468			124 (21.0)	573		
Cancer information-seeking			18.62	.0001			22.59	<.00001			6.63	.01
Yes	440 (45.7)	965			287 (33.9)	844			323 (38.5)	931		
No	495 (60.0)	818			374 (50.7)	743			406 (47.4)	844		
Television exposure			14.49	.0004			40.39	<.00001			10.32	.002
High	506 (59.1)	856			389 (53.5)	792			417 (48.6)	855		
Low	416 (47.0)	910			258 (31.8)	783			303 (38.0)	960		
Radio exposure			4.34	.04			4.52	.04			0.32	.57
High	431 (55.7)	780			326 (45.7)	755			347 (44.0)	810		
Low	497 (49.9)	952			333 (39.2)	831			378 (42.1)	959		
Internet exposure			17.37	.0001			73.01	<.00001			41.54	<.00001
High	385 (45.9)	888			210 (29.5)	791			239 (31.1)	880		

	Colon Cancer Perceived Ambiguity				Skin Cancer Perceived Ambiguity				Lung Cancer Perceived Ambiguity			
	N (%)[a]	Total[b]	χ^2	p	N (%)[a]	Total[c]	χ^2	p	N (%)[a]	Total[d]	χ^2	p
Low	548 (60.3)	889			448 (56.8)	795			489 (56.7)	887		
Newspaper exposure			1.61	.21			0.28	.60			1.97	.17
High	456 (55.7)	859			299 (41.2)	714			325 (40.1)	846		
Low	480 (50.9)	926			362 (43.1)	878			404 (45.2)	930		
Television health news exposure			2.95	.24			9.41	.01			9.67	.01
≥Once/week	499 (55.8)	905			361 (47.4)	775			390 (48.4)	890		
<Once/week	199 (48.4)	425			113 (33.1)	373			135 (33.4)	416		
None	232 (51.7)	442			180 (41.4)	428			194 (42.3)	448		
Internet health news exposure			14.95	.001			83.28	<.00001			36.2	<.00001
≥Once/week	195 (44.2)	459			93 (24.4)	409			121 (33.0)	437		
<Once/week	91 (43.7)	251			58 (27.2)	198			55 (26.4)	231		
None	649 (59.2)	1,072			509 (53.0)	984			551 (51.0)	1103		
Print health news exposure			3.03	.23			8.86	.02			8.41	.02
≥Once/week	380 (49.6)	771			268 (41.8)	660			288 (41.0)	772		
<Once/week	201 (50.9)	405			118 (32.1)	359			131 (35.3)	399		
None	351 (56.3)	605			268 (48.3)	564			302 (49.7)	595		

Note. HINTS, 2005 Health Information National Trends Survey.

[a] Number (row percentage) of respondents reporting high perceived ambiguity.

[b] Total *N* = 1,788, decreased and unequal *n*s for individual variables are due to excluded and missing data.

[c] Total *N* = 1,594, decreased and unequal *n*s for individual variables are due to excluded and missing data.

[d] Total *N* = 1,777, decreased and unequal *n*s for individual variables are due to excluded and missing data.

TABLE 3

Multivariate Associations Between Perceived Ambiguity Regarding Cancer Prevention Recommendations, Sociodemographic Characteristics, and Health News Exposures (HINTS 2005)

	Colon Cancer Perceived Ambiguity			Skin Cancer Perceived Ambiguity			Lung Cancer Perceived Ambiguity		
	OR[a]	95% CI	PV[b]	OR[a]	95% CI	PV[c]	OR[a]	95% CI	PV[d]
Age			.03			.004			.02
70+	1.63	1.02–2.61		2.36	1.39–3.99		1.87	1.15–3.03	
50–69	0.98	0.70–1.35		1.45	0.97–2.18		1.06	0.72–1.54	
18–49	1.00			1.00			1.00		
Gender			.90			.88			.10
Male	0.98	0.69–1.38		0.96	0.60–1.54		1.35	0.94–1.95	
Female	1.00			1.00			1.00		
Race			.61			.002			.07
White	1.00			1.00			1.00		
Black	0.87	0.54–1.41		2.41	1.14–5.13		1.40	0.76–2.58	
Other	1.26	0.72–2.21		2.33	1.11–4.92		2.00	0.94–4.23	
Education level			.08			<.00001			<.00001
Less than high school	1.00			1.00			1.00		
High school graduate	0.99	0.58–1.69		0.51	0.29–0.89		0.43	0.23–0.80	
Some college	1.01	0.53–1.92		0.49	0.27–0.88		0.20	0.12–0.35	
College graduate	0.67	0.41–1.10		0.16	0.10–0.26		0.12	0.06–0.22	
Cancer information-seeking			.01			.21			.34
Yes	0.68	0.50–0.92		0.80	0.56–1.14		1.20	0.82–1.75	
No	1.00			1.00			1.00		
Television exposure			.14			.003			.42
High	1.25	0.92–1.70		1.67	1.17–2.37		1.14	0.82–1.57	
Low	1.00			1.00			1.00		
Radio exposure			.12			.28			.11
High	1.21	0.94–1.56		1.19	0.86–1.66		1.31	0.93–1.84	
Low	1.00			1.00			1.00		
Internet exposure			.52			.30			.43

	Colon Cancer Perceived Ambiguity			Skin Cancer Perceived Ambiguity			Lung Cancer Perceived Ambiguity		
	OR[a]	95% CI	PV[b]	OR[a]	95% CI	PV[c]	OR[a]	95% CI	PV[d]
High	0.88	0.58–1.32		0.77	0.47–1.27		0.82	0.49–1.37	
Low	1.00			1.00			1.00		
Newspaper exposure			.02			.79			.33
High	1.47	1.05–2.04		1.07	0.66–1.73		0.83	0.57–1.21	
Low	1.00			1.00			1.00		
Television health news exposure			.47			.99			.12
≥Once/week	1.29	0.85–1.96		1.01	0.60–1.71		1.41	0.94–2.11	
<Once/week	1.16	0.78–1.71		0.99	0.62–1.56		0.96	0.60–1.54	
None	1.00			1.00			1.00		
Internet health news exposure			.37			.003			.43
≥Once/week	0.90	0.58–1.39		0.46	0.29–0.72		0.88	0.52–1.50	
<Once/week	0.70	0.40–1.21		0.67	0.35–1.31		0.67	0.35–1.29	
None	1.00			1.00			1.00		
Print health news exposure			.08			.18			.95
≥Once/week	0.66	0.45–0.97		0.99	0.55–1.78		0.95	0.60–1.49	
<Once/week	0.86	0.57–1.29		0.64	0.35–1.15		0.92	0.53–1.60	
None	1.00			1.00			1.00		

Note. CI, confidence interval; HINTS, 2005 Health Information National Trends Survey; OR, odds ratio; PV, *p*-value.

[a] OR for high perceived ambiguity.

[b] $N = 1{,}614$.

[c] $N = 1{,}406$.

[d] $N = 1{,}628$.

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