# Designing Effective Health Communications: A Meta-Analysis

Punam Anand Keller and Donald R. Lehmann

*A meta-analysis of health communications examines the influence of 22 tactics and six individual characteristics on intentions to comply with health recommendations. The analysis indicates that message tactics have a significant influence on intentions toward health-related recommendations even after the authors account for individual differences. In addition, the authors examine when message tactics interact with individual characteristics to determine intentions. The results, which are based on 60 studies involving nearly 22,500 participants, show that there is significant opportunity to tailor health communications more efficiently to different market segments.*

*Keywords*: meta-analysis, health communications, message tactics, tailoring, intentions

The massive costs of health care ($1.7 trillion and counting) and the problems posed by various diseases (e.g., AIDS, obesity, diabetes, cancer, heart disease, mental illness) are well known and documented (Connolly 2004). People worry more about their personal health care costs than losing their jobs, being a victim of a violent crime, or terrorist attacks (Gurchiek 2005). As a consequence, massive efforts to improve knowledge about detection, prevention, and treatment have been undertaken. In addition, there is growing realization that health communication strategies need to be tailored to specific segments (Andreasan 2006). However, there is no general guide to the design of segment-focused health communications (Abrams, Mills, and Bulger 1999). To address this need, this article integrates previous studies that examine the role of message tactics and individual differences on intentions to comply with health recommendations.

Health communication models fall into two general categories: (1) those that examine outcomes related to acceptance of the message recommendations (e.g., attitudes, intentions, and behaviors in line with the message recommendations) and (2) those that examine outcomes related to message rejection (e.g., defensive avoidance, reactance, denial). Because our goal is to examine factors that determine compliance, we do not consider theories in the second category, such as the fear drive model (Hovland, Irving, and Kelley 1953), parallel response model (Leventhal 1970), and extended parallel response models (Witte and Allen 2000). Instead, our model identifies message tactics and individual characteristics that affect intentions. More specifically, this study attempts to identify which of 22 message tactics and six individual characteristics increase or decrease health intentions. To assess the need for tailored communications, we also examine the impact of interactions between message tactics and individual characteristics on intentions to comply with health recommendations. We accomplish this through a meta-analysis on the results reported in 60 published and unpublished experimental studies on health communications.[1]

## Background

There are four main theories explaining the formation of health attitudes, intentions, or behaviors: protection motivation theory, the health belief model, the theory of reasoned action, and subjective expected utility (for a review, see Weinstein 1993). These theories share an underlying premise that health intentions stem from a desire to avoid potential negative outcomes through cognitive appraisals. They all include a cost–benefit component in which the costs of taking a precautionary action are compared with the expected benefits of taking that action. Although the protection motivation model (Rogers 1985) was introduced as a way to test the effectiveness of health communications, extant studies have largely ignored the role of various message tactics and individual characteristics on health intentions. Health messages can provide risk information in different formats to increase perceptions of vulnerability, include action steps, or provide comparative information on alternative health actions to increase intentions (Keller 2006). Furthermore, there is some evidence that individual characteristics moderate health intentions. For example, Keller (2006) finds that promotion-oriented people are more influenced by messages that include action steps than

*Punam Anand Keller* is Charles Henry Jones Third Century Professor of Management, Tuck School of Business, Dartmouth College (e-mail: punam.keller@dartmouth.edu). *Donald R. Lehmann* is George E. Warren Professor of Business, Columbia Business School, Columbia University (e-mail: DRL2@columbia.edu). The authors appreciate Jacklyn Hull's assistance with data collection and analyses. Correspondence about this article or requests for the list of articles included in the meta-analysis should be addressed to Punam Anand Keller. Lauren Block served as associate editor for this article.

[1]A complete list of the articles used in the meta-analysis is available from the first author on request.


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by information on the effectiveness of the recommendations, whereas prevention-oriented people are more influenced by the latter type of message. Similarly, an increase in fear increases intentions among older adults but has been found to reduce health behaviors in young adults (Greening 1997; Keller and Olson 2008). These studies highlight the role of message factors and individual differences on health intentions.

## Message Tactics

Message tactics are a key controllable variable for health practitioners. Although none of the characteristics we studied is unique to health, we relied on health communication studies as much as possible to inform predictions of their impact on intentions. For each message tactic, we discuss the prevailing main-effect predictions, followed by studies that indicate an interaction between one message tactic and one individual characteristic. Because our focus was on tailoring health communications on the basis of individual differences, we do not examine the interactions between two or more message variables or individual differences.

### *Fear*

The literature variously indicates a negative relationship (Feshbach and Janis 1953; Lipkus et al. 2001; Witte and Allen 2000), an inverted U-shaped relationship (Janis 1967; Sternthal and Craig 1974), or a positive linear relationship between fear and preventive behavior (Boster and Mongeau 1984; Maddux and Rogers 1983; Rogers 1985; Sutton 1982). Because most studies reviewed do not arouse a high level of fear, the basic conclusion from this literature is that moderate fear arousal increases intentions, whereas low and high fear either do not change intentions (in the case of low fear) or can boomerang (in the case of high fear). However, the literature also identifies the moderating role of individual characteristics. Keller and Block (1996) show that high fear may be effective if the recipients are involved, whereas low fear may be more effective for people who are less involved.

### *Framing*

Health messages can be framed positively (if a person undertakes the healthful behavior, he or she will gain specific benefits) or negatively (if a person does not undertake the healthful behavior, he or she will lose specific benefits). The literature indicates that, in general, intentions to engage in preventive health are higher when the behavior is framed in terms of its costs (loss frames) than its benefits (gain frames), even when the two frames describe objectively equivalent situations (Rothman and Salovey 1997). Some studies show that the effectiveness of message frames depends on individual differences. Specifically, gain-framed messages may be more effective for people who focus on growth and accomplishment goals (i.e., promotion-oriented people), whereas loss frames may be more effective for people concerned with safety and security goals (i.e., prevention-oriented people; see Lee and Aaker 2004). Furthermore, the literature indicates that loss frames are more effective than gain frames among people who are highly involved, but the framing effect is insignificant or reversed for low-involvement audiences (Maheswaran and Meyers-Levy 1990; Meyerowitz and Chaiken 1987; Rothman and Salovey 1997).

### *Vividness and Base/Case Effects*

Most health messages contain vivid presentations because material in the form of pictures, concrete information, examples of specific cases/stories, or television presentations is typically more persuasive than text only, abstract arguments, population or base-rate estimates, or print presentations (Block and Keller 1995, 1997; Igartua, Cheng, and Lopes 2003; Keller and Block 1997; Kisielius and Sternthal 1986; Rook 1986). However, the vividness effects are reversed or disappear when audiences are highly involved. Furthermore, some races, such as African Americans, may be more dependent on vivid information (Zapka and DesHarnais 2006).

### *Physical Versus Social Consequences*

Emphasizing social consequences may be more effective than emphasizing physical consequences because they arouse less fear (Smith and Stutts 2003). Social consequences are especially salient among women. Denscombe (2001) suggests that women smoke more than men because of social identity and body image (weight control). The literature also suggests that social consequences are more salient among younger populations, whereas physical consequences loom larger as people age (Gold and Roberto 2000).

### *Referencing*

Two factors determine whether to focus the consequences of nonadherence on the target or those close to the target. In general, people tend to think that bad things happen to other people and not to themselves (Menon, Block, and Ramanathan 2002; Raghubir and Menon 1998). Accordingly, health communications in which consequences of nonadherence are directed at others (e.g., friends, family members) are more effective than when the consequences are directed at the individual. In addition, populations that are typically more other oriented, such as woman (Dube and Morgan 1996) and certain races (e.g., Hispanics; Walker et al. 2007), are more likely to respond favorably to messages that emphasize the harmful consequences to others.

### *Argument Strength*

Argument strength in health messages can be attained by a variety of means, including two-sided arguments and the inclusion of response efficacy information (Block and Keller 1998). In general, strong arguments are more effective than weak ones (Ahluwalia 2000; Gleicher and Petty 1992; Rosen 2000), but argument strength is appreciated only by those who are highly involved (Petty and Cacioppo 1986).

### *Source Credibility*

Both the marketing and the psychology literature indicate that source effects are strongest when the audience is not highly involved and engaged in peripheral processing. In a health context, the source effect may spill over to response

efficacy. For example, a message from the American Cancer Society outlining the number of lives saved by getting mammograms may result in higher perceptions of the effectiveness of this diagnostic tool than the same message from an unknown source. Furthermore, the health literature indicates that compared with a male communicator, a female communicator may actually increase message effectiveness (Dinoff and Kowalski 1999). Source credibility effects are less likely among highly involved audiences that focus more on argument strength (Petty, Cacioppo, and Schumann 1983).

#### Two-Sided Arguments

Two-sided messages contain arguments for following and not following the recommendations. Whereas one-sided positive messages are effective when the target audience only needs reinforcement, two-sided messages are more effective when the target audience is initially opposed to the recommendation. By presenting both sides of the issue, the communicator and the message may be viewed as more credible than when a one-sided message is used. Because a more involved audience is more likely to know that there are opposing arguments to the recommended behavior, one-sided messages have been found to work better than two-sided messages with less involved audiences, and vice versa (Settle and Golder 1974).

#### Number of Exposures

The health literature has not tested repetition effects as much as other literature streams. A few health studies have indicated that multiple exposures are more effective than a single exposure (e.g., Dijkstra, De Vries, and Roijackers 1999). Morrow and colleagues (1999) show that repetition may improve message recall among younger (age 19) but not older (age 71) audiences.

#### Tailored Versus Standard

Research has evaluated the effectiveness of communications tailored to audience characteristics, such as stage in decision making (Prochaska and DiClemente 1982), using a variety of methods, such as customized messages (Everett and Palmgreen 1995; Lipkus et al. 2001; Palmgreen et al. 2001), telephone counseling (Dijkstra, De Vries, and Roijackers 1999), computerized messages (Brug et al. 1998), or a combination of them (Curry et al. 1995). These studies report both higher intentions (Currry et al. 1995) and no effect of tailoring compared with a standard message (Drossaert, Boer, and Seydel 1996). Tailoring may have a more favorable effect on promotion-oriented audiences. Conversely, audiences may react with increased anxiety and lower intentions if they are prevention oriented or have a repressive cognitive style (Abrams, Mills, and Bulger 1999).

#### Emotions

Schwarz (1990) suggests that emotions have a role in directing attention and behavior. Compared with positive emotional states that signal that there is no problem, negative emotional states signal a problem-solving or prevention goal. Thus, emotional messages, especially those signaling a negative state, are expected to be more persuasive than unemotional ones (Keller, Lipkus, and Rimer 2002, 2003; Keller and Olson 2008). Furthermore, the literature suggests that these effects are stronger among women than men because women are more likely to engage in emotional appraisal (Dube and Morgan 1996).

#### Health Goal

Desired health behaviors can be undertaken for one of three reasons; (1) to prevent the onset of a health problem (e.g., exercise), (2) to detect the development of a health problem (e.g., breast self-exam), or (3) to cure or treat an existing health problem (e.g., medication for a thyroid deficiency). Although the literature indicates that, in general, prevention behaviors are perceived as less risky than detection behaviors (Rothman and Salovey 1997), messages about detection behaviors may result in higher intentions than messages about prevention behaviors as age increases (Moore et al. 2007). Furthermore, health recommendations either encourage the undertaking of some behavior, such as exercise, or discourage unhealthful behavior, such as smoking. Encouraging behaviors may be more strongly related to intentions than discouraging behaviors (Floyd, Prentice-Dunn, and Rogers 2000). It may also be easier to encourage new behaviors than to stop current unhealthful ones, especially those that are addictive (Taylor et al. 2007). In general, women are more likely than men to encourage healthful behaviors and discourage unhealthful ones (Seiffge-Krenke 2002).

### Individual Characteristics

Our selection of individual characteristics was motivated by studies reporting interaction effects between message tactics and individual differences. Most of these studies are cited in the previous section. In this section, we cite additional studies that indicate main effects of these individual characteristics on intentions.

#### Gender

Women are more likely than men to have higher intentions toward activities that improve their health. This is because they are (1) more concerned about health, especially physical consequences (Beech and Whittaker 2001); (2) more likely to engage in systematic health message processing (Meyers-Levy 1988); and (3) more concerned about long-term effects (Smith and Stutts 2003).

#### Age

The literature suggests that age is positively correlated with intentions to comply with healthful behaviors. Some studies have questioned the value of health communications for adolescents as they transition from allowing their parents to make decisions for them to being more influenced by their peers (Abraham et al. 1994; Fruin, Pratt, and Owen 2006; Pechmann and Shih 1999).

#### Race

The literature indicates that nonwhites may be less influenced by health communications than whites. This may be because of lower access to communications, greater influence of family and peers, and poorer access to health care (Shin et al. 2005; Walker et al. 2007).

### *Involvement*

It is not surprising that a participant's level of involvement is positively associated with higher familiarity and risk perceptions. In turn, this increases compliance with health recommendations (Albarracin, Cohen, and Kumkale 2003; Block and Keller 1998; Keller 1999).

### *Regulatory Focus*

Several studies indicate that the effectiveness of health communication may be a function of regulatory focus (e.g., Aaker and Lee 2001; Higgins 1997; Keller 2006; Lee and Aaker 2004). Regulatory focus theory suggests that people with a promotion orientation are likely to feel less vulnerable and show greater resistance to information about health threats than people with a prevention orientation (Higgins 1997).

## Related Meta-Analyses

Although there are several meta-analyses in the health literature, their goals differ from ours. Some meta-analyses examine the value of different health models for specific health issues, such as smoking cessation (Bruvold 1993) or HIV/AIDS (Durantini et al. 2006), and are based on field studies with a variety of noncommunication interventions. Because our goal is to identify guidelines for designing tailored health communications, we include only lab studies and field experiments that control for noncommunication effects. Other meta-analyses examine the effect of a single message tactic, such as level of fear (Witte and Allen 2000) or framing, on health intentions and behavior. Although these findings help predict the effect of these tactics on intentions, they do not provide comprehensive guidelines across various message tactics. Finally, a set of meta-analyses tests a particular theory, such as the protection motivation model (Floyd, Prentice-Dunn, and Rogers 2000), the health belief model (Harrison, Mullen, and, Green 1992), or the theory of reasoned action (Hausenblas, Carron, and Mack 1997). Although informative, these models do not provide guidelines for how message tactics need to be tailored to people to increase behavioral intentions.

# Method

The literature we cited in the previous section identifies a large number of message tactics and individual differences that influence intentions to comply with health recommendations. We explore the main and interaction effects of these factors in a meta-analysis.

## Selection of Studies

We initially searched for articles using the PsycInfo and ISI (Web of Science) databases. We also conducted searches using the ProQuest, Factiva, and LexisNexis databases. Within these databases, we used selected keywords (and combinations of keywords with "health" as the main topic), such as "health*," "messages*," "communication*," "campaigns*," "prevention*," "marketing*," "marketing strategy*," "experiment*," "tailoring*," "healthcare*," and "healthcare industry*." We located other studies by online and manual searches of journals in psychology, sociology, marketing, medicine, and communications. We also checked the bibliographies of relevant articles to obtain additional sources.

Our search produced articles from three main sources: psychology (47.2%), marketing (24.9%), and communications (12.2%) journals between 1961 and 2006 covering a range of issues, such as cancer (e.g., breast, cervical, skin, bowel), sexually transmitted diseases (e.g., HIV, AIDS, human papillomavirus), alcohol abuse, dental health, solar protection, hepatitis, heart disease, drug addiction, depression, smoking, and nutrition. The basic criteria for inclusion were as follows:

- Studies contained a message intervention: We included only studies that had a health message intervention varying one or more message factors. Specifically, we included studies that examined either main message effects or interactions between two message factors or message factors with individual variables.
- The study was a lab or field experiment: We included only studies that controlled for factors other than the independent variables of interest. We excluded studies that tested health communications in field interventions if they had simultaneous informal communication interventions (e.g., teacher coaching for adolescent sun screen usage) and/or if the study design did not permit assessment of message effects. The resultant percentages of lab and field studies were 66.1% and 33.9%, respectively.
- Data were provided on intention: Studies needed to have a measure of intention to perform the advocated health behaviors. We also gathered data on reported or actual behavior, but two concerns precluded meaningful analysis on this data: (1) The sample size was small (only 24 studies report behavior), and (2) there was no natural bound on behavior, because there is a finite scale for attitudes and intentions (e.g., smoking behavior can range from 0 to 40 cigarettes per day), which makes cross-study comparison difficult.

## Data Coding

Two people coded the data at the study level, and differences were resolved through discussion. For binary data, we used the percentage of participants who had a particular level (e.g., if 78% were women, this was coded as .78). If the variable was manipulated (e.g., case information provided) at the same level for all respondents, it (case information) was coded as a 1 (or 0). To enhance comparability for scales with different ranges, a 4 on a five-point scale, the most common scale encountered, was set to $(4 - 1)/(5 - 1) = .75$. Importantly, linear recoding of an interval-scaled variable does not affect its correlation with another variable. However, coding all variables on a 0–1 scale makes it easier to compare and interpret the size of the unstandardized coefficients, which are needed to predict intention levels (which is the goal here).

In the cases in which a variable was both measured and manipulated, we used the measured value because we had relatively few manipulated levels for many of the variables. When the variable was manipulated and we did not have measured values (e.g., fear, source credibility, argument strength), we converted the manipulated binary variable (e.g., high fear) into scale values. To do this, we used both a logical extreme value (.9) and the 95th percentile value of measured values on the variable (e.g., .81). Because the results do not vary substantially depending on which was

used, we report results based on the easier-to-implement extreme values (i.e., 1 versus 9).

We combined variables if they were reported in only one or two studies and theoretically represented the same general factor. For example, we coded anxiety as fear, and we coded drama/lecture and fast/slow music as levels of vividness. We also assessed whether the study used message tactics, such as fear arousal or base/case information, even if this variable was not the focus of the study.

Some variables had little data and often were assessed only in a single study. We required that at least two studies included the variable before we used it in the analysis. We also required there to be at least ten observations reported before we included a variable in the analysis. This eliminated several variables of theoretical analysis interest, such as message elaboration.

We dealt with missing data on the study characteristics in two ways. First, we treated it as missing in the analysis. Second, we included the mean value for cases in which data were available for three variables: age, gender, and race. The results are similar. Therefore, we used the data with means replacing missing values for age, gender, and race in all our analyses (Lemieux and McAlister 2005).

Typically, meta-analyses first either record or compute an effect size (e.g., correlation) of the impact of, for example, message variables across conditions and then relate effect sizes to other variables (here, individual characteristics) in a two-step procedure. Somewhat different from this type of meta-analysis, we directly relate the level of a key variable (i.e., intentions) to message and individual characteristics. We do this because our interest is in knowing what the value intention will be in different situations. In terms of assessment of the contingencies (impacts of the individual characteristics), the two methods are essentially equivalent (see the Appendix).[2]

**Table 1. Variable Frequency and Simple Correlations with Intentions**

| | Frequency % | Intention |
|---|---|---|
| **Message Tactics** | | |
| Fear | | .05 |
| Gain frame | 12.5 | –.03 |
| Loss frame | 12.8 | –.07 |
| Vividness | N.A. | .02 |
| Base rate stated | 8.6 | –.03 |
| Case of a person | 12.8 | .11 |
| Referencing (self → other) | 18 | **–.13** |
| Social consequences | 11.5 | **.13** |
| Physical consequences | 78.3 | .01 |
| Female communicator | 5.8 | –.01 |
| Male communicator | 2.6 | **–.14** |
| Source credibility | N.A. | **–.15** |
| Argument strength | N.A. | .05 |
| Two-sided arguments | 7.0 | **.14** |
| Multiple exposures | 4.2 | **.13** |
| Tailored message | 3.9 | .02 |
| Emotional message | 3.4 | –.03 |
| Encourage behavior | 74 | **–.12** |
| Discourage behavior | 17.1 | .05 |
| Prevention behavior | 73.3 | –.02 |
| Detection behavior | 20.2 | .02 |
| Remediation behavior | 5.3 | .05 |
| **Individual Characteristics** | | |
| Race | N.A. | .00 |
| Gender | N.A. | **.14** |
| Age | N.A. | –.03 |
| Promotion regulatory focus | 3.8 | –.03 |
| Prevention regulatory focus | 3.8 | –.04 |
| Low involvement | 11.4 | –.09 |
| High involvement | 12.8 | .02 |

Notes: Significant effects are in bold. N.A. = not applicable.

# Results

## Description of the Studies

In total, the studies sampled approximately 22,500 participants and covered a variety of health behaviors. As the means in Table 1 show, the data mostly came from a single exposure to a health communication (95.8%) that encouraged participants to undertake a healthful action (74%) to prevent some health consequence (73.3%), typically a physical one (78.3%).

## Correlational Analysis

To get an initial sense of the data, we correlated each of the analyzed variables with intention. The simple correlations of each message tactic and individual characteristic with intentions appear in Table 1. Most correlations are fairly modest in size, though many are significant.

Table 2 presents the correlations among the 22 message tactics. As in many meta-analyses, there is a collinearity concern given the nonfactorial (i.e., unbalanced) design formed by the predictor variables, several of which are significantly correlated with each other. This makes interpretation of the simple correlations in Tables 1 and 2 potentially misleading. Therefore, we concentrate our efforts on a multivariate regression analysis that controls for the impact of other variables.

## Full Regression Model

We followed four steps to examine the main and interaction effects predicted in the literature. The steps were to (1)

[2]To assess whether weighting would make a substantial difference in this case, we created the following weighting scheme for the intentions results: We treated the average intention score as a percentage (i.e., we interpreted .56 as $p = .56$). We then used the standard formula for variance of a percentage—$\sqrt{p(1-p)/n}$—to calculate an estimated variance. We then weighted each observation by the inverse of its variance and ran a weighted least squares regression. On the whole, the results are similar. Of the 30 coefficients in Table 4, 24 retained the same sign, and none switched from positively to negatively significant, or vice versa. The most notable changes were fear and discouraging behavior, which had significant, positive impacts under weighted least squares, and race and high involvement, which had negative ones. Overall, the correlation between the two sets of coefficients was .58, which increases to .74 if we drop discourage behavior from the calculation. Because the dependent variable was not a true percentage and the sample size for a few of the results were estimated (e.g., for a total sample of 100 across treatments, we estimated the sample size for each cell as 25 when cell sizes were not reported), the weighted least squares results are questionable. Consequently, we report the ordinary least squares results in this article.

**Table 2. Message Tactic Correlations**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 | | | | | | | | | | | | | | | | | | | | | |
| 2 | –.02 | 1.0 | | | | | | | | | | | | | | | | | | | | |
| 3 | .03 | –.08 | 1.0 | | | | | | | | | | | | | | | | | | | |
| 4 | **–.17** | –.06 | –.06 | 1.0 | | | | | | | | | | | | | | | | | | |
| 5 | –.07 | .04 | .04 | .09 | 1.0 | | | | | | | | | | | | | | | | | |
| 6 | –.04 | –.07 | –.03 | **.17** | –.09 | 1.0 | | | | | | | | | | | | | | | | |
| 7 | **.11** | .02 | .01 | –.01 | .09 | –.21 | 1.0 | | | | | | | | | | | | | | | |
| 8 | **.14** | –.02 | –.02 | –.08 | –.10 | –.06 | **.34** | 1.0 | | | | | | | | | | | | | | |
| 9 | .06 | .05 | .05 | .01 | –.02 | **.11** | **–.26** | **–.23** | 1.0 | | | | | | | | | | | | | |
| 10 | .04 | –.04 | –.04 | .06 | .08 | .04 | –.04 | –.07 | –.30 | 1.0 | | | | | | | | | | | | |
| 11 | **.14** | –.05 | –.05 | .07 | .04 | **.11** | .04 | **.12** | –.06 | –.03 | 1.0 | | | | | | | | | | | |
| 12 | –.06 | .03 | .03 | **.17** | .08 | –.07 | **.13** | .01 | –.02 | **.12** | **.12** | 1.0 | | | | | | | | | | |
| 13 | **.11** | **.11** | **.11** | .01 | .03 | –.01 | **.16** | .07 | **.20** | **–.23** | .00 | –.02 | 1.0 | | | | | | | | | |
| 14 | .04 | –.10 | –.10 | **–.12** | –.09 | **–.13** | .10 | **.26** | **.13** | –.06 | –.04 | **–.19** | .05 | 1.0 | | | | | | | | |
| 15 | –.02 | –.02 | –.02 | **.17** | –.07 | **.27** | .06 | .01 | **.13** | –.09 | **–.12** | .08 | **.35** | –.02 | 1.0 | | | | | | | |
| 16 | **.13** | –.02 | –.02 | **.12** | –.04 | .06 | **.35** | **.45** | **.12** | –.06 | .06 | –.05 | .07 | **.32** | **.11** | 1.0 | | | | | | |
| 17 | –.01 | .01 | .05 | **.14** | –.07 | **.40** | **–.11** | –.02 | –.01 | .08 | –.03 | –.01 | .01 | –.06 | –.01 | –.06 | 1.0 | | | | | |
| 18 | .03 | .10 | .10 | –.05 | .10 | **.18** | .04 | –.01 | **.31** | –.08 | –.02 | .01 | **.20** | **–.24** | .07 | **.11** | .01 | 1.0 | | | | |
| 19 | –.04 | **–.15** | **–.15** | **.15** | **–.17** | **–.14** | **.15** | –.09 | **–.13** | .08 | .04 | .05 | .02 | **.29** | **.13** | –.09 | .01 | **–.70** | 1.0 | | | |
| 20 | –.02 | –.03 | –.02 | –.05 | **–.13** | **.13** | .01 | **–.12** | **.29** | **–.28** | –.01 | .03 | **.27** | .10 | **.22** | **–.14** | **.14** | .04 | **.22** | 1.0 | | |
| 21 | .07 | **.11** | .10 | **.11** | **.21** | **–.12** | .05 | –.05 | .10 | .03 | –.07 | .06 | –.03 | **–.14** | –.01 | **.18** | **–.11** | **.19** | **–.13** | **–.67** | 1.0 | |
| 22 | .03 | **.15** | **.15** | –.07 | –.05 | –.08 | **.17** | **.13** | –.10 | –.04 | –.02 | –.05 | **.29** | –.05 | –.10 | –.04 | –.04 | –.05 | .01 | .07 | –.09 | 1.0 |

Notes: 1 = fear, 2 = gain frame, 3 = loss frame, 4 = vivid, 5 = base rate, 6 = case, 7 = referencing, 8 = social, 9 = physical, 10 = female communicator, 11 = male communicator, 12 = source credibility, 13 = argument strength, 14 = two-sided argument, 15 = number of exposures, 16 = tailored, 17 = emotional, 18 = encourage behavior, 19 = discourage behavior, 20 = prevention, 21 = detection, and 22 = remediation. Numbers in bold are significant at $p < .05$.

identify predictor variables with at least ten observations, (2) drop highly correlated main effects (we dropped discourage unhealthful behavior and prevention behavior because they were highly negatively correlated with encourage healthful behaviors and detection behaviors, respectively), (3) run a main-effects and an interaction model with the predictor variables identified in the literature, and (4) examine each predicted interaction by adding it to the full set of main effects. To avoid overlooking potentially important determinants, we used a significance level of .10 instead of the more conventional .05 as a cutoff.

A comparison of the predictions from the literature and the regression results appears in Table 3. Overall, 75% of the predictions were directionally supported, 31% significantly so. Only 4 (8%) were significant in the opposite direction. Thus, in general, the results are consistent with prior research.

There are several significant main effects even when all other main effects are included in the model. Specifically, we find support for the findings in the literature on the effectiveness of using case information, social consequences, other-referencing, female communicators, and messages on detection behaviors. The predictions about two message variables were reversed significantly (source credibility and encouraging healthful behaviors), and others (framing and emotional arousal) had incorrect signs but were not significant. Of the individual differences, we found that women are likely to have higher intentions than men. Although the gender, race, and involvement effects were directionally confirmed, they were insignificant, as was the disconfirmation of the regulatory focus main effect.

With few exceptions, the interactions between individual characteristics and message tactics predicted in the literature received directional and statistical support. The main differences were as follows: (1) Prevention-focused people are significantly more influenced by a gain-framed messages, whereas the reverse is true for promotion-focused people; (2) loss frames do not result in the expected higher intentions among highly involved audiences; (3) moderate fear is most effective across involvement levels; (4) referencing may not matter to highly involved audiences, and the distinction between base and case information may not be valued by people who are less involved; and (5) detection behaviors are associated with higher intentions than prevention behaviors across audience age. We discuss these results in greater detail in the final section.

## A Predictive Model of Communication Effects

To provide guidelines for tailored communications, we used the meta-analysis to develop an empirical model of health communications to increase intentions. We followed eight steps to develop a reduced model that contained main and interaction effects to explain health intentions: (1) identify predictor variables with at least ten observations, (2) create all possible two-way interactions between message tactics and individual characteristics, (3) run a main-effects and an interaction model with the predictor variables identified in Step 1, (4) drop the insignificant variables in Step 3 and rerun the regression, (5) drop interactions that would not be reliable to estimate either because the number of nonzero values is less than ten or when the correlation of a main effect and its interaction are greater than .9, (6) run a regression of the remaining interactions and main effects from Step 3, (7) perform a nested test to determine whether the interactions as a group are significant (they are, suggesting that a main-effects-only model is insufficient), and (8) rerun the regression in Step 6 after dropping insignificant interactions. These steps produced the model in Table 4.

As Table 4 (Columns 1 and 2) indicates, we found several significant effects. As observed in the full regression model, women, whites, and older audiences had higher intentions. In addition, those with either a promotion or a prevention focus had lower intentions. Four message tactics (focus on social or physical consequences, emotional messages, and discouraging unhealthful behaviors) enhanced health intentions. Several other message tactics (loss framing, vividness, and detection behaviors) undermined intentions. We did not observe significant main effects for regulatory focus, gain frames, or referencing.

The model (Table 4) suggests several ways to tailor health communications for different audiences. Health messages promoting detection behaviors are appealing across age segments. However, health communications that focus on personal consequences in an emotional manner will increase intentions in a female audience, but an unemotional appeal is more effective if the target is a male audience. Health messages that focus on personal consequences and use a vivid format (e.g., pictures, concrete descriptions) will result in higher health intentions primarily among white target audiences, but these message tactics boomerang for nonwhite audiences. Finally, prevention-focused audiences that strive to ensure safety and security appear to generate higher intentions in response to a gain-framed message, whereas a loss-framed message is more effective among promotion-focused audiences that are motivated by accomplishment and growth.

The model can be used in at least two ways: (1) to predict the effectiveness of different health communications for a given target audience and (2) to compare the effectiveness of a particular health communication across audiences. To illustrate the first potential use, we focus on the case of encouraging breast cancer diagnosis in older women for three target audiences (1–3) and two message strategies (A and B). Message A employed a gain frame focused on social consequences to others with an emotional but nonvivid format (e.g., "If you detect breast cancer early, your grandchildren can enjoy your company"). Message B used a loss frame focused on physical consequences with a vivid format (e.g., "If you don't detect breast cancer early, you could lose both breasts as shown in the picture of the women in this brochure").

For the first two target audiences—older women, half white and half other, with either a promotion or a prevention focus (Target 1) and older white women with a prevention focus (Target 2)—the first message strategy produced higher average intentions than the second. However, the second message was more effective than the first message among older nonwhite women with a promotion focus (Target 3). These findings highlight the importance of tailoring health communications.

**Table 3. Predictions from the Literature and Results from the Full Regression Model**

| Predicted Direction | Direction | Significance[a] |
|---|---|---|
| **Main Effects** | | |
| Moderate fear > low fear | Confirmed | Not significant |
| Loss frames > gain frames | Disconfirmed | Not significant |
| Vivid > nonvivid | Confirmed | Not significant |
| Case > base rate | Confirmed | Significant |
| Social > physical consequences | Confirmed | Significant |
| Other- > self-referencing | Confirmed | Significant |
| Strong > weak arguments | Confirmed | Not significant |
| High > low source credibility | Disconfirmed | Significant |
| One- > two-sided arguments | Confirmed | Not significant |
| Female > male communicator | Confirmed | Significant |
| Multiple > single exposures | Confirmed | Not significant |
| Tailored > standard format | Confirmed | Not significant |
| Emotional > unemotional | Disconfirmed | Not significant |
| Detection > prevention goal | Confirmed | Significant |
| Encourage healthful > discourage unhealthful | Disconfirmed | Significant |
| Gender: women > men | Confirmed | Significant |
| Age: older > younger | Confirmed | Not significant |
| Race: white > nonwhite | Confirmed | Not significant |
| Involvement: high > low | Confirmed | Not significant |
| Regulatory focus: prevention > promotion | Disconfirmed | Not significant |
| **Interaction Effects** | | |
| High involvement: moderate fear > low fear | Confirmed | Not significant |
| Low involvement: low fear > moderate fear | Disconfirmed | Not significant |
| High involvement: loss > gain | Disconfirmed | Not significant |
| Low involvement: gain ≥ loss | Confirmed | Not significant |
| High involvement: self > other | Disconfirmed | Not significant |
| Low involvement: other > self | Confirmed | Significant |
| High involvement: pictures = text | Confirmed | Not significant |
| Low involvement: pictures > text | Confirmed | Not significant |
| High involvement: base > case | Confirmed | Not significant |
| Low involvement: case > base | Disconfirmed | Not significant |
| High involvement: two- > one-sided argument | Excluded[b] | |
| Low involvement: one- > two-sided argument | Excluded | |
| High involvement: strong > weak argument | Confirmed | Not significant |
| Low involvement: strong = weak argument | Disconfirmed | Not significant |
| High involvement: strong = weak source credibility | Confirmed | Not significant |
| Low involvement: strong > weak source credibility | Confirmed | Not significant |
| Prevention focus: loss > gain | Disconfirmed | Significant |
| Promotion focus: gain > loss | Disconfirmed | Significant |
| Younger: social > physical | Confirmed | Significant |
| Older: physical > social | Confirmed | Significant |
| Younger: multiple > single exposure | Confirmed | Not significant |
| Older: multiple = single exposure | Confirmed | Not significant |
| Younger: prevention > detection | Disconfirmed | Not significant |
| Older: detection > prevention | Confirmed | Significant |
| White: self = other | Confirmed | Significant |
| Nonwhite: other > self | Confirmed | Significant |
| White: vivid = nonvivid | Confirmed | Not significant |
| Nonwhite: vivid > nonvivid | Confirmed | Not significant |
| Men: self = other | Confirmed | Significant |
| Women: other > self | Confirmed | Significant |
| Men: unemotional > emotional | Confirmed | Significant |
| Women: emotional > unemotional | Confirmed | Significant |
| Men: physical > social | Confirmed | Not significant |
| Women: social > physical | Confirmed | Not significant |

[a]Significant at $p < .10$.
[b]Excluded because of collinearity.

**Table 4. Predicted Intentions by Scenario: Reduced Model**

| | | Target Audiences | | | | | |
|---|---|---|---|---|---|---|---|
| | **B** | **1** | | **2** | | **3** | |
| Constant | **2.10** | | | | | | |
| **Individual Characteristics** | | | | | | | |
| Age | **–.01** | .8 | | 1 | | 1 | |
| Gender | **.15** | 1 | | 1 | | 1 | |
| Race | **–1.97** | .5 | | 0 | | 1 | |
| Promotion focus | –.09 | .5 | | 0 | | 1 | |
| Prevention focus | –.13 | .5 | | 1 | | 0 | |
| | | **A** | **B** | **A** | **B** | **A** | **B** |
| **Message Tactics** | | | | | | | |
| Discourage behavior | **.05** | 0 | 0 | 0 | 0 | 0 | 0 |
| Gain frame | –.04 | 1 | 0 | 1 | 0 | 1 | 0 |
| Loss frame | **–.06** | 0 | 1 | 0 | 1 | 0 | 1 |
| Social consequences | **.22** | 1 | 0 | 1 | 0 | 1 | 0 |
| Physical consequences | **.06** | 0 | 1 | 0 | 1 | 0 | 1 |
| Emotion | **1.13** | .7 | 0 | .7 | 0 | .7 | 0 |
| Referencing | .70 | 1 | 0 | 1 | 0 | 1 | 0 |
| Vividness | **–3.26** | .2 | .8 | .2 | .8 | .2 | .8 |
| Detection behavior | **–.22** | 1 | 1 | 1 | 1 | 1 | 1 |
| **Interactions** | | | | | | | |
| Age × detection behavior | **.01** | .8 | .8 | 1 | 1 | 1 | 1 |
| Gender × referencing | **.62** | 1 | 0 | 1 | 0 | 1 | 0 |
| Gender × emotion | **–1.67** | .7 | 0 | .7 | 0 | .7 | 0 |
| Race × vivid | **4.31** | .1 | .4 | 0 | 0 | .2 | .8 |
| Race × referencing | **–1.61** | .5 | 0 | 0 | 0 | 1 | 0 |
| Prevention × gain frame | **.51** | .5 | 0 | 1 | 0 | 0 | 0 |
| Promotion focus × loss frame | **.42** | 0 | .5 | 0 | 0 | 0 | 1 |
| Predicted average intentions | | .80 | .56 | .95 | .32 | .45 | .95 |
| Estimated actual behavior[a] | | .32 | .16 | .45 | .05 | .10 | .45 |

[a].5(intention)$^2$.
Notes: Numbers in bold are significant at $p < .10$.

Intention does not directly convert to behavior and is an unreliable predictor at the individual level.[3] Behavior also increases substantially at high levels of intention. Thus, recalibration is required to convert intentions into predicted behavior (Jamieson and Bass 1989; Kalwani and Silk 1983). A useful approximation is related to the square of intentions. Specifically, behavior = .5(intentions)$^2$. This formula produces the predicted behavior estimates in the last row of Table 4. Using these calculations, we find that compliance with the message is still better for the good message, albeit no single message is predicted (logically) to create anything close to universal compliance.

[3]Although the dependent variables are logically bounded between zero and one, regression-based results may produce predictions outside the feasible range. Therefore, for the purpose of building a model to help predict the impact of marketing communication on intentions, we created a new variable, ln[intention/(1 – intention)] and used it as the dependent measure in regression. By multiplying values of the variables by the coefficients from the regression (i.e., calculating $B_iX_i$) and then "undoing" the transformation, we can predict intentions under different scenarios as Intentions = exp(BX)/1 + exp(BX).

## Discussion

A meta-analysis of 60 studies, which report results in 584 different experimental conditions, indicates that the type of message communication has an impact on intentions. We used two approaches to identify fruitful matches between message tactics and audience characteristics, a full and reduced regression model. The results from the full regression model suggest that the meta-analysis supports the majority of the effects observed in the literature (Table 3). Specifically, we find support for the use of case information, social consequences, other-referencing, female communicators, and messages on detection behaviors to enhance health intentions. We also recommend focusing on discouraging unhealthful behavior rather than promoting healthful behaviors and deemphasizing source credibility. Finally, untailored framing and emotional messages are not advisable.

Our results indicate that low-involvement audiences are more persuaded by moderately fearful gain frames, other-referencing, vivid messages, and strong source credibility. Conversely, high-involvement audiences prefer base infor-

mation and strong messages that are also moderately fearful, but they do not distinguish between levels of vividness, source credibility, and referencing. Surprisingly, we did not find a differential advantage for the loss-framed message among those who were highly involved. Similarly, we did not observe the differential advantage of the loss-framed message among prevention-focused people, but we did among promotion-focused audiences. Coupled with a negative, albeit insignificant, main effect of loss frames on health intentions, these findings suggest that the process underlying the effects of loss-framed health communications should be revisited.

Younger audiences prefer social consequences over multiple exposures, whereas older audiences are more influenced by physical consequences, regardless of the number of message exposures. Messages advocating detection behaviors are popular across age groups. Nonwhites seem to care more about vivid messages that emphasize the effect of health consequences on loved ones. Finally, messages that persuade women are different from those that influence men. Specifically, women respond to emotional messages with social consequences for oneself or health consequences to near and dear ones, whereas men are more influenced by unemotional messages that emphasize personal physical health consequences. Taken together, these findings offer many opportunities to tailor health communications for different target audiences.

## Limitations

There are several limitations to this study. These pertain to the absence of data on behavior and other variables, the exclusion of other possible interaction effects, and some standard meta-analysis methodological issues.

### Absence of Data on Behavior and Other Variables

The data set does not permit an examination of the relationship between intentions and behavior. Sheeran and Orbell's (2000) meta-analysis indicates that intentions explain no more than 50% of behavior and that the relationship is diminished as the time gap between assessment of intentions and behavior increases. One approach to increase the link between intentions and behavior is to encourage people to set clear standards regarding when the intended outcome is achieved (Gollwitzer, Heckhausen, and Steller 1990). Another method is to present people with hypothetical scenarios that describe (un)successful progress toward behavioral outcomes and to measure intentions to continue performance of the behavior (e.g., weight loss of three pounds in the first month, two in the second, and so forth; Chatzisarantis et al. 2004).

We also were unable to examine some important variables because of insufficient data. In particular, we were unable to examine elaboration, recall, affective reaction to the consequences, and health recommendations, as well as the effects of health barriers, such as financial impediments. Future studies should include more nonexperimental data and consider specific diseases. In addition to capturing the influence of individual and message tactics more effectively, field studies may provide more insights into longitudinal effects and the relationship between intentions and behavior.

### Exclusion of Interaction Effects

This study is restricted to main and interaction effects between categories of predictors (i.e., between message tactics and individual differences). For example, the interaction between two message tactics (fear and message frame) or two individual characteristics (involvement and gender) remains untested.

### Directionality

The results from this study are aggregate and largely correlational. In addition, high correlations between predictor variables may distort the regression results. Further research could test whether the data support specific health communication models (e.g., Albarracin, Cohen, and Kumkale 2003).

### Measurement Errors

Our judgment-based estimates of the level of fear, source credibility, and argument strength may be inaccurate. Furthermore, we may have increased the variance of certain variables by combining them with related theoretical constructs (e.g., anxiety, fear) and increased the predictability of base/case information by including this variable even when it was not the focus of the study. There are also the standard problems of meta-analysis. These include the possibility of omitted studies and the unbalanced nature of the design. These problems not withstanding, we uncovered some notable and potentially important results.

## Summary

A major goal of this article was to provide evidence-based guidance for tailoring health communications to enhance health intentions. In general, the meta-analysis results support those of previous studies. Our results (Table 4) indicate that several message factors can be used to enhance the effectiveness of health communications aimed at broad audiences. We advocate emphasizing social and physical consequences in an emotional format to enhance health intentions. For example, "If you smoke around your kids, they are more likely to suffer from bronchitis and be ostracized by their friends because their clothes smell of smoke." The model also indicates that, in general, three message tactics should not be used: vivid messages, promotion of detection behaviors, and loss frames.

The model also indicates that health communications should be tailored for specific audiences. Although health messages on detection behaviors are equally appealing across age segments, older target audiences have higher intentions for detection behaviors than prevention or remedial behaviors. Thus, an effective smoking cessation message for older adults may be, "Get tested for lung damage from the effects of primary or second-hand smoke." For female audiences, an emotional message emphasizing personal consequences is effective (e.g., "Reduce your anxiety and get peace of mind by staying away from people who smoke"), whereas an unemotional message is more effective for men (e.g., "Don't smoke and stay away from smok-

ers"). Our data indicate that white audiences are more persuaded by messages that focus on personal consequences and use a vivid format (e.g., "You will be healthier if you stay away from smokers by not going near smoking areas including bars, outside office buildings, and stadiums"), but nonwhite audiences are more influenced by social consequences and nonvivid formats, such as "Don't smoke if you want to remain influential among your friends and community."

Table 4 can be used to predict the effectiveness of targeted health communications by inserting individual target characteristics (e.g., Target 1) to examine the effectiveness of different communication strategies (e.g., A or B). Alternatively, values for an existing communication strategy (e.g., A) can be used to predict its best target audience (Target 1, 2, or 3). Follow-up studies should both assess the predictive value of the model in Table 4 and use alternative methods (e.g., clinical trials) to substantiate, refine, or refute the results. Such work will contribute to both basic theory and more effective health communications.

## Appendix

Our analysis uses a less aggregate level of data than many meta-analyses. Given appropriate weighting, it will produce equivalent results. Consider a case with two studies, each with two conditions X (e.g., messages), two levels of individual characteristic Z, and three observations per condition:

| Study | Dependent Variable Y | Condition X | Characteristic Z |
|---|---|---|---|
| 1 | Y(1, 1, 1) | 1 | 1 |
| 1 | Y(1, 1, 2) | 1 | 1 |
| 1 | Y(1, 1, 3) | 1 | 1 |
| 1 | Y(1, 0, 1) | 0 | 1 |
| 1 | Y(1, 0, 2) | 0 | 1 |
| 1 | Y(1, 0, 3) | 0 | 1 |
| 2 | Y(2, 1, 1) | 1 | 0 |
| 2 | Y(2, 1, 2) | 1 | 0 |
| 2 | Y(2, 1, 3) | 1 | 0 |
| 2 | Y(2, 0, 1) | 0 | 0 |
| 2 | Y(2, 0, 2) | 0 | 0 |
| 2 | Y(2, 0, 3) | 0 | 0 |

If the data are disaggregated, it is possible to pool data across studies and conditions to run a simple regression to estimate simultaneously the effect of X, Z, and XZ on Y at the individual level (i.e., treat it as a single data set).

However, the literature rarely provides raw data. If there are average results within a condition (as is the case here), we get the following:

| Study | Dependent Variable Y | Condition X | Characterstic Z |
|---|---|---|---|
| 1 | $\hat{Y}(1, 1)$ | 1 | 1 |
| 1 | $\hat{Y}(1, 0)$ | 0 | 1 |
| 2 | $\hat{Y}(2, 1)$ | 1 | 0 |
| 2 | $\hat{Y}(2, 0)$ | 0 | 0 |

We ran the analysis at this level (i.e., $\hat{Y}$ versus X and Z). Our meta-analysis model is as follows:

$$(A1) \qquad Y(i, j) = B_0 + B_1X(i, j) + C_0Z(i) + C_1X(i, j)Z(i).$$

It is possible to aggregate the data further by examining the difference between values of the dependent variable within the study and between conditions (and convert this to an effect size measure, such as a correlation):

| Study | Effect of X = 1 Versus 0 | Z |
|---|---|---|
| 1 | $\hat{Y}(1, 1)$—$\hat{Y}(1, 0)$ | 1 |
| 2 | $\hat{Y}(2, 1)$—$\hat{Y}(2, 0)$ | 0 |

This is probably the most common way to set up a meta-analysis. Here, the meta-analysis equation becomes the following:

$$(A2) \qquad \hat{Y}(i, 1) - \hat{Y}(i, 0) = C_0 + C_1Z(i).$$

In this case, the $C_1$ derived from Equation A2 will be identical to that from Equation A1; that is, it does not matter which way this is done if the focus is on the impact of Z. However, if the focus is on predicting $\hat{Y}$ under different conditions (Xs), our approach is more straightforward.

When sample sizes differ by condition and different studies have different numbers of observations, the results will differ because of differential weighting; the fully disaggregated approach weights each data point equally, the "average" approach we follow weights each condition equally (and, thus, studies with more conditions more heavily), and the final approach weights each study equally. Different weighting schemes can be employed depending on how the researcher wants to weight the observations, conditions, and/or studies.

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