Anthony D. Cox, Dena Cox, & Susan Powell Mantel

Consumer Response to Drug Risk Information: The Role of Positive Affect

Risk disclosure is an essential element of the marketing of prescription drugs and other medical products. This study examines how consumers respond to verbal information about the frequency and severity of medical-product risks and how media-induced affect can moderate such responses. The study finds that consumers tend to overestimate the actual likelihood of adverse events described with words such as "common" or "rare" (compared with the probabilities such terms are typically intended to convey) and that consumers tend to give little weight to such probability language when forming product use intentions. However, consumers in positive media-induced moods seem to engage in more nuanced evaluation of product risk information, weighing both frequency and severity information and using such information to make inferences about other product attributes (e.g., product efficacy). These findings suggest that medical marketers and regulators need to devise more effective means of communicating risk probability to consumers and that positive mood induction (e.g., by placing advertisements in upbeat media environments) can enhance consumers' ability to process product risk information.

Keywords: affect, product risk, health behavior, advertising

For many years, consumers have been exposed to product risk statements, ranging from health warnings in tobacco advertising to financial loss disclaimers in mutual fund advertisements (Hoy and Andrews 2004). However, the prevalence and prominence of such warnings have increased dramatically in recent years, with the rapid growth of direct-to-consumer (DTC) marketing of prescription drugs and medical devices. When the Food and Drug Administration (FDA) was created in the early twentieth century, consumer drug advertising was still associated with the misleading claims of nineteenth-century "snake oil" purveyors. Therefore, the FDA required manufacturers of prescription drugs to limit their promotional efforts to physicians, pharmacists, and other health care professionals. However, beginning in the late 1980s, the FDA began to relax the rules on consumer advertising of prescription drugs, setting off an accelerating growth in DTC advertising over the next two decades, from $12 million in 1989 (Calfee 2002) to $4.8 billion in 2007 (*Pharma Marketletter* 2009).

However, DTC advertising has important regulatory restraints. The FDA (1999) mandates that any DTC advertisement that mentions both a brand name (e.g., Lipitor) and its purpose (e.g., reducing serum cholesterol) must also contain a "major statement" of product risks within the advertisement's main body. The risks described in DTC advertisements vary from severe (e.g., liver damage, birth defects) to fairly mild side effects (e.g., dry mouth, drowsiness) and also vary in reported likelihood. Thus, some adverse events are described as "rare" or "very rare," and others are described as "common" or "commonly reported." Indeed, FDA (2004) guidelines suggest that both the most serious risks and the three to five most frequently occurring risks should be mentioned.

The implicit assumption of such risk disclosure is that consumers will be able to appropriately interpret and weigh risk information to make informed health care choices (e.g., Calfee 2002; FDA 2004). Many models of health care decision making (e.g., protection motivation theory, health belief model; see Berry 2004; Schwarzer 2001) can be classified as "expectancy models," which imply that consumers are rational in their decision making and use a version of a weighted sum model to process and use available information. This suggests that consumers assign a probability estimate to the likelihood descriptors (e.g., "rare" = 1% of the time) and severity descriptors (e.g., a "severe" headache feels twice as bad as a "mild" headache) and then form global product evaluations by weighting the disutility of potential outcomes by their subjective probabilities.

The empirical research that exists on how consumers actually interpret risk disclosures in DTC advertisements is sparse and somewhat contradictory. Some studies suggest that product risk disclosures can significantly lower consumers' product evaluations (e.g., Goetzl 2001), recall of

Anthony D. Cox is Professor of Marketing and Chancellor's Faculty Fellow (e-mail: acox@iupui.edu), and Dena Cox is Professor of Marketing and Faculty Fellow (e-mail: dcox@iupui.edu), Kelley School of Business–Indianapolis, Indiana University. Susan Powell Mantel is Associate Professor of Marketing, Miller School of Business, Ball State University (e-mail: spmantel@bsu.edu). Author order is alphabetical. The authors thank Sasha (Alexander) Fedorikhin, Frank Kardes, James Kellaris, and the anonymous *JM* reviewers for their helpful comments on previous drafts of this article. This research was funded in part by a research grant from the Kelley School of Business awarded to Dena Cox.

ISSN: 0022-2429 (print), 1547-7185 (electronic)

Journal of Marketing
Vol. 74 (July 2010), 31–44

product benefits (Morris, Mazis, and Brinberg 1989), and product use compliance (Wosinska 2005). Other studies suggest that consumers often ignore risk disclosures (e.g., Menon et al. 2003), and some have even suggested that such risk statements can actually enhance consumers' product evaluations (e.g., Goetzl 2000). More recent research has suggested that consumers subjectively evaluate product risk statements depending on whether statements of product benefits are gain or loss framed (Cox, Cox, and Zimet 2006). However, little is known about the contingencies that govern whether advertised risk disclosures have a negative, neutral, or positive impact on consumer brand attitudes and intentions. The need for research in this area is stressed in an FDA (2004, p. 7) report, which concludes "we have not evaluated how presenting the information in different formats affects consumer comprehension, and we believe that there is much more to be learned before we develop final guidance on how best to inform patients about the drugs being promoted."

To that end, the current research examines how consumers respond to advertised disclosures of drug risks that vary in severity and frequency. Specifically, we address the following questions:

1. How do consumers interpret the "probability language" typically used to describe the likelihood of potential adverse product events (i.e., terms such as "very common" and "very rare")? Do these terms mean the same thing to consumers as they do to advertisers and regulators?
2. What evaluative weight do consumers give to the stated severity of a potential adverse product event versus its stated likelihood (frequency) of occurring? Many models of risky decision making suggest that consumers will (or should) give considerable weight to both severity and likelihood and that these two factors should be combined in forming global product evaluations. Do these models accurately describe consumer evaluations of advertised risk disclosures?
3. Do consumers' responses to product risk disclosures vary depending on the media context in which the product risk message appears? Specifically, how does media-induced mood influence the ways consumers respond to product risk information?

In the following section, we discuss previous research and theory relevant to these questions. Then, we report the results of an experiment that examines these issues empirically. Finally, we discuss the implications of the findings and directions for further research.

Theory and Hypotheses

Consumer Interpretation of Probability Words

Many models of risky decision making (e.g., expectancy–value models; Eagly and Chaiken 1993) posit that consumers weigh information about the likelihood of adverse events in evaluating risky products. However, research indicates that people often have difficulty understanding numerical risk expressions, such as probabilities and percentages (Berry 2004; Kahneman and Tversky 1979; Loewenstein et al. 2001). Thus, most consumer information on product risks (including risk disclosures in DTC drug advertisements) describes the likelihood of adverse events with familiar probability words, such as "rare," "common," and "uncommon."

In the European Union (EU), the European Commission has tried to increase the precision and consistency with which such words are used in product labeling and promotion by providing specific guidelines for translating numerical risk probabilities into probability words (e.g., "very common" side effects occur in >10% of patients, "common" side effects occur in 1%–10% of patients, "uncommon" side effects occur in .1%–1% of patients, "rare" side effects occur in .01%–.1% of patients, and "very rare" side effects occur in <.01% of patients). However, in the United States, the FDA has not issued specific guidelines for use of such terms (Aiken 2009; FDA 2009).

Thus, we conducted research to determine whether there are informal or implicit norms that govern the use of such "frequency words" in U.S. DTC advertising. First, we retrieved current DTC print advertisements for 24 prescription drugs (including the top 10 brands in 2008 DTC expenditures). Second, we extracted from these advertisements every side effect description using any variation of the words "common" or "rare" (e.g., "rare," "rarely occurring," "commonly"). Third, for each side effect, we searched the product's "prescribing information" insert for information on actual incidence rates of that side effect in clinical trials and postmarketing surveillance. Across all 24 brands' advertisements, 126 specific side effects were described as "common," and 15 specific side effects were described as "rare." For 120 of the 126 "common" side effects, we were able to find the numerical incidence of that side effect in clinical trials among patients in both the drug treatment and the placebo conditions. For example, the consumer advertisement for Viagra states that "common side effects for Viagra include ... facial flushing," while the package insert reveals that "flushing" occurs in 10% of clinical trial patients taking Viagra and 1% of patients given a placebo. Overall, the 120 side effects described as "common" in DTC advertising had a median incidence rate of 7.25% among patients taking the drug (M = 9.51%, SD = 7.98), which is roughly 4.0% greater than the 3.3% median incidence rate in the placebo group (M = 4.38%, SD = 4.67%). Both the 7.25% "raw" incidence rate and the 4.0% "incremental" rate are within the 1%–10% range dictated for "common" side effects in the EU.

Incidence data on side effects described as "rare" were more elusive, in part because "rare" side effects often do not emerge in clinical trials (which involve a few thousand patients) but instead emerge during "postmarketing surveillance" of adverse events. Such data are often difficult to obtain and interpret (e.g., because of underreporting). Nonetheless, we were able to glean some norms in drug companies' use of the word "rare." First, drug company regulatory compliance personnel told us that, in general, they feel comfortable describing a side effect as "rare" in an advertisement as long as it is described as "rare" in product labeling (because the FDA has already approved the labeling). Second, we found that many package inserts contain the following statement: "Rare events are those occurring in less than 1/1000 patients" (i.e., <.1%, much like the EU guidelines for "rare" and "very rare"). Finally, the "rare"

side effects on which we could find data typically had incidence rates much lower than .1%. For example, advertisements for Cialis describe "sudden hearing loss" as a "rare" side effect. This warning is based (Falco 2007) on the FDA having received 29 reports of sudden hearing loss among users of all erectile dysfunction brands between 1996 and 2006, a period during which 40 million erectile dysfunction prescriptions were written. Even if we assume that these 29 reports represent only 5% of all hearing-loss cases among brand users, the incidence rate would translate into .00145%, or 1 of every 69,000 prescriptions.

In summary, the FDA has no official guidelines for the use of words such as "rare" and "common," but the use of these terms in U.S. DTC advertising appears to adhere to norms that are similar to those prescribed in the EU. However, although words such as "rare" and "common" have fairly consistent numerical meanings to drug marketers, it does not necessarily follow that consumers interpret them in this way (Berry et al. 2003). Research suggests that though such terms are familiar to most consumers, their numerical interpretation varies widely from consumer to consumer (Dhami and Wallsten 2005). Furthermore, research in Europe suggests that the mean (or median) percentages that consumers associate with such terms often depart significantly from what they are intended to convey. For example, although British consumers differentiate between frequency words used in package inserts, they tend to overestimate the likelihood of adverse events described with these words (Berry et al. 2003). In particular, British consumers tend to greatly overestimate the likelihood of adverse events described as "rare" or "very rare."

If similar overestimation is shown to occur among U.S. consumers evaluating DTC messages, this could be a problem because it might cause consumers to unnecessarily forgo potentially beneficial medical products and perhaps expose themselves to even greater risks of product nonuse. Wosinska (2005) uses an econometric analysis of consumer sales data to investigate compliance after exposure to DTC advertisements listing the risks of the cholesterol-reducing drug Lipitor and finds reduced drug compliance among the brand's existing users after the execution of the DTC campaign—an effect the author speculates (but does not test) is caused by these consumers' elevated concern about a "rare but serious side effect" (liver damage) described in the DTC advertisements. The question for U.S. drug marketers is, Will similar frequency misperceptions occur when U.S. consumers evaluate product risk information? Thus, the first hypothesis is as follows:

H_1: When consumers evaluate information on a potentially risky new product, (a) they tend to overestimate the likelihood of adverse events described as either "very common" or "very rare" (compared with the actual probabilities these terms are typically used to convey in DTC advertising), and (b) their overestimation of the likelihood of an adverse event is most pronounced for events described as "very rare."

Weighing the Severity and Likelihood of Adverse Product Events

Any risk associated with product use has two important dimensions: the severity of the potential adverse event and its likelihood of occurrence. Several accepted models of how health-related information is processed assume that consumers make health care decisions based on a rational evaluation of both frequency and severity. Typically, consumers are assumed to combine severity and frequency in a multiplicative way, forming global evaluations by weighting the severity (or disutility) of potential outcomes by their subjective probabilities. This "rational" view of risky decision making has been formalized with models that predict independent variables' (e.g., attitudes, susceptibility, severity) influence on behavioral intentions in the health belief model (Berry 2004; Rosenstock 1974), the theory of reasoned action (Fishbein and Ajzen 1975), and the heath action process approach (Schwarzer 2001), among others. These models have been used because they are predictive in survey-based correlational studies that evaluate breast self-examination (Moore, Barling, and Hood 1998) and intention to have a Pap smear (Barling and Moore 1996), among other behaviors. These studies imply that consumers can adequately understand and process the presented risk, benefits, and expected outcomes and thus behave rationally in their health care decisions.

However, we believe that under certain circumstances, consumers' actual weighting of severity and likelihood information will deviate markedly from these expected utility models—the perception of risk may be dependent on other elements of the situation. Risk may be evaluated relative to the perceived benefit (Alhakami and Slovic 1994; Finucane et al. 2000) or influenced by the frame in which the message is presented (Cox, Cox, and Zimet 2006). Weinstein (2000, p. 65) notes that "it is surprising that empirical studies of health-protective behavior provide little support for a perceived probability by perceived severity interaction." It may be that both frequency and severity affect the decision process, but it is not a multiplicative relationship, or it may be that there are situational differences that determine the relative impact of frequency and severity.

Furthermore, we expect severity to be a stronger force because research shows that consumers often have a difficult time differentiating levels of probability but can effectively differentiate levels of payoff (Loewenstein et al. 2001). This research suggests that risk severity information has a greater influence on consumers' product use intentions than risk frequency information. However, consumers' evaluations of risk severity and frequency information may vary depending on their prior affective state. We discuss this phenomenon in the next section.

Media Context, Mood, and Product Risk

Media context is an important but understudied aspect of advertising research (Pelsmacker, Geuens, and Anckaert 2002). Although "real-world" ad exposure almost always occurs within a specific media context (i.e., advertisements are embedded in magazines, television programs, and so forth), most audience testing presents advertisements in a

"media vacuum," without surrounding program or editorial material. However, evidence indicates that media context can affect audience moods and that media-induced moods can affect how consumers process advertising (e.g., Shapiro, MacInnis, and Park 2002).

Yet the effects of media-induced mood on consumers' responses to product risk information are not obvious. Three competing streams of research posit different processes by which mood influences message evaluation. First, the "mood-as-information" model suggests that consumers use mood as a cue to guide information processing and that positive mood reduces detailed processing (see Schwarz 2001). Second, the "risk-as-feelings" model suggests that risk elicits feelings that determine the active mood state and that these risk-induced feelings influence the decision process (see Slovic et al. 2005). The third stream of research posits that a positive mood actually increases consumers' ability to process, use, and extrapolate from information in making decisions (Isen 2000). In this section, we discuss the competing theories' predictions regarding consumer processing of product risk information.

The mood-as-information model posits that positive-affect consumers interpret their mood to mean that "all is well" and then base stimulus judgments on internal, schema-based knowledge ("top-down" processing) rather than detailed external information. Those in neutral or negative moods interpret their mood to mean that "all is not well" and then tend to process detailed information in the environment through "bottom-up" processing (Bless et al. 1996; Schwarz 2001; Schwarz and Clore 1983). However, the findings in this area have been mixed. While some studies find that positive mood induces reliance on global evaluations rather than detailed data analysis (Bless, Mackie, and Schwarz 1992), other research suggests that positive mood does not decrease processing capacity or motivation (Bless et al. 1996). Indeed, happy people have been shown to engage in detail-oriented, effortful processing in some tasks (Bless et al. 1990; Bless et al. 1996). Fedorikhin and Cole (2004) extend this stream by examining perceived social risk and suggest that positive mood can act as a "prime," activating similarly valenced assessments of risk. In general, both the mood-as-information and the affect-priming models suggest a main effect of mood, in which positive-mood people tend to generate more positive evaluations than neutral-mood people. In addition, the risk-as-information model would predict an interaction, in which the judgments of neutral-mood people (compared with positive-mood people) are more strongly influenced by both severity and frequency information because neutral-mood people are more attuned to the details of the environment.

The risk-as-feelings model suggests that the mood generated by the evaluated risk would supersede any preexisting mood state (Alhakami and Slovic 1994; Lowenstein et al. 2001; Slovic et al. 2005). That is, a risky stimulus is "tagged" with some level of affect that is stored in memory. Then, "[affect] may serve as a cue for many important judgments (including probability judgments)" (Slovic et al. 2005, p. S36) through a mental shortcut called the "affect heuristic" (Finucane et al. 2000). Therefore, regardless of media-induced mood or stated frequency of that side effect, participants would reject a product described as having severe side effects (because it generates negative feelings) and accept a product described as having mild side effects (because it generates more positive feelings). Much of the empirical support for the risk-as-feelings hypothesis relies on either correlational studies or mood manipulations that are contained within the same message that presents the risks and benefits of the underlying activity. Thus, in this research stream, it is difficult to separate the influence of mood from the manipulation of risk.

A third stream of research makes different predictions regarding how mood influences risk processing. This research stream posits that positive moods (compared with neutral moods) increase consumers' ability to discriminate between important, high-stakes risks and more minor, low-stakes risks (Isen and Geva 1987). Therefore, although consumers in positive moods may be more likely to disregard relatively trivial risks than consumers in neutral moods, they may be reluctant to take large, unjustified risks involving "meaningful potential losses" (Nygren, Isen, and Taylor 1996, p. 70). In a sense, consumers in good moods should extrapolate risks to their likely outcomes and evaluate risks in proportion to their relative importance. This theory helps explain these and other findings that are difficult to account for with the mood-as-information, affect-priming, or risk-as-feelings hypotheses.

Isen (2000) posits that this phenomenon may be part of a broader pattern, in which people in positive moods are simply better decision makers (i.e., better able to rationally weigh and integrate information, as well as interpret the logical extensions of that information). Research suggests that positive mood facilitates cognitive flexibility, openness to new information, and the ability to perceive connections among potentially related concepts (e.g., Erez and Isen 2002; Isen and Daubman 1984; Murray et al. 1990; for a review, see Isen 2001). Therefore, this stream of research would predict that people in a positive mood (compared with those in a neutral mood) are more likely to use and interpret all the information in a situation and extend that information to a likely outcome to make a decision.

We designed the current study to test the conflicting predictions of the three streams of mood research by independently manipulating audience mood and risk presentation (i.e., frequency and severity). In this way, we set the opposing hypotheses against one another and expect to find support for the third stream of research. Therefore, we propose hypotheses suggested by this third stream of mood research:

H_2: Consumers' behavioral intentions are influenced by a three-way interaction among media-induced mood, side effect severity information, and side effect frequency information.

a. Among neutral-mood people, behavioral intentions are influenced by a main effect of severity. Specifically, neutral-mood people will report significantly lower intention to use a product with potential side effects that are severe, regardless of the stated frequency of these side effects.

b. Among positive-mood people, behavioral intentions are influenced by an interaction between frequency and sever-

ity. Specifically, positive-mood people will give relatively little evaluative weight to the severity of side effects described as "very rare" but substantial weight to the severity of side effects described as "very common."

c. Among positive-mood people, the impact of risk frequency and severity information is mediated by inferences about other product attributes (e.g., perceived product efficacy).

Method

Overview

To test these hypotheses, we conducted a randomized, between-subjects experiment, in which a national sample of young adults was exposed to a brief magazine story (intended to manipulate mood), followed by a message for a prescription drug for the early detection of skin cancer. The experiment varied the frequency and severity of the side effects described in the product message and independently varied the mood evoked by the news story. We discuss the development and pretesting of the experimental stimuli and then describe the main experiment. Note that by using a controlled experiment in which mood and risk are independently manipulated, we can separate the influence of mood from the influence of the two manipulated elements of risk to understand how each affects decision making.

Risk Message Stimuli, Pretests, and Interpretation of Risk Probability Words

Risk messages. Five versions of a message were developed for a prescription lotion to detect skin cancer. Each message version had the same picture (a stylized picture of the sun) and headline ("Important News for Young Adults About Skin Cancer"). The body of each message contained basic information about skin cancer (drawn from the American Cancer Society Web site), which was identical for all experimental and control groups. The experimental messages also contained a statement about a potential side effect, which varied in stated frequency (either "very common" or "very rare") and severity (either "a mild headache that lasts for about an hour" or "an extremely severe headache that lasts for several weeks and may require medical treatment to avoid permanent nerve damage"). The control (no side effect) message stated that "there are no side effects to this lotion." (For full wording of the messages, see the Appendix.)

Risk pretest. To assess participant response to the frequency and severity manipulations, we conducted a pretest using a 2 (frequency of side effect: common versus rare) × 2 (severity of side effect: mild versus severe) factorial between-subjects design, with a control (no side effect). We summarize the results of this pretest in Table 1. Pretest participants were recruited from an introductory business class at a large midwestern university. A total of 114 volunteers participated in the pretest and received extra course credit for their participation. Data were collected using paper-and-pencil measures. Each participant was assigned randomly to one of the five target messages and then completed measurement scales to evaluate his or her perceptions of the frequency and severity of the product's side effects. Participants assessed perceived side effect likelihood using three five-point (1 = "strongly disagree," and 5 = "strongly agree") Likert-type scales (i.e., "It is likely that I will experience some side effects of this lotion"; "If I use this lotion, I will probably experience some side effects"; "Most people who use this lotion will experience side effects"). We measured perceived side effect severity with three statements using the same five-point Likert scale (i.e., "The potential side effects of this lotion are very serious," "This lotion has the potential for very severe side effects," and "Using this lotion could lead to very negative consequences"). These scales for perceived likelihood and severity proved to be reliable ($\alpha = .93$, and $\alpha = .95$, respectively).

To test the impact of the manipulations on perceived side effect severity and likelihood, we ran two two-way analyses of variance (ANOVAs). The severity manipulation check showed that perceived severity was influenced solely by a main effect of stated severity ($F_{(1, 109)} = 170.6$, $p < .001$, $\eta^2 = .61$) and no other main or interactive effects. Thus, the severity manipulation appears to be successful and unconfounded. Furthermore, the reported means show that perceived severity is in the expected direction ($M_{severe} = 4.2$, $M_{mild} = 1.7$, $M_{control} = 2.1$), and a Bonferroni post hoc analysis indicated that the severe condition is significantly higher than either the mild or the control at $p < .001$, and the control and mild cell are not statistically different from each other.

The frequency manipulation check showed that perceived side effect likelihood was influenced by a main effect of stated frequency ($F_{(1, 109)} = 43.2$, $p < .001$, $\eta^2 = .284$) in the expected direction ($M_{control} = 2.2$, $M_{rare} = 2.7$, $M_{common} = 4.0$; all ps $< .05$ in Bonferroni pairwise comparisons). Stated severity had no significant main effect on perceived side effect likelihood. However, there was a significant frequency × severity interaction on perceived likelihood ($F_{(1, 109)} = 10.5$, $p = .002$, $\eta^2 = .088$). Frequency descriptors

TABLE 1
Risk Pretest Means (and Standard Deviations)

	Mild Side Effect		Severe Side Effect		No Side Effect
	"Rare" n = 22	"Common" n = 25	"Rare" n = 23	"Common" n = 22	Control Group n = 22
Perceived side effect severity	1.77 (.86)	1.72 (.56)	4.28 (.79)	4.18 (1.16)	2.10 (1.10)
Perceived side effect likelihood	2.85 (1.0)	3.49 (.75)	2.52 (1.07)	4.42 (.71)	2.20 (1.05)

(common versus rare) had a stronger effect on perceived likelihood when describing severe side effects than when describing mild side effects. Specifically, perceived side effect likelihood was greater among participants in the common/severe condition (M = 4.42) than among those in the common/mild condition (M = 3.49; t = 4.3, $p < .001$, $\eta^2 = .295$). Although this effect could be viewed as a potential confound, note that pretest participants perceived "very common" side effects as more likely than "very rare" side effects, regardless of whether these side effects were mild ($M_{common/mild}$ = 3.49, $M_{rare/mild}$ = 2.85; t = 2.51, $p = .016$) or severe ($M_{common/severe}$ = 4.42, $M_{rare/severe}$ = 2.52; t = 6.97, $p < .001$). Nonetheless, the main study includes analysis to ensure that these effects do not provide an alternative explanation of the results.

Mood Induction Stimuli and Manipulation Checks

To manipulate media-induced mood independently, we selected several "human interest" news stories from the national press and made subtle modifications to each of these stories to elicit either a positive or a neutral mood. The four stories selected reported on (1) a boy who was rescued after being trapped in a "crane" vending machine, (2) the Soap Box Derby national championship races, (3) the "Click It or Ticket" seat belt campaign, and (4) a teenager's attempt to play on the Ladies Professional Golf Association tour. Two versions of each story were constructed to represent positive and neutral versions by changing a few aspects of each story. For example, the two versions of the golf story described the teenager either winning the tournament (positive mood) or merely participating in the tournament (neutral mood). Eight stories (positive and neutral versions of the four original stories) were developed.

Affect Pretest 1. Fifty-six respondents were recruited from an undergraduate business class at a large midwestern university. Respondents were told that they would be evaluating a short news article and would be asked to report their feelings about the article. Data were collected through a Web survey, in which each participant was randomly assigned to one of the experimental conditions. After participants read their assigned article, they were asked the following:

> Now, we would like for you to answer some questions about your feelings while reading this article. Please think back to the article you just read and think about the feelings and emotions that you experienced during this reading. Please indicate the extent to which you felt each of these feelings.

Then, they evaluated the article on two of Izard's (1977) emotion subscales: happy ("joyful," "happy," "delightful"; $\alpha = .94$) and sad ("sad," "down"; $\alpha = .88$).[1] From this initial pretest, we identified the two stories (golf and seat belt) that exhibited the largest differences between the positive and the neutral versions of each of the two articles. We then subjected these four stories (positive and neutral versions of the golf and seat belt stories) to a second pretest.

[1]Participants evaluate each mood descriptor word on a five-point scale, where 1 is "not at all" and 5 is "very much so."

Affect Pretest 2. We conducted the second pretest with 148 students (75 females, 73 males) recruited from introductory business classes.[2] Through the Web survey, each participant was randomly assigned to one of the four final article versions. After exposure to the article, participants responded to Izard's (1977) emotion scale; we used summed measures of the happy ($\alpha = .95$) and sad ($\alpha = .89$) subscales to evaluate the mood induced by each article. We conducted a multivariate analysis of variance (MANOVA) with mood manipulation (positive versus neutral) and news article type (golf versus seat belt) as the independent variables and Izard's happy and sad subscales as the dependent measures. As we expected, there was no main or interactive effect of story type ($F_{(1, 144)} < 1.0$, not significant [n.s.]) on either the happy or the sad subscales, suggesting that both of the story topics could be combined in the analysis. In addition, there was no significant effect on the sad subscale for any of the main or interactive comparisons ($F_{(1, 144)} < 1.7$, n.s.). However, there was a significant main effect of the happy subscale for the positive versus neutral conditions ($M_{positive}$ = 3.35, $M_{neutral}$ = 2.89; $F_{(1, 144)} = 5.74$, $p = .018$). Thus, we deemed the selected news articles to be effective manipulations of media-induced mood.

Method: Main Experiment

To test the hypotheses, we employed a $2 \times 2 \times 2$ between-subjects full factorial experimental design, with a control cell representing no side effects. The factors were media-induced mood (positive versus neutral), product side effect severity (mild versus severe), and product side effect frequency (very rare versus very common). The manipulations of mood, side effect severity, and side effect frequency were identical to those in the pretests.

Participants. Four hundred thirty-four respondents were recruited from a nationwide sample of Internet users (representing 49 different states).[3] The final sample included 93 participants who were in the control cell (i.e., no side effects) and 341 participants who viewed a message that manipulated frequency and severity. The sample was evenly divided by gender (217 females, 216 males). Thirty-eight percent of the respondents were ages 18–28, 23% were ages 29–33, 33.1% were ages 34–38, and 6.5% were age 39 or older. Thus, the majority of participants (more than 94%) fell in the 18–38 age range, which represents "young adults" (i.e., the target audience for the messages). More than 84% had some college or more, 97% had never been

[2]All the student samples were collected from different classes, so no student repeated the same study.

[3]The Internet survey sampling company randomly selected the Caucasian American respondents from a panel of nearly 9 million household members, representing more than 3.7 million unique e-mail addresses worldwide. The panel pool is recruited and enrolled using banner advertisements and online recruitment methods, exclusively with permission-based techniques. The sample participants agree to belong only to this online survey pool and no other. The pool is used exclusively for research (not sales) purposes and is monitored to ensure that participants complete no more than four surveys per year. Although the panelists have an intrinsic motivation to be involved in survey research, they are offered small rewards with each survey invitation.

diagnosed with skin cancer, and more than 80% did not have an immediate family member who had been diagnosed. Random assignment to cells should have distributed these variables equally across the manipulated cells. To be sure, we ran a chi-square test on each distribution. For all three variables, the values are relatively evenly dispersed across the manipulated cells (i.e., self skin cancer diagnosis, all cells have two or fewer reported cases; family skin cancer diagnosis, $\chi^2 < 1.64$, n.s.; and gender, $\chi^2 < .66$, n.s.). Therefore, the sample is considered nonbiased by gender or history of skin cancer.

Procedure. For each person who responded to the survey invitation, the first screen on the Web survey presented an introduction to the study. Participants were thanked for their participation and were told the following:

> In a moment, you will be asked to view a short newspaper article and an advertisement for a proposed new product. Please view these as you would normally view articles and advertisements in a newspaper.... After you have read the article and the advertisement, please ... begin the questionnaire. You will be asked to answer some questions about what you have read and your feelings about the product.

After respondents read the introduction and agreed to participate, they were randomly assigned to one of four versions of a human interest story (2 story type × 2 mood level), followed by one of five versions of the target product message (which varied in the frequency and severity of stated side effects [plus control] as developed in the pretests).

Because the experiment included a manipulation of mood in the form of a human interest story, we wanted to ensure that the respondents did not guess the purpose of the study and respond to demand effects. Thus, as a check for potential demand effects, we conducted a postexperimental inquiry with a sample of 51 adult respondents ages 20–39 (recruited from the survey sampling online panel) who did not participate in the main experiment. Each of these respondents completed the entire experimental procedure and then was asked two additional questions: "What do you think is the purpose of this study?" and "What do you think the researchers expect to find from this study?" None of the respondents guessed any of the study's hypotheses. The majority of respondents stated that the researchers were interested in measuring and/or increasing young people's knowledge about skin cancer risk and skin cancer prevention and detection products. Not a single respondent mentioned the role of mood or emotion or made any reference to the mood induction stimulus (i.e., the news article that preceded the product message).

Pooling and Manipulation Checks

Because we used two versions of the "news article," we conducted a pooling test by running a MANOVA with a "story version code" as an independent variable along with the manipulated variables mood, frequency, and severity. We evaluated the results to determine whether they differed by story version (i.e., golf story versus seat belt story). Pooling test results showed no significant results involving story version in the overall MANOVA or on any of the individual dependent variables evaluated in the study. Therefore, we conducted all subsequent analyses with the data pooled across versions.

Perdue and Summers (1986) suggest that manipulation checks are best conducted in a separate pretest rather than being included in the main experiment that examines the dependent variables (e.g., brand attitudes, intentions). They note (p. 319) that "including these checks in the main experiment can present problems independent of whether they come before or after the dependent variable measures." Manipulation checks placed before the dependent measures may bias the latter (e.g., by creating demand effects), while checks placed after the dependent measures may fail to detect stimulus effects that are inherently transient, such as mood inductions (see Vastfjall 2002). Therefore, we relied on the separate pretest studies to test the effects of the mood and risk manipulations.

Measures

We assessed "behavioral intention" (BI) by averaging participants' evaluations on two statements ("How likely would you be to ask your doctor about this product?" and "How likely would you be to purchase this lotion if it were available?") on a seven-point intention scale ranging from "very unlikely" (1) to "very likely" (7). The resulting scale was reliable ($\alpha = .92$).

We assessed "attitude toward product usage" (Att_{usage}) by measuring participants' agreement with four statements adapted from Cox, Cox, and Zimet (2006) ("Overall, I think this lotion is a very good product," "Using this product would be important to me," "People who use this product are safer than those who do not," and "I would rather use this lotion than any currently available alternative") on a five-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). A factor analysis of these four items yielded a single factor, on which each item had a loading greater than .88, which explained 80% of the variance. Thus, we combined the scores on these four items to form a mean measure with coefficient alpha of .92.

We assessed "perceived overall product risk" (Overall Product Risk) by having participants report their agreement (on a five-point Likert scale) with the statement "Overall, this lotion is risky."

We assessed "fear about using the product" (Fear) by having participants report their agreement (on five-point Likert scales) with the statements "Using this lotion would make me worry" and "I would be afraid to use this lotion." The coefficient alpha for this mean scale was .90.

We assessed "belief about product efficacy" (Efficacy) by having respondents report their agreement with the three statements "This lotion is effective in detecting skin cancer," "This lotion works in detecting skin cancer," and "People who use this lotion are less likely to die of skin cancer" (measured on a five-point Likert-type scale). A factor analysis of these three items yielded a single factor, on which each item had a loading greater than .71, which explained 76% of the variance. Thus, we combined participants' scores on these three items to form an averaged measure with a coefficient alpha of .83.

We assessed "perceived vulnerability to skin cancer" (Vulnerability) using the two statements "I worry about getting skin cancer" and "I am fearful that I will get skin cancer at some time in my life." Participants evaluated these on the same five-point "disagree/agree scale" ($\alpha = .94$).

We assessed "perceived barriers to product use" (Barriers) by having participants report their agreement (same "disagree/agree scale") with the four statements "Using this lotion would be inconvenient," "Using this lotion would be embarrassing," "Using this lotion would be too expensive," and "Using this lotion would take too much effort." A factor analysis of these four items yielded a single factor, on which each item had a loading greater than .66, which explained 67% of the variance. Thus, we combined participants' scores on these four items to form an averaged measure with a coefficient alpha of .84.

In addition, we assessed perceived percentage likelihood by asking a single question: "If you, personally, used the lotion, what is the percentage chance that you would experience some side effects? (Please write in the number) ____ %."

Results

Interpretation of Risk Probability Words

We examined consumers' numerical interpretation of the risk language typically used to describe side effects in DTC prescription drug advertisements. In this analysis, we also entered respondents' age category as a factor to determine whether their estimations of a drug's side effect frequency might vary with their overall level of life experience. As we hypothesized, the data replicate previous findings from Europe (e.g., Berry et al. 2003) regarding consumers' interpretation of probability words, such as "rare" or "common." That is, although a side effect described as "very common" is typically used to imply an incidence of approximately 10%, study participants reported their perceived likelihood of "very common" side effects to be 37.9%. Similarly, although "very rare" is typically used to convey an actual side effect incidence of less than .01%, participants estimated their own likelihood of experiencing such side effects to be much higher (M = 29.03%). Thus, while the estimated likelihood of side effects differs significantly between the "very rare" and the "very common" conditions ($F = 4.50$, $p < .035$), participants tend to greatly overestimate the incidence of side effects associated with these verbal descriptors (particularly "very rare") compared with the actual probabilities these terms are typically used to convey. The analysis also indicated that this tendency did not vary significant across respondent age groups. Age did not have a main effect on consumers' estimated probability of experiencing side effects, nor did it moderate the impact of risk descriptors ("very common" versus "very rare") on those perceptions.

Weighing the Severity and Likelihood of Product Risks

As we noted previously, the economic models of risky decision making assume that consumers will (or should) give decision weight to both the frequency and the severity of potential product risks, weighting the severity of potential effects by their respective likelihoods. However, we predicted that consumers' evaluations of overall product risk information in DTC advertisements would deviate markedly from the predictions of such models. To examine these effects, we conducted a MANOVA with frequency and severity as the independent variables and behavioral intention (BI), attitude toward product use (Att_{usage}), fear of using the product (Fear), and perceived overall product risk (Overall Product Risk) as dependent variables. First, the overall model shows a significant main effect of severity ($F_{(4, 337)} = 22.1$, $p < .001$). Severity had a significant main effect on all the dependent variables in the expected direction: BI ($M_{mild} = 4.3$ versus $M_{severe} = 3.0$; $F_{(1, 337)} = 42.2$, $p < .001$), Att_{usage} ($M_{mild} = 3.5$ versus $M_{severe} = 2.9$; $F_{(1, 337)} = 41.0$, $p < .001$), Fear ($M_{mild} = 2.5$ versus $M_{severe} = 3.3$; $F_{(1, 337)} = 63.4$, $p < .001$), and Overall Product Risk ($M_{mild} = 2.5$ versus $M_{severe} = 3.3$; $F_{(1, 337)} = 68.3$, $p < .001$). Second, there was no significant main effect of side effect frequency in either the overall MANOVA ($F_{(4, 334)} = 1.0$, $p = .41$) or the ANOVAs of the individual outcome variables (η^2 ranged from .000 to .004). Third, there is no evidence of any frequency × severity interaction either in the overall MANOVA (multivariate $F_{(4, 334)} = .81$, $p = .52$) or on any of the four dependent variables (η^2 ranged from .000 to .004). Thus, in the sample as a whole, the stated severity of a product side effect has a strong influence on consumers' product evaluations and perceived risk, while the stated frequency had no effect (main or interactive) on consumers' product evaluations and intentions. However, as we hypothesized, media-induced mood moderated participants' responses to product risk frequency and severity information. We discuss these effects next.

Consumer Mood and Product Risk Response

In the next analyses, we examine how media-induced mood influences consumers' response to product side effect severity and frequency. We summarize the results of this analysis in Table 2. As H_2 predicted, and contrary to the prediction of the mood-as-information and risk-as-feelings literature, there was no main effect of mood on behavioral intention. However, there was a significant interaction of mood × severity × frequency ($F_{(1, 333)} = 5.34$, $p = .021$, $\eta^2 = .016$).

Among neutral-mood participants, behavioral intention was influenced solely by stated side effect severity ($F_{(1, 171)} = 17.1$, $p < .001$, $\eta^2 = .09$), while stated side effect frequency had neither main ($F = .01$, $p = .92$, $\eta^2 = .000$) nor interactive ($F = .61$, $p = .44$, $\eta^2 = .004$) effects on intentions. Thus, as Figure 1 shows, neutral-mood participants gave essentially the same evaluative weight to the side effect severity regardless of whether the side effect was described as "very rare" or "very common." This finding is consistent with H_{2a} but is contrary to most normative models of risky decision making, suggesting that the utility/disutility of a potential outcome should be weighted by its likelihood of occurrence.

However, among positive-mood participants, there was not only a main effect of stated side effect severity on intention ($F_{(1, 162)} = 26.5$, $p < .001$, $\eta^2 = .14$) but also a significant

TABLE 2
Main Experiment: Cell Means (and Standard Deviations)

	Positive Mood				Neutral Mood			
	Mild Side Effect		Severe Side Effect		Mild Side Effect		Severe Side Effect	
	"Rare" (n = 41)	"Common" (n = 39)	"Rare" (n = 42)	"Common" (n = 44)	"Rare" (n = 39)	"Common" (n = 44)	"Rare" (n = 49)	"Common" (n = 43)
Behavioral intent	4.1 (2.1)	5.2 (1.7)	3.3 (1.9)	2.9 (1.9)	4.2 (1.9)	4.0 (2.1)	2.8 (1.6)	3.0 (1.8)
Attitude toward product usage	3.5 (1.0)	3.8 (.7)	2.8 (.9)	2.8 (.9)	3.4 (.8)	3.3 (1.0)	2.9 (.8)	3.0 (1.0)
Perceived overall product risk	2.5 (1.0)	2.6 (1.0)	3.5 (1.0)	3.5 (1.2)	2.4 (.9)	2.4 (.9)	3.2 (1.0)	3.3 (1.0)
Fear about using product	2.5 (.8)	2.7 (1.0)	3.4 (1.0)	3.5 (1.2)	2.3 (.9)	2.5 (1.0)	3.2 (1.1)	3.3 (1.0)
Perceived product efficacy	3.4 (.8)	3.8 (.8)	3.2 (.7)	3.4 (.8)	3.3 (.8)	3.3 (.9)	3.2 (.6)	3.3 (.8)
Perceived barriers to product use	2.6 (.9)	2.4 (.9)	2.6 (.6)	2.6 (.7)	2.3 (.7)	2.5 (.8)	2.7 (.6)	2.8 (.9)
Perceived % likelihood of side effects	21.1 (30.2)	33.8 (33.3)	38.5 (35.0)	43.3 (33.3)	27.7 (35.6)	33.5 (32.2)	33.8 (32.2)	34.7 (36.5)
Perceived vulnerability to skin cancer	3.3 (1.1)	3.5 (1.2)	3.1 (1.1)	2.8 (1.2)	3.2 (1.2)	3.1 (1.1)	3.2 (1.0)	3.5 (.9)

frequency × severity interaction ($F_{(1, 162)} = 5.93$, $p = .016$, $\eta^2 = .04$). As Figure 2 shows, positive-mood participants give relatively little weight to the severity of a potential side effect described as "very rare" ($M_{rare/severe} = 3.3$, $M_{rare/mild} = 4.1$; $F_{(1, 81)} = 3.4$, $p = .07$, $\eta^2 = .04$), but they give substantial weight to the severity of a side effect described as "very common" ($M_{common/severe} = 2.9$, $M_{common/mild} = 5.2$; $F_{(1, 81)} = 31.3$, $p < .001$, $\eta^2 = .28$). This is consistent both with H_{2b} and with normative models of risky decision making, in which high-probability events are given greater evaluative weight than low-probability events. Figure 2 also reveals that when the product's potential side effects are mild, positive-mood participants actually seem to prefer a product whose mild side effects are described as "very common" ($M_{common/mild} = 5.2$) to one whose side effects are "very rare" ($M_{rare/mild} = 4.1$; $F_{(1, 78)} = 6.22$, $p = .015$, $\eta^2 = .074$). Thus, H_{2b} is supported, but the exact pattern of effects is particularly noteworthy.

To better understand this pattern of results, we focused on the third stream of mood research discussed previously in this article. This stream predicts that positive-mood people are more open to unique information and are better able to detect connections among potentially related concepts (Isen 2001). Thus, it seems reasonable that a person in a positive mood may use product risk information to make inferences about other product attributes (see Stewart, Folkes, and Martin 2001, pp. 351–52), especially product efficacy or effectiveness (see Ursic 1984). That is, we posit that positive-mood consumers may make the inference that if a product has common (albeit mild) side effects, it must be effective—or what might be called "the Listerine heuristic" (i.e., "if it tastes bad, it must be killing germs"). In this case, "if they put it on the market with common (albeit mild) side effects, it must be effective."

To assess this interpretation, we first examined whether positive-mood participants' judgments of a product's effi-

FIGURE 1
Behavioral Intent Among Neutral-Affect Participants

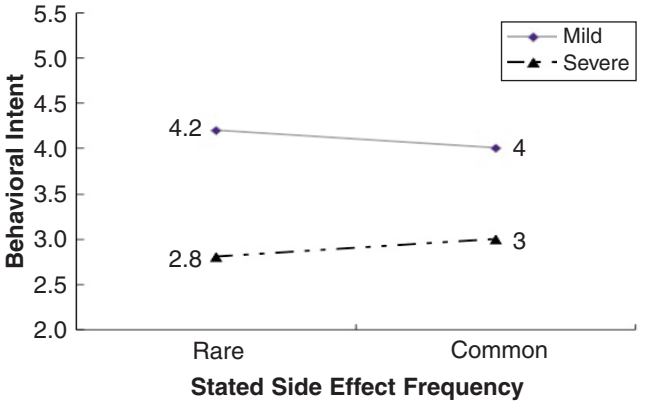
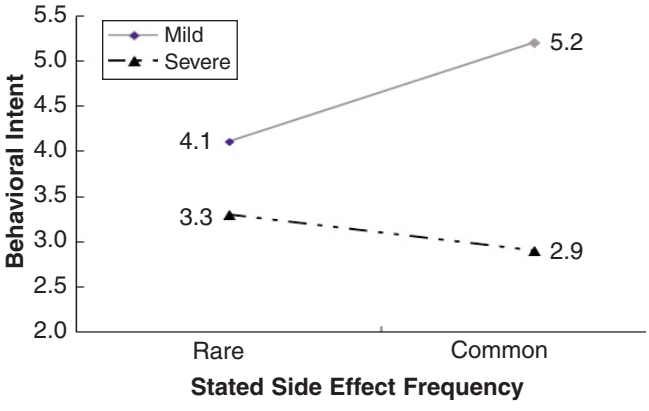


FIGURE 2
Behavioral Intent Among Positive-Affect Participants



cacy are influenced by its side effect frequency. As we predicted, positive-mood participants perceive a product with "very common" side effects as having greater efficacy (M = 3.59) than a product with "very mild" side effects (M = 3.27; $F_{(1, 162)} = 6.98$, $p < .01$). Among neutral-mood participants, stated side effect frequency has no impact on perceived efficacy ($F_{(1, 171)} = .15$, $p = .70$).

Next, we conducted mediation analysis, examining whether positive-mood participants' preference for a product whose mild side effects are "very common" (versus "very rare") is mediated by perceived product efficacy. We employed Baron and Kenny's (1986) mediation test method, estimating a series of regression models and testing the significance of the (unstandardized) regression coefficients. First, a bivariate regression model confirmed that among positive-mood participants, side effect frequency (common/mild versus rare/mild) had a significant effect on behavioral intention (B = 1.08; t = 2.49, $p = .015$). Second, a bivariate regression model confirmed that side effect frequency had a significant impact on perceived product efficacy (B = 1.18; t = 2.12, $p = .037$); that is, positive-mood participants perceived a product with common/mild side effects as more effective than one with rare/mild side effects. Third, we regressed behavioral intention simultaneously on both stated side effect frequency and perceived efficacy. In this model, the proposed mediator (perceived efficacy) has a significant influence on behavioral intention (B = .51; t = 7.77, $p < .001$), while the effect of the independent variable (side effect frequency) becomes nonsignificant (B = .47; t = 1.41, $p = .164$). Thus, the regression results satisfy all four of Baron and Kenny's criteria for establishing mediation. As an additional step, we followed Baron and Kenny's further recommendation and tested the statistical significance of the indirect effect of frequency on intention, mediated by perceived efficacy (frequency → perceived efficacy → intention), using the conservative Sobel (1982) test. This test confirmed the significance of the proposed mediated path (z = 2.04, $p < .05$).[4]

Thus, higher side effect frequency appears to signal higher product efficacy, and as long as potential side effects are mild, this makes the product more attractive to positive-mood participants. However, when potential side effects are severe, positive-mood participants do not prefer the product with more frequent side effects. Why is this so? Analysis indicates that when side effects are mild, perceived product risk has little influence on behavioral intentions ($r_{BI,risk} = –.15$, $p = .18$). Instead, positive-mood participants' intentions to use a product with mild side effects are driven largely by their beliefs regarding its efficacy ($r_{BI,efficacy} = .68$, $p < .001$). However, when side effects are severe, positive-mood participants' behavioral intentions are more strongly influenced by perceived product risk ($r_{BI,risk} = –.46$, $p < .03$), and efficacy is much less important ($r_{BI,efficacy} = .21$, $p = .054$). Fisher's z-tests (Cohen and Cohen 1983) confirm that the intention/risk correlation is significantly higher when side effects are severe ($r_{BI,risk} = –.46$) than when they are mild ($r_{BI,risk} = –.15$; z = 2.2, $p = .028$), while the intention/efficacy correlation is significantly higher when side effects are mild ($r_{BI,efficacy} = .68$) than when they are severe ($r_{BI,efficacy} = .21$; z = 3.95, $p < .001$).

Thus, positive-mood participants perceive higher side effect frequency as signaling higher product efficacy, and as long as potential side effects are mild, this greater effectiveness makes the product more attractive. However, if the product's potential side effects are severe (i.e., it can lead to permanent nerve damage), positive-mood participants do not really care how effective it is.

The results suggest that positive-mood participants not only use both frequency and severity information in evaluating the product but also use this information to make inferences about other product attributes (i.e., efficacy), and they employ these inferences in forming their behavioral intentions. Next, we discuss the implications of these findings.

Discussion

Risk disclosure requirements for DTC advertising are predicated on the assumption that consumers appropriately interpret and weigh this risk information to make informed health care choices (Calfee 2002; FDA 2004). However, the question remains as to how and when consumers use the different types of risk information contained in such messages.

This study examines how consumers respond to information about the frequency and severity of product risks and how such responses are moderated by media-induced affect. We find that consumers tend to greatly overestimate the actual likelihood of adverse events described with words such as "common" or "rare" (compared with the probabilities such terms are typically intended to convey) and tend to give little weight to such probability language when forming product use intentions. However, consumers in positive media-induced moods seem to engage in more nuanced evaluation of product risk information, weighing both frequency and severity information and using such information to make inferences about other product attributes (e.g., product efficacy). In the following paragraphs, we explore these findings in greater depth, discussing their possible implications for marketers and public policy makers. We also note some study limitations and suggest directions for further research.

As we noted previously, most models of risky decision making assume that consumers will (or should) give roughly equal weight to hazard severity and frequency. Many such models posit that these two risk dimensions have an interactive effect on consumer product evaluations,

[4]As an alternative explanation of these results, we examined whether the simple effect of stated side effect frequency (rare versus common) on behavioral intention (BI) was mediated by participants' perceived percentage likelihood of experiencing side effects. However, the data do not support this alternative mediation process. When BI is regressed simultaneously on both stated frequency and perceived side effect likelihood, the proposed mediator (perceived likelihood) has no significant influence on BI (B = .01; t = 1.4, $p = .165$), while the effect of the independent variable (stated frequency) on BI remains significant (B = .96; t = 2.18, $p < .05$). Furthermore, a Sobel test reveals that this alternative mediated path (frequency → perceived likelihood → BI) does not approach statistical significance (z = .13, $p = .897$). Similar analyses revealed that none of the hypothesized effects of the independent variables on BI were mediated by perceived side effect likelihood.

such that the severity of a potential product hazard is weighted by its perceived probability. However, we find no significant main effect of frequency and no frequency × severity interaction among neutral-mood participants. Instead, these consumers' behavioral intentions were strongly influenced by a main effect of product side effect severity. Neutral-mood consumers reported much lower intentions to use a product with the potential for a severe side effect, regardless of whether this side effect was described as "very rare" or "very common."

Although consumers' reluctance to use a product that has any potential to cause severe harm is understandable, the finding that consumers (or at least neutral-mood consumers) give so little weight to information on the likelihood of such harm should be a matter of some concern. It is possible for advertisements for medical products to understate product risks; however, it is also possible for them to overstate them. Because medical products often have important health benefits, such overestimation of risk can endanger consumers' health by deterring use of potentially beneficial products (Stewart, Folkes, and Martin 2001, p. 258). As we noted previously, Wosinska (2005) presents evidence that the risk warnings in Lipitor advertisements caused some heart patients to stop taking the medication, even though the described risk was quite rare. Similarly, some research suggests that FDA "black box" warnings about suicidal thoughts associated with antidepressant use could have actually increased teen suicides by decreasing antidepressant use among depressed adolescents who really needed to be taking the medications (Gibbons et al. 2007). Thus, although there is an understandable push toward more prominent presentation of product risk information in DTC advertisements (FDA 2009), there may be a point beyond which this trend is counterproductive, particularly if consumers disregard information on the (often small) likelihood of the potential adverse event.

However, this study suggests that consumers' processing of product risk information is influenced by media-induced mood. Media-induced mood moderated the effects of product side effect severity and frequency on consumers' behavioral intent. Specifically, consumers in the positive-mood condition were influenced by both frequency and severity information in forming behavioral intent, while those in the neutral-mood condition were influenced only by severity information.

Furthermore, the data suggest that positive-mood consumers' evaluations are driven, at least in part, by inferences about the efficacy of the product. Among positive-mood participants, higher side effect frequency increases perceived product efficacy, and if potential side effects are mild, this makes the product more attractive. However, when potential side effects are severe, positive-mood participants do not prefer the product with more frequent side effects. Further analysis revealed that when side effects are mild, positive-mood participants' product use intentions are driven largely by beliefs regarding product efficacy. However, when side effects are severe, positive-mood participants' behavioral intentions are more strongly influenced by perceived product risk, while efficacy becomes much less important. Thus, positive-mood participants perceive higher side effect frequency as signaling higher product efficacy, and as long as potential side effects are mild, this greater perceived effectiveness increases their intentions to use the product. However, if the product's side effects are severe, positive-mood participants do not really care how effective it is. (By analogy, if a consumer discovers that a Ford Pinto can explode on rear impact, he or she may not really care whether the gas-tank placement increases gas mileage.) In summary, the findings suggest that positive-mood participants not only use both frequency and severity information but also use this information to make inferences about other product attributes (i.e., efficacy) and employ these inferences in forming their behavioral intentions.

These data are consistent with H_2 and are inconsistent with the mood-as-information and risk-as-feelings theories of how mood influences decision making. The mood-as-information theory (see Bless et al. 1996) predicts that positive-mood participants would base their product judgments on their general schema or "activated stereotype" for the broad product category, thus giving little weight to the "specifics of the situation" (i.e., to detailed product attribute information presented in the message). However, we find that positive-mood participants are *more* sensitive to detailed product information presented in the message, weighing information on both side effect frequency and severity and elaborating on this detailed information to make inferences about other product attributes (i.e., efficacy).

Alternatively, the risk-as-feelings literature predicts that the feelings generated by product risk information would overshadow participants' prior mood states, and there would be no significant influence of media-induced mood on the dependent variables. However, the data show an interaction of mood and risk (mood × frequency × severity) with behavioral intent. Thus, the data are most consistent with the predictions of the third stream of mood research we described previously; that is, consumers who are in a media-induced positive mood state (compared with neutral-mood consumers) are more willing to take small risks (mild side effects), particularly when greater efficacy is inferred from the frequency descriptors.

This finding suggests that the positive-mood consumer is more willing to take the presented information and extrapolate it into efficacy implications, while the neutral-mood consumer is focused only on the most salient piece of information presented (i.e., severity) and translates this information into an overall assessment of risk. This result is consistent with the third stream of mood literature we discussed previously, which suggests that consumers in a positive mood are more likely to generate more unusual and diverse first associates (Isen et al. 1985) and to understand metaphors (Roehm and Sternthal 2001).

Implications for Managers and Regulators

The results of this study have several potential implications for both marketers and regulators of risky products, especially products intended to prevent or treat disease. Importantly, this study suggests that consumers make fuller use of product risk information when they are in a positive affective state. Although it is difficult for marketers or policy makers to control the particular mood of a consumer when

he or she is evaluating product risk information, it may be possible to influence his or her mood state when processing such information. For example, advertisers might present positive mood induction stimuli (e.g., pleasant images) within the advertisement itself (though such stimuli should be presented before presentation of risk information, not concurrently, to avoid interference with consumer reception of risk information). Alternatively, positive mood induction might be achieved through media placement—that is, by inserting product risk messages within media environments (e.g., specific magazines) that are likely to create a mood conducive to risk-message processing. Some critics of DTC advertising may be alarmed by such recommendations, concluding that such positive mood inductions are designed to make consumers blithely ignore product risk information. However, that is not what we found—again, positive-mood consumers appear to be more attuned to the nuances of product risk information than neutral-mood consumers. Indeed, it might be fruitful for further research to explore whether positive affect enhances the processing of risk information in other, nonadvertising settings (e.g., whether the presence of pleasant, low-stress atmospherics in a clinical setting enhances patients' ability to weigh potential risks and benefits when considering surgery and other medical treatments).

In addition, the results of this study suggest that marketers and regulators need to find more effective ways of communicating the frequency (or likelihood) of potential product risks to consumers. The marketing literature contains excellent research on how the format of product risk information influences consumer awareness of a potential product hazard (e.g., Bettman, Payne, and Staelin 1986; Hoy and Andrews 2004; Stewart, Folks, and Martin 2001). However, much less attention has been paid to communicating the actual frequency with which such adverse events occur. For some products, such frequency communication may not be important. Some products (e.g., household cleansers; Bettman, Payne, and Staelin 1986) have hazards that are avoidable if the product is used as directed, while other products (e.g., tobacco, illegal drugs) are so harmful that risk communicators may not care whether consumers greatly overestimate the risk of adverse events. However, consumers evaluating medical treatments need to weigh the risks of product use carefully against the risks of product nonuse. Without an understanding of relative risk probabilities, consumers may overestimate extremely low-likelihood risks (e.g., a life-threatening drug reaction) and underestimate higher-likelihood events (e.g., getting the disease the drug is intended to prevent). Therefore, it is important that marketers and regulators explore alternative approaches to communicating risk frequency information to consumers.

Limitations and Further Research

This study has several limitations that should be addressed in further research. First, although this study found that positive media-induced affect can alter consumers' responses to product risk information, further research should broaden this line of investigation and examine the potential impact of specific negative media-induced emotions (e.g., anger, fear, sadness) on consumer interpretation of product risk information.

Second, the participants in this study were relatively young adults (a national sample of adults approximately 18–40 years of age, with a median age of about 30). This was an appropriate audience for the messages (young adults are a prime target audience for skin cancer prevention products), and several DTC campaigns target this age group (e.g., the DTC campaign for the human papillomavirus vaccine Gardasil is targeted toward young women and girls). However, it should be noted that many DTC advertisements target older adults suffering from chronic ailments. There may be differences in how older adults process risk information in such messages, both because of age-related information-processing differences and because of older adults' greater direct experience with the risks associated with both diseases and treatments. Therefore, we urge researchers to examine the phenomena studied herein with older adults. More broadly, it would be fruitful for researchers to examine how individual differences other than age (e.g., health literacy, overall risk aversion) may moderate consumer processing of risk frequency and severity information.

Third, as is the case with many marketing communication experiments, this study presented consumers with mes-

APPENDIX
Risk Message Stimuli

Important News for Young Adults about Skin Cancer

Skin cancer is the most common form of cancer among people in their twenties. Every 53 minutes, someone dies of skin cancer. Skin cancer can be hard to see with the naked eye, or may look like a normal mole or freckle.

Fortunately, there is now a medicated lotion which can detect skin cancer. This product is not a sun block or sun screen. It is applied by a doctor to the patient's skin, and creates a gentle reaction which allows the doctor to easily detect the early development of skin cancer. This lotion is highly effective. [There are no side effects of using this lotion].

A [very common/very rare] side effect of using this lotion is a [mild headache that lasts for about an hour/an extremely severe headache that lasts for several weeks and may require medical treatment to avoid permanent nerve damage].

For more information, call 1-800-4CANCER, or talk to your doctor.

sages for a new, unfamiliar product so that they would have no prior information about the product and its risks. Presenting participants with information about existing brands creates some additional complications because the effects of presented information must be untangled from prior brand beliefs and attitudes. However, despite these methodological challenges, researchers could extend this line of research to the study of familiar brands. In particular, it would be useful to examine how the presentation of risk information affects the decision of existing product users to continue (or discontinue) use of the product.

Finally, further research should examine a broad range of approaches for communicating risk frequency information to consumers, including verbal, numerical, and graphical approaches. As we show in this study, verbal communication of risk (using adjectives such as "rare" or "common") is widely used by marketers, but it is problematic. Such words are inherently ambiguous, and lay interpretations of risk terms often deviate dramatically from the intent of risk communicators. Numerical presentations of likelihoods (e.g., odds, percentages, probabilities) have the advantage of greater precision but also present communication problems. Research suggests that many people find percentages and probabilities to be confusing (Berry 2004; Tversky and Kahneman 1981) and uninvolving (Cox and Cox 2001). However, some research suggests that presenting consumers with "natural frequencies" (e.g., "Of every 10,000 people who take this medicine, approximately 30 people will have a seizure") may be clearer than percentages or probabilities (e.g., Slovic, Monohan, and MacGregor 2000). In addition, Schwartz, Woloshin, and Welch (2009) recently showed that placing numerical drug- and placebo-outcome information in a "drug facts box" in DTC advertisements (similar to nutritional labeling on food packaging) can improve consumer understanding of the drug's benefits and risks. Finally, a promising method of overcoming some of these problems may be the graphical presentation of risk likelihoods. Some research suggests that graphical risk presentations can be processed more rapidly (Paivio 1971) and can increase both risk comprehension and intention to adopt risk-reduction behaviors (e.g., Cox et al. 2010). Therefore, further research should examine whether graphical methods improve consumers' ability to assess product risk and efficacy information in DTC advertisements of prescription drugs and other risky products.

REFERENCES

Aiken, Kathryn (2009), personal communication with Dr. Aiken, social science analyst in the Division of Drug Marketing, Advertising and Communication at the FDA (August 3).

Alhakami, Ali and Paul Slovic (1994), "A Psychological Study of the Inverse Relationship Between Perceived Risk and Perceived Benefit," *Risk Analysis*, 14 (December), 1085–1096.

Barling, Norman R. and Susan M. Moore (1996), "Prediction of Cervical Cancer Screening Using the Theory of Reasoned Action," *Psychological Reports*, 79 (1), 77–78.

Baron, Reuben M. and David A. Kenny (1986), "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology*, 51 (6), 1173–82.

Berry, Dianne (2004), *Risk Communication and Public Health*. New York: Open University.

———, Theo Raynor, Peter Knapp, and Elisabetta Bersellini (2003), "Patients' Understanding of Risk Associated with Medication Use: Impact of European Commission Guidelines and Other Risk Scales," *Drug Safety*, 26 (1), 1–11.

Bettman, James, John Payne, and Richard Staelin (1986), "Cognitive Considerations in Designing Effective Labels for Presenting Risk Information," *Journal of Public Policy & Marketing*, 5, 1–28.

Bless, Herbert, Gerd Bohner, Norbert Schwarz, and Fritz Strack (1990), "Mood and Persuasion: A Cognitive Response Analysis," *Personality & Social Psychology Bulletin*, 16 (2), 331–45.

———, Gerald Clore, Norbert Schwarz, Verena Golisano, Christinea Rabe, and Marcus Wolk (1996), "Mood and the Use of Scripts: Does Happy Mood Really Lead to Mindlessness?" *Journal of Personality and Social Psychology*, 71 (4), 665–79.

———, Diane Mackie, and Norbert Schwarz (1992), "Mood Effects on Attitude Judgments: Independent Effects of Mood Before and After Message Elaboration," *Journal of Personality and Social Psychology*, 63 (October), 585–95.

Calfee, John (2002), "Public Policy Issues in Direct-to-Consumer Advertising of Prescription Drugs," *Journal of Public Policy & Marketing*, 21 (Fall), 174–93.

Cohen, Jacob and Patricia Cohen (1983), *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cox, Anthony D., Dena Cox, and Gregory Zimet (2006), "Understanding Consumer Responses to Product Risk Information," *Journal of Marketing*, 70 (January), 79–91.

Cox, Dena and Anthony D. Cox (2001), "Communicating the Consequences of Early Detection: The Role of Evidence and Framing," *Journal of Marketing*, 65 (July), 91–103.

———, ———, Lynne Sturm, and Gregory D. Zimet (2010), "Behavioral Interventions to Increase HPV Vaccination Acceptability Among Mothers of Young Girls," *Health Psychology*, 29 (1), 29–39.

Dhami, Mandeep and Thomas Wallsten (2005), "Interpersonal Comparison of Subjective Probabilities: Toward Translating Linguistic Probabilities" *Memory & Cognition*, 33 (6), 1057–1068.

Eagly, Alice and Shelly Chaiken (1993), *The Psychology of Attitudes*. Orlando, FL: HBJ Publishers.

Erez, Amir and Alice M. Isen (2002), "The Influence of Positive Affect on the Components of Expectancy Motivation," *Journal of Applied Psychology*, 87 (December), 1055–1067.

Falco, Miriam (2007), "Impotence Drugs May Increase Risk for Sudden Hearing Loss," *CNN Online*, (October 18), (accessed March 1, 2010), [available at http://www.cnn.com/2007/HEALTH/10/18/hearing.loss/index.html].

FDA (1999), "Consumer-Directed Broadcast Advertisements," (accessed March 1, 2010), [available at http://www.fda.gov/ohrms/dockets/ac/00/backgrd/3627b2bl.pdf].

——— (2004), "Brief Summary: Disclosing Risk Information in Consumer-Directed Print Advertisements," (January), (accessed March 1, 2010), [available at http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm069984.pdf].

——— (2009), "Presenting Risk Information in Prescription Drug and Medical Device Promotion," (May), (accessed March 1, 2010), [available at http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/UCM155480.pdf].

Fedorikhin, Alexander and Catherine A. Cole (2004), "Mood Effects on Attitudes, Perceived Risk and Choice: Moderators and Mediators," *Journal of Consumer Psychology*, 14 (1–2), 2–12.

Finucane, Melissa, Ali Alhakami, Paul Slovic, and Stephen Johnson (2000), "The Affect Heuristic in Judgments of Risk and Benefits," *Journal of Behavioral Decision Making*, 13 (January), 1–17.

Fishbein, Martin and Icek Ajzen (1975), *Beliefs, Attitudes, Intentions, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.

Gibbons, Robert, C. Hendricks Brown, Kwan Hur, Sue Marcus, Dulal Bhaurnik, Joelle Erkens, et al. (2007), "Early Evidence on the Effects of Regulators' Suicidality Warnings on SSRI Prescriptions and Suicide in Children and Adolescents," *American Journal of Psychiatry*, 164 (9), 1356–63.

Goetzl, David (2000), "TVB Study: DTC Disclosures Lend Credibility to Drug Ads," *Advertising Age*, (June 5), 6.

——— (2001), "Xenical Reworks Its Ads; TV Spots Stress Awareness, Skip Over Side Effects," *Advertising Age*, (February 5), 3.

Hoy, Mariea G. and J. Craig Andrews (2004), "Adherence of Prime-Time Televised Advertising Disclosures to the 'Clear and Conspicuous' Standard: 1990 Versus 2002," *Journal of Public Policy & Marketing*, 23 (Fall), 170–82.

Isen, Alice M. (2000), "Positive Affect and Decision Making," *Handbook of Emotions*, 2d ed., Michael Lewis and Jeannette Haviland-Jones, eds. New York: Guilford, 417–501.

——— (2001), "An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues with Practical Implications," *Journal of Consumer Psychology*, 11 (2), 75–86.

——— and Kimberly A. Daubman (1984), "The Influence of Affect on Categorization," *Journal of Personality and Social Psychology*, 47 (December), 1206–1217.

——— and Nehemia Geva (1987), "The Influence of Positive Affect on Acceptable Level of Risk: The Person with a Large Canoe Has a Large Worry," *Organizational Behavior and Human Decision Processes*, 39 (April), 145–54.

———, Mitzi M. Johnson, Elizabeth Mertz, and Gregory F. Robinson (1985), "The Influence of Positive Affect on the Unusualness of Word Associations," *Journal of Personality and Social Psychology*, 48 (June), 1413–26.

Izard, Carroll E. (1977), *Human Emotions*. New York: Plenum Press.

Kahneman, Daniel and Amos Tversky (1979), "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, 47 (March), 263–91.

Loewenstein, George R., Eike U. Weber, Christopher K. Hsee, and Ned Welch (2001), "Risk as Feelings," *Psychological Bulletin*, 127 (March), 267–86.

Menon, Ajit, Aparna Deshpande, Matt Perri, and George Zinkhan (2003), "Consumers' Attention to the Brief Summary in Print Direct-to-Consumer Advertisements: Perceived Usefulness in Patient-Physician Discussions," *Journal of Public Policy & Marketing*, 22 (Fall), 181–91.

Moore, Susan, Norman Barling, and Bernadette Hood (1998), "Predicting Testicular and Breast Self-Examination Behavior: A Test of the Theory of Reasoned Action," *Behavior Change*, 15 (1), 41–49.

Morris, Louis, Michael Mazis, and David Brinberg (1989), "Risk Disclosures in Televised Prescription Drug Advertising to Consumers," *Journal of Public Policy & Marketing*, 8, 64–70.

Murray, Noel, Harish Sujan, Edward R. Hirt, and Mita Sujan (1990), "The Influence of Mood on Categorization: A Cognitive Flexibility Interpretation," *Journal of Personality and Social Psychology*, 59 (September), 411–25.

Nygren, Thomas, Alice Isen, and Pamela Taylor (1996), "The Influence of Positive Affect on the Decision Rule in Risk Situations: Focus on Outcome (and Especially Avoidance of Loss) Rather than Probability," *Organizational Behavior and Human Decision Processes*, 66 (April), 59–72.

Paivio, Allan (1971), *Imagery and Verbal Processes*. New York: Holt, Rinehart and Winston.

Pelsmacker, Patrick, Maggie Geuens, and Pascal Anckaert (2002), "Media Context and Advertising Effectiveness: The Role of Context Appreciation and Context/Ad Similarity," *Journal of Advertising*, 31 (Summer), 49–61.

Perdue, Barbara and John O. Summers (1986), "Checking the Success of Manipulations in Marketing Experiments," *Journal of Marketing Research*, 23 (November), 317–26.

Pharma Marketletter (2009), "U.S. DTC Rx. Advertising Falls 8% to $4.4 Billion," (April 27), 1.

Roehm, Michelle L. and Brian Sternthal (2001), "The Moderating Effect of Knowledge and Resources on the Persuasive Impact of Analogies," *Journal of Consumer Research*, 28 (September), 257–72.

Rosenstock, Irwin M. (1974), "The Health Belief Model and Preventive Health Behavior," *Health Education Monographs*, 2 (Winter), 354–86.

Schwartz, Lisa, Steven Woloshin, and Gilbert Welch (2009), "Using a Drug Facts Box to Communicate Drug Benefits and Harms," *Annals of Internal Medicine*, 150 (8), 516–27.

Schwarz, Norbert (2001), "Feelings as Information: Implications for Affective Influences on Information Processing," in *Theories of Mood and Cognition: A User's Handbook*, Leonard Martin and Gerald Clore, eds. Mahwah, NJ: Lawrence Erlbaum Associates, 159–76.

——— and Gerald L. Clore (1983), "Mood, Misattribution, and Judgments of Well-Being: Informative and Directive Functions of Affective States," *Journal of Personality and Social Psychology*, 45 (September), 513–23.

Schwarzer, Ralf (2001), "Social-Cognitive Factors in Changing Health-Related Behavior," *Current Directions in Psychological Science*, 10 (April), 47–51.

Shapiro, Stewart, Deborah MacInnis, and C. Whan Park (2002), "Understanding Program-Induced Mood Effects," *Journal of Advertising*, 31(Winter), 15–26.

Slovic, Paul, John Monahan, and Donald MacGregor (2000), "Violence Risk Assessment and Risk Communication: The Effects of Using Actual Cases, Providing Instructions and Employing Probability vs. Frequency Formats," *Law and Human Behavior*, 24 (3), 271–96.

———, Ellen Peters, Melissa L. Finucane, and Donald G. MacGregor (2005), "Affect, Risk and Decision Making," *Health Psychology*, 24 (July, Supplement), S35–S40.

Sobel, Michael E. (1982), "Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models," *Sociological Methodology*, 13, 290–312.

Stewart, David W., Valerie Folkes, and Ingrid Martin (2001), "Consumer Response to Warnings and Other Types of Product Hazard Information," in *Handbook of Marketing and Society*, Paul Bloom and Gregory Gundlach, eds. Thousand Oaks, CA: Sage Publications, 335–71.

Tversky, Amos and Daniel Kahneman (1981), "The Framing of Decisions and the Psychology of Choice," *Science*, 211 (4481), 453–58.

Ursic, Michael (1984), "The Impact of Safety Warnings on Perception and Memory," *Human Factors*, 26 (6), 677–82.

Vastfjall, Daniel (2002), "Influences of Current Mood and Noise Sensitivity on Judgments of Noise Annoyance," *Journal of Psychology*, 136 (July), 357–70.

Weinstein, Neil (2000), "Perceived Probability, Perceived Severity and Health-Protective Behavior," *Health Psychology*, 19 (January), 65–74.

Wosinska, Marta (2005), "Direct-to-Consumer Advertising and Drug Therapy Compliance," *Journal of Marketing Research*, 42 (August), 323–32.