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A Model of Consumers' Preventive Health Behaviors: The Role of Health Motivation and Health Ability

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This article develops and tests a model of the individual and joint effects of various consumer characteristics on health information acquisition behaviors (e.g., using media sources) and health maintenance behaviors (e.g., restricting diet). Theory development overviews the interdisciplinary literature on health and proposes that health motivation independently influences consumers' preventive health behaviors while the effect of health ability on health behaviors is moderated by the level of health motivation. This theory is tested in a survey of 404 consumers. Results indicate that the interaction of health ability and health motivation affects consumers' health behaviors. However, mixed results suggest that high levels of ability and motivation are not always critical precursors of health behaviors; instead, the impact of these characteristics depends on the particular health behavior and the specific health ability characteristic. Implications for theory and practice are discussed.

Consumers are increasingly sensitive to factors affecting their health. As a result, in 1992 an estimated \$817.2 billion was spent on health activities (U.S. Department of Commerce 1993), much of which involved preventive health measures (McGinnis 1990). Despite the obvious importance of health behaviors and the size of these expenditures, investigations from the field of consumer research regarding health have been limited. One reason may be lack of comprehensive models to explain consumers' health behaviors (see Zaltman and Vertinsky [1971] for a significant exception). Instead, research has typically focused on single dependent variables, such as nutrition information processing (Russo et al. 1986) or patient satisfaction (Friedman and Churchill 1987), or on single independent variables, such as age (Cole and Gaeth 1990), social class (Gelb and Gilly 1979), or health beliefs (Oliver and Berger 1979; Smith and Scammon 1986). Another reason for limited consumer research is that health behaviors are an interdisciplinary concern, including such fields as psychology, health education, preventive medicine, epidemiology, sociology, nutrition, public health,

social marketing, and consumer research (see Table 1 for a summary of health models). A third reason may be the nature of health research findings, which have tended to be equivocal in nature.

The present article draws on research across disciplines to develop a model of consumers' health behaviors that includes a comprehensive set of consumer characteristics and health behaviors. The consumer characteristics are conceptualized as either a health motivation or a health ability, and the theory introduces interactions among these characteristics to explain a series of preventive behaviors ranging from health information acquisition to dietary change and stress management. This approach extends existing theory while explaining equivocal results of past research.

CONCEPTUAL FRAMEWORK

Model Overview

The proposed model focuses on two sets of preventive or asymptomatic health behaviors. *Health information acquisition behaviors* refer to the degree to which consumers acquire health information from various sources, including media and labels, friends and family, and health professionals. *Health maintenance behaviors* refer to the degree to which consumers perform health-enhancing behaviors, including utilizing health professionals for checkups, improving dietary intake, minimizing stress, moderating alcohol consumption, and eliminating tobacco use.

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TABLE 1
OVERVIEW OF HEALTH MODELS

Models and description	Sample studies
A. Communications models:	
Threatening health communications models: describe the change of health cognitions through the use of threatening communications	Higbee (1969); Leventhal (1970)
Persuasive communications models: describe the interpretation and reception of persuasive health communications as a function of message and recipient characteristics	McGuire (1981); Petty and Cacioppo (1986)
Diffusion of innovation models: theorize that patterns of health innovation adoption depend on acceptance and communication by opinion leaders	Rogers (1983); Smith, Olshavsky, and Smith (1979)
B. Social models:	
Sociocultural models: assess impact of cultural, subcultural, group norms, life-style, and socioeconomic factors on health behaviors	Bullough (1972); Coburn and Pope (1974); Langlie (1977)
Empowerment education models: illustrate how group participation and community action enhance beliefs in ability to change health behaviors	Friere (1983); Wallerstein and Bernstein (1988)
C. Cognitive models:	
Health belief models: focus on health behaviors' perceived benefits and barriers, the perceived threat of harm, and perceived internal and external cues to action as determinants	Becker (1974); Janz and Becker (1984); Rosenstock (1974)
Perceived utility models: predict choice of health-related actions with greatest perceived utility	Cohen (1984); Marsh and Matheson (1983)
Behavioral intention models: explore relationships between attitudes and health behaviors with behavioral intention as a mediator	Ajzen and Madden (1986); Fishbein and Ajzen (1975); Fishbein and Jaccard (1973)
Health consciousness model: investigates health involvement, self-monitoring, and awareness as determinants	Gould (1990)
D. Behavioral models:	
Social learning theory: focuses on role of modeling behaviors, necessity of developing skills, and encouragement of self-efficacy	Bandura (1977, 1986)
Health locus of control models: theorize about the effects of health outcome control orientations (i.e., the degree to which health outcomes result from personal efforts, chance, health care providers, or general threats)	Lau (1982, 1988); Lau and Ware (1981); Wallston and Wallston (1982)
Behavioral modification models: use operant-conditioning techniques to influence health behaviors	Davidson and Davidson (1980); Pomerleau, Bass, and Crown (1975)
E. Marketing models:	
Contingency framework: suggests health provider-patient relationships differ depending on power sources	Friedman and Churchill (1987)
Social marketing models: theorize that manipulation of marketing mix variables (product, price, place, and promotion) can motivate health behaviors	Gelb and Gilly (1979); Kotler and Zaltman (1971)
Health information utilization models: theorize about the effects of consumer and information characteristics on cognitive and behavioral health activities	Cole and Gaeth (1990); Moorman (1990); Russo et al. (1986); Scammon (1977)
F. Combination models:	
Self-regulating behavior model: theorizes that personal, behavioral, and environmental variables influence health behaviors	Clark and Zimmerman (1990)
PRECEDE model: classifies health influences as predisposing factors (e.g., knowledge), enabling factors (e.g., environment), and reinforcing factors	Anderson and Newman (1973); Smith and Scammon (1986)
Empowering potential/wellness motivation model: focuses on imaging health behavior change and the role of support structures in initiating and maintaining health behaviors	Fleury (1991)
Person-environment dynamic interaction model: stresses reciprocal relationships among situational and personal determinants of health behaviors	Levy (1991)
Protection-motivation and adaptive/maladaptive coping model: models sources of information and cognitive-mediating processes (i.e., perceived self- and response efficacy) as determinants of adaptive and maladaptive health-coping strategies	Rippetoe and Rogers (1987)
Health marketing strategy evaluation model: includes psychological, social, and behavioral variables as health behavior determinants in less developed countries	Zaltman and Vertinsky (1971)
Health promotion model: consists of cognitive-perceptual elements, modifying environmental factors, and other cues to action as health behavior determinants	Pender (1987); Weitzel (1989)

Two general categories of consumer characteristics are examined as predictors.¹ The first, *health motivation*, is defined as consumers' goal-directed arousal to engage in preventive health behaviors (see MacInnis, Moorman, and Jaworski 1991; Park and Mittal 1985). This characteristic focuses on consumers' willingness to perform or interest in performing health behaviors. The second, *health ability*, refers to consumers' resources, skills, or proficiencies for performing preventive health behaviors. Seven consumer characteristics reflecting health ability are investigated: health knowledge, health status, health locus of control, health behavioral control, education, age, and income. In this model, each characteristic is viewed as a resource or skill that consumers exhibit to varying degrees. For example, health knowledge and education levels reflect an expertise that assists in health information processing and in selecting healthy behaviors. Likewise, age and health status reflect resources that indicate consumers' mental and physical abilities to select and implement health behaviors. Income reflects consumers' financial abilities to implement health behaviors. Finally, health locus of control and health behavioral control beliefs, which reflect a sense of control over health outcomes and behaviors, indicate greater perceived ability to engage in health behaviors.

A focus on motivation and ability as predictors of behavior is consistent with prior research. In the literature on planned change, for example, variables reflecting target adopters' motivation and ability are stressed as important preconditions for attitudinal and behavioral change (Davis 1973; Davis and Salasin 1975; Zaltman and Duncan 1977). Furthermore, previous consumer research has suggested that ability and motivation increase attention to and comprehension of relevant information and produce more stable and enduring attitudes (Batra and Ray 1986; Bettman and Park 1980; Celsi and Olson 1988; Hoch and Deighton 1989; Lutz, MacKenzie, and Belch 1983; Petty and Cacioppo 1986).

Other research describes the effects of interactions among motivation and ability, such as Bettman and Park (1980), who conclude that consumers who are moderately motivated and moderately able perform information-processing activities most effectively; MacInnis and Jaworski (1989), who propose that ability moderates the effect of motivation on ad information processing; and MacInnis et al. (1991), who theorize, and Maheswaran and Sternthal (1990), who demonstrate, that high ability and high motivation result in the highest processing level.

The proposed model theorizes that health motivation independently influences consumers' preventive health behaviors (referred to as health behaviors throughout). Health motivation activates consumers and drives them

to pursue health behaviors, which are presumably important goals or values (Celsi and Olson 1988). Health motivation also moderates the impact of health ability on health behaviors. In this way, health motivation stimulates consumers to put their knowledge, skills, or resources into practice.

Hypothesized Relationships

Table 2 contains the literature used to generate the proposed hypotheses. Research examining health motivation has found it to be associated with most health behaviors. Likewise, the consumer research literature has found that motivated consumers devote more attention to and exert greater cognitive effort toward the processing of relevant information (see Celsi and Olson [1988] for a review of this literature). Similarly, we propose that health motivation will increase consumers' health information acquisition and health maintenance behaviors. The rationale, in this case, lies in the fact that health motivation's arousal should drive consumers to engage in health behaviors. We hypothesize:

H1: Consumers with higher health motivation levels will perform more health behaviors than will consumers with lower health motivation levels.

Considering health abilities, *health knowledge* refers to the extent to which consumers have enduring health-related cognitive structures. Several health studies report that highly knowledgeable consumers acquire and retain more information (see Table 2). These findings indicate, as consumer research has, that knowledge may ease the encoding of information, which may make acquisition more likely (Alba and Hutchinson 1987; Brucks 1985; Johnson and Russo 1984; MacInnis et al. 1991). Other research, however, indicates that high knowledge levels may reduce consumers' acquisition of information if they feel less need for more information (Table 2; Bettman and Park 1980; MacInnis and Jaworski 1989). One way to minimize these possible negative effects is to ensure that knowledgeable consumers are also highly motivated. High motivation will offset knowledgeable consumers' tendency to reduce information acquisition, while not diminishing the facilitating role that current knowledge can play in information acquisition activities.

Table 2 indicates the same equivocality associated with the effect of health knowledge on health maintenance behaviors. One way to interpret these mixed results is to suggest that health knowledge will affect health behaviors only when health motivation is present. Theory supports this perspective by viewing knowledge as an important starting point in decision making but not ensuring behavioral implementation (Lavidge and Steiner 1961; Ray et al. 1973). However, other research suggests that, when knowledgeable consumers are motivated, the likelihood of behavior increases (Rogers 1983). We predict:

¹Consumer characteristics can also be conceptualized from the perspective of the PRECEDE model, which views them as predisposing (enduring), enabling (situational), or motivating in nature (Anderson and Newman 1973).

H2: Consumers with higher health knowledge levels will perform more health behaviors than will consumers with lower health knowledge levels when health motivation is high as opposed to low.

Health status refers to consumers' perceived physical and mental well-being. We conceptualize good health as a health ability and suggest that consumers can utilize their current health as a resource to assist them in engaging in additional health behaviors. The literature, however, indicates that health status has not always been found to positively affect health behaviors (see Table 2). To explain these results, we theorize that a healthy status will facilitate health behaviors only when consumers are also motivated with regard to health. Specifically, motivated consumers will use their health as a resource to maintain it. For example, physically fit consumers use this status to facilitate the enactment of exercise behaviors. Unmotivated consumers, however, are likely to become complacent in their good health and perform no additional health behaviors to maintain it. We hypothesize:

H3: Consumers with higher perceived health status levels will perform more health behaviors than will consumers with lower perceived health status levels when health motivation is high as opposed to low.

Health locus of control refers to consumers' enduring beliefs that health outcomes are controllable (Rotter 1966), with "internals" believing that outcomes are contingent on their own behaviors or personal qualities and "externals" believing that outcomes are controlled by others, luck, or fate (Seeman and Evans 1962).² As Table 2 suggests, studies examining the effect of health locus of control on health information acquisition and health maintenance behaviors present varied results. Following from other research, this inconclusiveness may indicate that health locus of control is moderated by health motivation (Lau et al. 1986; Wallston et al. 1976).³ That is, motivated consumers would use perceived control over health outcomes to engage in health behaviors, but unmotivated consumers would not. We hypothesize:

H4: Consumers with higher health locus of control levels will perform more health behaviors than will consumers with lower health locus of control levels when health motivation is high as opposed to low.

²Health locus of control has also been conceptualized as multidimensional, consisting of self-control, powerful-other-control, chance-control, and no-control beliefs (see Lau and Ware 1981), although there has been mixed success in validating these dimensions (Eiser et al. 1989).

³Health locus of control studies examining the moderating role of health motivation have typically labeled it health value.

Another health ability, *health behavioral control*, refers to consumers' enduring beliefs that health behaviors can be successfully executed (Bandura 1977). Health behavioral control differs from health locus of control in its focus on control over health behavior performance rather than control over health outcomes. The literature on behavioral control has not been concerned with health information acquisition; however, research has generally found a positive relationship between behavioral control and health maintenance behaviors (see Table 2). Behavioral control's effects can, in part, be attributed to the confidence that such beliefs give to consumers engaging in costly health behaviors (in terms of emotional, behavioral, and time costs; Bagozzi and Warshaw 1990) and to the increased persistence high behavioral control consumers exhibit (Bandura 1977). In addition to these effects, health motivation should improve behavioral control's effects. Specifically, the presence of health motivation ensures that consumers who are confident in their ability to enact health behaviors are, in fact, interested in doing so. This combination is more predictive than behavioral control alone. Hence, we hypothesize:

H5: Consumers with higher behavioral control levels will perform more health behaviors than will consumers with lower behavioral control levels when health motivation is high as opposed to low.

Education refers to level of formal education. As Table 2 reflects, education has been found to encourage most types of health information acquisition and health maintenance behaviors. Despite this, we believe health motivation will improve the effects of education on health behaviors similar to its predicted effect on health knowledge. Specifically, health motivation should ensure that knowledge acquired through education will assist in the processing of health information and the enactment of health maintenance behaviors. Hence, we hypothesize:

H6: Consumers with higher education levels will perform more health behaviors than will consumers with lower education levels when health motivation is high as opposed to low.

Age reflects consumers' mental and physical ability to engage in health behaviors. Following other research, increased age is viewed as constituting less ability (Cole and Gaeth 1990; Spotts and Schewe 1989). Reviewing age research, some studies suggest that age inhibits health information acquisition because of elderly consumers' declining cognitive and perceptual skills; others find no difference between old and young consumers (see Table 2). Research regarding the effects of age on health maintenance behaviors is also mixed, suggesting that age may interact with other consumer characteristics to influence health behaviors. Following our focus on the moderating role of health motivation, we theorize that it will moderate the impact of age on health be-

TABLE 2

REVIEW OF THE EFFECTS OF CONSUMER CHARACTERISTICS ON HEALTH BEHAVIORS

Representative studies	Health behaviors and relationship to consumer characteristic
A. Health motivation:	
Fletcher et al. (1989)	Breast self-examination (+)*
Gelb and Gilly (1979)	Regular use of dental services (+)*
Moorman (1990)	Cognitive and behavioral utilization of nutrition labels (0)
Zweig, LeFevre, and Kruse (1988)	Prenatal visits, perinatal outcomes (+)
B. Health knowledge:	
Avis, McKinlay, and Smith (1990)	Exercising (+); smoking, stress, body mass, blood pressure (0)
Bell et al. (1981)	Personal food selection (+)
Boechner, Kohn, and Rockwell (1990)	Improved dietary habits (+)
Brucks, Mitchell, and Staelin (1984)	Reliance on nutrition information informing brand beliefs (-); ability to encode nutrition information (+)
Fletcher et al. (1989)	Breast self-examination (+)*
Ford and Bowie (1988)	AIDS protection behavioral intentions (0)
Golden and Johnson (1991)	Reading AIDS direct mail, prior AIDS information search, behavior change (0); AIDS information search (after AIDS information exposure) (?)
Greidanus and Contento (1989)	Nutrition test scores (0)
Howze, Smith, and DiGilio (1989)	Exercise behavior (+)
Johnson and Johnson (1985)	Nutritious eating (+)
Laiho, Honkala, and Nyyssönen (1991)	Brushing teeth, chewing Xylitol gum, fluoride rinsing (+)
Lewis, Sims, and Shannon (1989)	Frequency of milk consumption (0); commitment to consume milk (+)
Moorman (1990)	Motivation to process nutrition labels (+); comprehension and elaboration of nutrition labels, quality of food selection behavior (0)
Newell et al. (1985)	Nutritious food-shopping scores, nutrition adequacy score (+)
Ottomanelli et al. (1990)	AIDS-related risk behaviors (0)
Petosa and Jackson (1991)	Safe-sex intentions (0)
Probart, Davis, and Kime (1989)	Use of physicians for health information (+); use of dieticians/health food store personnel for health information (+)
Saegert and Young (1983)	Health food use (+)*
Segest et al. (1990)	Condom use (0)
Shepherd and Stockley (1987)	Attitudes and behavioral intention toward fatty food consumption (0)
Speers et al. (1990)	Seeking high blood pressure treatment (+)
C. Health status:	
Antonucci, Akiyama, and Adelman (1990)	Cancer detection behavior (+)*
Bigbee (1989)	Education program involvement (+)
Colsher et al. (1990)	Smoking behavior (-)
Contento and Maksymowicz-Murphy (1990)	Dietary behavior improvement (+)
Feick, Herrmann, and Warland (1986)	Use of labels, magazines/newspaper articles, family and friends, and television programs for health information (0); use of books and pamphlets, doctors/health professionals (-)
Hickey, Rakowski, and Julius (1988)	Health/illness information seeking (+)
Muhlenkamp, Brown, and Sands (1985)	Healthy life-style (+)
Pineault et al. (1989)	Health counseling in a hospital (-)
Rakowski et al. (1990)	Positive and negative health information seeking (0)
Rosner, Namazi, and Wykle (1988)	Physician use (0)*
Weitzel (1989)	Healthy life-style, including exercise, good nutrition, and stress management (+)*
Williams and Dueker (1985)	Clinic use (-)*
Zavela et al. (1988)	Worksite wellness program participation (0)
D. Health locus of control:^a	
Aaronson, Mural, and Pfoutz (1988)	IHLC, use of print media for health information (+)*; IHLC, use of providers for health information (-)*; CHLC, use of radio, television for health information (+)*; PHLC, use of doctors for health information (+)*; use of self for health information (-)*
Abella and Heslin (1984)	IHLC, preventive health behavior (+)*
Bernstein (1970)	ILOC, smoking behavior modification (0)
Best (1975)	ELOC, smoking withdrawal (0)*
Best and Steffy (1975)	ILOC, smoking modification (0)*
Bigbee (1989)	HLC, effectiveness of consumer health education program (0)*
Brown and Fitzpatrick (1988)	PHLC, dietary control in dialysis patients (+); IHLC, CHLC, dietary control in dialysis patients (0)
Bush and lanotti (1985)	ILOC, children's use of alcohol, tobacco, drugs (0)
Contento and Maksymowicz-Murphy (1990)	CHLC, improved diet (-); PHLC, IHLC, improved diet (0)
DeVito, Bogdanowicz, and Reznikoff (1982)	ILOC, intention to obtain health pamphlets (+)*
Dielman et al. (1987)	IHLC, substance use, misuse, intent to use (-); EHLC, substance use, misuse, intent to use (0)
Eiser et al. (1989)	PHLC, IHLC, smoking behavior (-); CHLC, smoking behavior (+)
Golden and Johnson (1991)	ILOC, reading direct mail AIDS information (0); ILOC, receptivity to more AIDS information (after AIDS information exposure), behavioral change (+)
Hickey et al. (1988)	IHLC, preventive health behaviors (0)*
Hjelle and Clouser (1970)	ILOC, smoking (0)
Houts and Warland (1989)	ILOC, nutritious food behavior (+)
Kennedy, Probart, and Dorman (1991)	ILOC, radon information seeking (0)
Keutzer (1968)	ILOC, smoking behavior modification (0)
Lau (1982)	IHLC, self-care, use of medical professionals (+); PHLC, early health habits with professionals (+)

TABLE 2 (Continued)

Representative studies	Health behaviors and relationship to consumer characteristic
Muhlenkamp et al. (1985)	CHLC, health-promoting behaviors (-); PHLC, visits to clinic during illness (-)
Nagy and Wolfe (1983)	IHLC, chronic illness (-)*; PHLC, CHLC, chronic illness (+)*
Phares (1976)	ILOC, contraceptive use (0)
Quadrel and Lau (1989)	IHLC, health knowledge (after exposure to health information) (0)*; IHLC, breast self examination (0)
Quinn and Norris (1986)	HLC, anxiety and depression (0)
Seeley (1976)	ILOC, family planning goals (0)
Tinsley and Holtgrave (1989)	IHLC, parents' use of childhood preventive health services (+); CHLC, PHLC, parents' use of childhood preventive health services (0)
Wallston, Maides, and Wallston (1976)	ILOC, hypertension information pamphlet seeking (0)*
Weitzel (1989)	PHLC, stress management, nutrition (+); CHLC, nutrition (-)
Williams (1972)	ILOC, seat belt use (0)
E. Health behavioral control:	
Ajzen and Madden (1986)	Intentions to perform behaviors, actual goal attainment (+)
Contento and Maksymowicz-Murphy (1990)	Dietary behavior improvement (0)
Davis-Chervin, Rogers, and Clark (1985)	Dietary behavior modification (+)
Goldberg, Gershoff, and McGandy (1990)	Reduction in salt and sugar intake, weight control, dietary adequacy, use of diagnostic and provider information (+)
Howze et al. (1989)	Exercise behavior (+)
Kok et al. (1991)	Intention to stop smoking, stop-smoking behaviors (+)*
Kviz et al. (1991)	Registration in smoking cessation program (+)
Lau, Hartman, and Ware (1986)	Exercise, proper eating, sleeping, wearing seat belts, not drinking alcohol (+)*
Logsdon, Lazaro, and Meier (1989)	Exercising, wearing seat belts, losing weight, decreasing alcohol consumption, breast self-examination (+); smoking (0)
Matheson et al. (1991)	Perceived importance of nutrition, flexibility in changing nutrition practices, social support (+)
Rakowski et al. (1991)	Nonsmokers, low body mass, exercise (+)
Rippetoe and Rogers (1987)	Adoption of adaptive coping strategies to health threats (+)*
Rosenstock (1988)	Compliance with prescribed medical treatments (+)*
Sennot-Miller and Miller (1987)	Weight reduction activities (+)
Shannon et al. (1990)	Eating behaviors to achieve desired weight (+)
Smith and Scammon (1986)	Cancer-screening service utilization (+)
Weitzel (1989)	Health-promoting life-style, stress management (+)*
F. Education:	
Anderson, Meissner, and Portnoy (1989)	Television health information seeking (-); radio, publication, provider information seeking (+)
Antonucci et al. (1990)	Preventive health behaviors, cancer detection behaviors (+)*
Avis et al. (1990)	Health knowledge (+)*
Bassler and Newell (1982)	Healthy food consumption (+)*
Feick et al. (1986)	Labels, magazines/newspaper articles, books and pamphlets, family and friends, doctors/health professionals used as information source (+); television programs used as health information source (0)
Ferguson, Discenza, and Miller (1987)	Perceived usefulness of warning label information (0)
Fullmer, Geiger, and Parent (1991)	Comprehension of diet-disease messages, attitude toward health messages on labels (+)
Golden and Johnson (1991)	Reading AIDS direct mail information (-); prior AIDS information search, receptivity to AIDS information, behavior change (0)
Gottlieb and Green (1984)	Exercise, favorable weight, favorable sleep (+)*; smoking (-)*
Greidanus and Contento (1989)	Nutrition knowledge and reasoning test scores (0)*
Hornik and Schlinger (1980)	Active sports participation (+); heavy eating, smoking (-)*; heavy drinking (+)*
Johnson and Johnson (1985)	Eating nutritiously (+)
Kviz et al. (1991)	Registration in smoking cessation program (-)
Leigh (1983)	Not smoking (-)*; exercising, safe occupation (+)*
Moorman (1990)	Motivation and self-reported ability to process nutrition labels, quality of food selection (-); nutrition label comprehension (+)
Pineault et al. (1989)	Likelihood of receiving health counseling in a hospital (-)*
Rakowski et al. (1990)	General health information seeking (0)
Rosenstock (1988)	Compliance with prescribed treatments (0)*
Rosner et al. (1988)	Health symptom reporting (-)*
Saegert and Young (1983)	Health food consumption (+)*
Shepperd et al. (1990)	Breast self-examination frequency/quality (0)
Speers et al. (1990)	High blood pressure knowledge (+)*
Weitzel (1989)	Health-promoting life-style, good nutrition (+)
Worsley (1989)	Newspaper, health/medical books, magazines used as health information source, chiropractor information seeking (+)
Yung, Contento, and Gussow (1984)	Health food purchasing (+)*
G. Age:	
Akin et al. (1986)	Alcohol consumption volume (+)*
Anderson et al. (1989)	Use of television for health information (-); use of radio or publications for health information (+)
Axelsson and Penfield (1983)	Attitudes toward nutrition and food (0)*
Cole and Gaeth (1992)	Effective use of nutritional information in a choice task (-)
Cole and Houston (1987)	Television information encoding (+)

TABLE 2 (Continued)

Representative studies	Health behaviors and relationship to consumer characteristic
Colsher et al. (1990)	Former smokers, more alcohol consumption, physical disease and symptoms, poorer perceived health status (+)
Contento and Maksymowicz-Murphy (1990)	Dietary "changers" (+)*
Feick et al. (1986)	Use of magazines/newspaper articles, books, and pamphlets (+); use of labels, family and friends, doctors/health professionals, television programs (0)*
Ferguson et al. (1987)	Usefulness of different warning labels according to information and source (0)
Gans et al. (1990)	Cholesterol information recall, dietary change, exercise, physician contact (0)*
Goldberg et al. (1990)	Print and audiovisual media sources of nutrition information (+)
Golden and Johnson (1991)	Reading AIDS direct mail information, behavior change (0); receptivity to AIDS information (+)
Gottlieb and Green (1984)	Exercise and physical activity (-)*; smoking behaviors (+)*
Griedanus and Contento (1989)	Nutrition knowledge and reasoning test scores (0)*
Hornik and Schlinger (1980)	Sports participation (-); heavy drinking (+); weight watching (+); heavy eating (-)*
Kviz et al. (1991)	Registration in smoking-cessation program (+)
Lambert-Lagacé (1983)	Television used for nutrition information (+); newspapers; magazines, cookbooks, nutrition books used (-)
Moorman (1990)	Nutrition label comprehension (-); self-reported ability to process nutrition labels (+)
Morris et al. (1987)	Use of pharmacists for health information (0); use of written materials at pharmacy, friends, reference books (-); use of mass media, written materials at doctor's office (+)
Pineault et al. (1989)	Health counseling in a hospital (+)*
Probart et al. (1989)	Physicians, dieticians/health food store personnel contact (+)
Rakowski et al. (1990)	General health information seeking (0)
Rosenstock (1988)	Compliance with prescribed medical treatments (0)
Ryan and Bower (1989)	Nutrient intake (-)*
Spotts and Schewe (1989)	Information-processing ability, visual ability, auditory ability, learning, memory (-)
Stewart et al. (1989)	Regular health care provider retention (+)
U.S. Department of Health and Human Services (1988)	Weight control, dietary control, consumption of vitamins and minerals (-)
Weitzel (1989)	Health responsibility, good nutrition (+)*; exercise (-)*
Worsley (1989)	Use of fitness instructors, health food shop personnel, magazine articles, best friend, family members, health and medical books (-); use of children for health information (+)
Williams and Dueker (1985)	Clinic use (-)
Yung et al. (1984)	Health food purchases (+)*
H. Income:	
Aaronson et al. (1988)	Use of books for nutrition information (+)*; use of family for nutrition information (-)*
Akin et al. (1986)	Salty snack eating, lighter volume eaters (-)*
Axelsson and Penfield (1983)	Nutritious/healthful attitude (+)*
Bassler and Newell (1982)	Consumption of milk, vitamin C, fruits, vegetables (+)*
Dawson (1989)	Physician contact (+); interest in health matters (-)
Feick et al. (1986)	Use of labels, magazines/newspaper articles, books and pamphlets, family and friends, doctors/health professionals, television programs (0)
Ferguson et al. (1987)	Usefulness of warning label information (0)
Fletcher et al. (1989)	Breast self-examination (0)*
Gelb and Gilly (1979)	Preventive dental care (+)*
Gottlieb and Green (1984)	Exercise, alcohol consumption, physical activity (+)*
Haan, Kaplan, and Camacho (1987)	Mortality rates (-)*; healthy behaviors (+)*
Laiho et al. (1991)	Oral hygiene behaviors (+)
Lenhart and Read (1989)	Nutritional intake, money spent on food (+)*
McLeod and Kessler (1990)	Vulnerability to undesirable events, low behavioral control (-)*; cognitive flexibility (+)*
Rosenstock (1988)	Compliance with prescribed medical treatments (0)*
Rosner et al. (1988)	Physician use (+)*
Ryan and Bower (1989)	Nutrient intake (+)*
Saegert and Young (1983)	Health and nutrition knowledge (+)
Shepherd and Stockley (1987)	Attitude toward consuming high-fat foods (-)*
Shepperd et al. (1990)	Breast self-examination frequency/quality (0)
Slater and Carleton (1985)	Mortality rates (-)
Speers et al. (1990)	High blood pressure knowledge (+)*
Stewart et al. (1989)	Regular health care provider retention (+)
Worsley (1989)	Use of grown children for health information (-); use of health and medical books for health information (+); use of family doctor for health information (-)*; use of newspapers for health information (+)*
Yung et al. (1984)	Health food purchasing (+)*

NOTE.—Effects are as follows: (+) positive, (-) negative, (0) no effect, (?) questionable effects, *other moderating factors.

*The literature has adopted two scales. First is a general locus of control (LOC) scale consisting of external LOC (ELOC) and internal LOC (ILOC). Second is a multidimensional health locus of control (HLC) scale consisting of self or internal HLC (IHLC), external HLC (EHLC), powerful other HLC (PHLC), and a chance HLC (CHLC).

haviors. However, in contrast to the previous hypotheses that propose that health ability differences emerge when health motivation is high (as opposed to low), this and the next hypothesis propose that health ability differences emerge when health motivation is low (as opposed to high). Specifically, age is predicted to have a detrimental impact on health behaviors only when health motivation is low. High health motivation levels, on the other hand, should mitigate the negative effects of age on health behaviors, and no differences should be found. We hypothesize:

H7: Younger consumers will perform more health behaviors than will older consumers when health motivation is low as opposed to high.

Income reflects consumers' financial ability to engage in health behaviors. Little research has been performed regarding the effect of income on health information acquisition, and only two studies report a positive effect. For health maintenance behaviors, a number of studies have found a positive effect; however, results are somewhat mixed (see Table 2). As with the other health abilities, the effect of income is theorized to be influenced by health motivation. In the case of health information behaviors, health motivation should encourage lower-income consumers to acquire information to overcome feelings of alienation (McLeod and Kessler 1990) and limited access to health professionals (Myers, Lindenthal, and Pepper 1975). Likewise, health motivation should encourage lower-income consumers to perform health maintenance behaviors to overcome the normative pressure to use alcohol and tobacco products in lower-class subcultures (Haan, Kaplan, and Camacho 1987) and the limited access to healthy products and health services (Friedman 1990). Therefore, income is predicted to have a detrimental impact on health behaviors only when health motivation is low. When motivation is high, however, lower-income consumers should be able to overcome these disadvantages. We predict:

H8: Higher-income consumers will perform more health behaviors than will lower-income consumers when health motivation is low as opposed to high.

METHOD

Pretesting

Following definitions of the construct domains, measures were adopted from past research or generated for this study. Most theoretical constructs in the study were measured with multi-item scales. A pretest was administered to 67 undergraduate students in an introductory marketing class to purify the measures and generate final scales that were internally reliable and had low intercorrelations. The final questionnaire reflected only minor format changes.

Sampling and Procedures

Respondents who differed on characteristics critical to our theory were selected. To obtain a wide range of responses, two sampling techniques were used. First, a *stratified sample* with random selection for lower-income, higher-income, and elderly consumer strata was used. Lower- and higher-income consumers were obtained by randomly selecting households in lower- and higher-income neighborhoods in Madison and Milwaukee, Wisconsin.⁴ The response rate was slightly higher among the higher income (67/118 = 57 percent) than the lower income (51/118 = 43 percent). Older consumers were randomly selected from adult centers (where elderly consumers spend the day) and retirement communities (51/118 = 43 percent), and young consumers were retained from the pretest (67/67 = 100 percent). Second, a *random sample* of consumers was selected from telephone directories in the same cities and contacted by mail to generate variation on the other consumer characteristics (168/375 = 45 percent).

In both samples, respondents received a letter describing the research, a consent form, and a questionnaire. A single dollar bill was affixed to the cover letter as a token of appreciation and as a way of increasing response rates. Respondents were asked to refrain from using reference material and to return the questionnaire in a prepaid, enclosed envelope. Overall, the response rate was 51 percent after removal of incomplete and ineligible responses.

Measurement

The final survey instrument contained measures of the consumer characteristics and health behaviors (see Appendix). Following Churchill's (1979) measurement paradigm, the reliability of each dependent variable was assessed by calculating coefficient alpha. Item-to-total correlations were also inspected and items with particularly low correlations were eliminated if doing so did not diminish the measure's coverage of the construct domain. This analysis indicated that tobacco nonuse and alcohol moderation had low correlations with other measures and did not correlate well with one another. These behaviors were, however, retained as single-item measures in the analysis because of their importance to public health. Following this, the unidimensionality of the multi-item dependent measures was assessed using LISREL 7 (Gerbing and Anderson 1988; Jöreskog and Sörbom 1989). Models ranging from one to eight factors were estimated, corresponding to the number of multi-item dependent measures. Two sets of dependent variables suggested a structure other than that theorized: health professional service utilization and

⁴The low-income neighborhoods included Section 8 housing and other neighborhoods with home values below \$50,000; the high-income neighborhoods included home values over \$200,000. Questionnaires were hand delivered to every fourth household.

TABLE 3
PROPERTIES OF PURIFIED MEASURES

Construct	Items	Range	Mean	SD	Alpha
A. Health behaviors:					
Media and label information acquisition (Mediainfo)	5	1-7	2.84	.99	.72
Family and friends information acquisition (Casualinfo)	2	1-7	3.53	1.39	.67 ^a
Health professional interactions (Profinteract)	6	1-7	4.01	1.11	.72
Life-balancing behaviors (Lifebalance)	3	1-7	4.75	1.31	.74
Positive diet addition (Posdiet)	2	1-7	5.43	1.31	.80 ^a
Negative diet restriction (Negdiet)	6	1-7	4.44	1.34	.86
Alcohol moderation (Alcohol)	1	1-7	5.30	1.95	...
Tobacco nonuse (Tobacco)	1	1-7	5.84	2.14	...
B. Health ability characteristics:					
Health knowledge (Hknow)	1	1-10	7.37	2.51	...
Perceived health status (Hstatus)	2	1-7	5.26	1.38	.68 ^a
Health locus of control (Hlcontrol) ^b	27	1-7	4.74	.58	.79
Health behavioral control (Bcontrol)	12	1-7	4.69	.89	.73
Education (Educate)	1	8-18	14.23	2.61	...
Age (Age)	1	19-87	43.67	19.18	...
Income (Income)	1	1-6	3.85	1.97	...
C. Health motivation (Hmotive)					
	8	1-7	4.60	.95	.82

^aMeasure is a Pearson correlation.

^bTo create this measure, the chance-control and no-control items were recoded and combined with the self-control and provider-control items to reflect the degree of control over health outcomes. The original Lau and Ware Hlc scale has only eight provider-control items. Two additional items were added because pretesting suggested they reflected the same domain as the original items (see Appendix).

health professional information acquisition showed evidence of high cross-loadings (indicating one factor instead of two), whereas dietary behaviors eliminating negative products and adding positive products had weak loadings (indicating two factors instead of one). Given this, the health professional variables were combined and the diet variables were separated (see Table 3). The predicted number of factors had a superior fit as indicated by goodness-of-fit indices (GFI, chi-square), by low cross-loadings between factors, and by significant factor loadings ($t > 2.00$).⁵

Identical procedures were followed for the independent variables (see Table 3). In addition, because previous research has dealt with each dimension of the health locus of control construct as a single measure, we examined whether the data fit this structure or a structure combining the dimensions into a composite measure. To do so, measures were constructed for each of four types of control (i.e., self-control, provider-control, chance-control, and no-control). Following this, a confirmatory factor model was assessed in which the summated scales were used as indicants of the theorized higher-order constructs. The model fit the data well ($\chi^2_{(2)} = 1.28$, $p < .53$, GFI = .99), better than the null model, which allowed each type of control to be a single

construct ($\Delta = .98$). Furthermore, all indicants loaded significantly on the theorized higher-order construct ($t > 2.00$). Given these results, health locus of control was constructed as a single variable.

RESULTS

General Theory-testing Approach

Prior to analysis, several procedures were undertaken. First, in creating interactions, independent variables were first mean centered to reduce collinearity (Cronbach 1987). Second, multicollinearity levels among the independent variables was assessed and determined not to be harmful, given that all variance inflation factors (VIF) were less than 10 (see Mason and Perreault 1991). Third, the correlation among the eight dependent variables was determined to be reasonable with a range of $\rho = .01-.48$ and most variables correlated at $\rho < .20$.

The hypothesized relationships were tested in a multivariate general linear model in which the independent variables (i.e., main and interaction effects associated with the consumer characteristics) were modeled as factors affecting the correlated health behaviors.⁶ Following Pedhazur (1982), a model containing the main effects was first estimated (Wilks's $\lambda = .21$, approximate $F(64,2680) = 7.13$, $p < .001$), followed by the estimation

⁵For the dependent variables, chi-square was significantly smaller for the six-factor model ($\Delta\chi^2_{(1)} > 3.84$) than competing factor models. Similarly, for the health ability characteristics, chi-square was significantly smaller for the three-factor model than for competing factor models. One of the self-control over health outcomes measures associated with health locus of control had a t -value of 1.6 but was retained to ensure coverage of the theoretical domain.

⁶This approach was chosen over multiple regression, which would not allow for multiple dependent variables, and over a maximum likelihood approach because of problems in addressing several key assumptions in modeling continuous interactions (Bagozzi and Yi 1989; Bollen 1989).

of a full model containing both the main and interaction effects (Wilks's $\lambda = .17$, approximate $F(120,2624) = 4.41$, $p < .001$).⁷ An incremental F -test (Pedhazur 1982) indicated the full model was more predictive than the main-effects model (Incremental $F(1,1777) = 7.45$, $p < .05$), while explaining a high degree of variance ($1 - \lambda = R^2 = .83$; Pedhazur 1982). Given this, the full model was used to test the hypotheses. Table 4 contains these results.

To examine significant interactions, a technique that overcomes the need to create subgroups from continuous independent variables was adopted (see Aiken and West 1992; Cohen and Cohen 1983). This technique involves creating a conditional formulation of the regression equation, such that $Y = \alpha + \beta_{\text{mod}}X_{\text{mod}} + \beta_{\text{ind}}X_{\text{ind}} + \beta_{\text{inter}}X_{\text{mod}}X_{\text{ind}}$, where mod (moderator variable) = health motivation, ind (independent variable) = health ability, and inter (interaction variable) = health motivation \times health ability, is reformulated to estimate $Y = \alpha + X_{\text{ind}}(\beta_{\text{ind}} + \beta_{\text{inter}}X_{\text{mod}}) + (\beta_{\text{mod}}X_{\text{mod}})$, where X_{mod} takes on high ($\bar{X} + 1\sigma$) and low ($\bar{X} - 1\sigma$) levels. The outcome is a series of equations reflecting the effect of health ability under different health motivation levels.⁸ The results reported below reflect the application of the conditional regression approach to the data contained in Table 4.

Tests of the Hypothesized Relationships

Hypothesis 1 predicted that health motivation would positively affect all of the health behaviors. Results indicate that health motivation increases the amount of health information acquired from media sources, health professional contact, diet restriction, and diet addition. Health motivation does not, however, affect acquisition from casual sources, life-balancing behaviors, or tobacco and alcohol consumption. These findings indicate mixed support for Hypothesis 1.

Hypothesis 2 predicted that high health knowledge levels would affect health behaviors in the presence of health motivation. Results indicate that two of the eight health behaviors are affected by interactions involving health knowledge and health motivation (Table 4). In both cases, when health motivation is high, health knowledge is positively related to media source use ($\beta = .49$) and to diet restriction ($\beta = .46$). However, when health motivation is low, health knowledge is negatively related to media use ($\beta = -.03$) and to deletion of negative dietary elements ($\beta = -.02$). These results support

Hypothesis 2. Results also indicate that health knowledge has several main effects on health behaviors. Specifically, health knowledge has a positive effect on all the health maintenance behaviors (except life balancing); it also has a positive effect on the acquisition of health information from media sources, a negative effect on casual sources, but no effect on health professional contact. Together, these results suggest that the hypothesized interaction between health knowledge and health motivation is supported only for certain health behaviors, whereas health knowledge alone more effectively predicted others. Therefore, Hypothesis 2 is partially supported.

Hypothesis 3 predicted that perceived health status would be moderated by health motivation such that healthy consumers would perform more health behaviors than unhealthy consumers when health motivation is high. Results indicate that perceived health status is moderated by health motivation for half of the eight health behaviors. In all these interactions, however, when motivation is high, health status has a negative relationship with health behaviors, including media information acquisition ($\beta = -.12$), professional contact ($\beta = -.27$), diet addition ($\beta = -.02$), and life balancing ($\beta = -.10$). However, when motivation is low, health status has a positive relationship with these health behaviors. These results do not support Hypothesis 3. Furthermore, health status has a negative main effect on health professional contact and a positive main effect on the use of casual sources of health information, indicating further lack of support for Hypothesis 3.

Hypothesis 4 predicted that health locus of control would interact with health motivation. Results indicate only one such interaction. For motivated consumers, health locus of control and media information acquisition are negatively related ($\beta = -.21$), whereas, for unmotivated consumers, they are positively related ($\beta = .12$). In addition, health locus of control has a positive main effect on life balancing and a negative main effect on diet restriction and casual information acquisition. These results do not support Hypothesis 4.

Hypothesis 5 predicted that health motivation would increase health behavioral control's effect on health behaviors. Results do not support Hypothesis 5, as there were no significant interactions. However, health behavioral control did have a positive main effect on health professional contact, life balancing, diet restriction, diet addition, and tobacco restriction, while having no effect on media or casual information acquisition.

Hypothesis 6, which hypothesized that education would interact with health motivation to improve health behaviors, also receives little support. Results indicate that education interacts with health motivation for consumers' use of media sources such that, for motivated consumers, education is negatively related to health information acquisition from media sources ($\beta = -.87$). However, for unmotivated consumers, education is positively related to the acquisition of media information ($\beta = .31$). Other interactions involving ed-

⁷The formula for calculating the approximate F associated with Wilks's λ is the sum of squares between (ssb)/sum of squares error (sse). The degrees of freedom for ssb is $n_h p$, where n_h is the number of independent variables and p is the number of dependent variables; the degrees of freedom for sse are $Ml - 1 - n_h p/2$, where $l = [(p^2 n_h^2 - 4)/(p^2 + n_h^2 - 5)]^{1/2}$, and $M = n_e - (p + 1 - n_h)/2$, where n_e is the degrees of freedom for the sum of squares and cross-products matrix, as calculated in the MANOVA subroutine (SPSS 1991, p. 148).

⁸Although we will not plot lines, Aiken and West (1992) suggest that various levels of health ability (X_{ind}) could be entered into the equation at $\bar{X} \pm 1\sigma$ levels to depict the relationships.

TABLE 4
MULTIVARIATE RESULTS OF THE THEORY TEST

Hypothesis and dependent health behaviors	Significant predictor	Beta	t-Value
Consumers with higher health motivation levels will perform more health behaviors than will consumers with lower health motivation levels:			
Mediainfo	Hmotive	.23	3.54**
Profinteract	Hmotive	.19	2.65**
Negdiet	Hmotive	.35	4.63**
Posdiet	Hmotive	.32	4.14**
Consumers with higher health knowledge levels will perform more health behaviors than will consumers with lower health knowledge levels when health motivation is high as opposed to low:			
Mediainfo	Hknow	.23	1.86*
Mediainfo	Hknow × Hmotive	.24	2.01*
Casualinfo	Hknow	-.38	-2.34*
Negdiet	Hknow × Hmotive	.22	1.63*
Posdiet	Hknow	.28	1.88*
Tobacco	Hknow	.66	2.47**
Alcohol	Hknow	.45	1.84*
Consumers with higher perceived health status levels will perform more health behaviors than will consumers with lower perceived health status levels when health motivation is high as opposed to low:			
Mediainfo	Hstatus × Hmotive	-.08	-1.96
Casualinfo	Hstatus	.14	2.54**
Profinteract	Hstatus	-.15	-3.10**
Profinteract	Hstatus × Hmotive	-.11	-2.35**
Lifebalance	Hstatus × Hmotive	-.12	-2.62**
Posdiet	Hstatus × Hmotive	-.08	1.71*
Consumers with higher health locus of control levels will perform more health behaviors than will consumers with lower health locus of control levels when health motivation is high as opposed to low:			
Mediainfo	Hlcontrol × Hmotive	-.15	-1.73*
Casualinfo	Hlcontrol	-.23	-1.91*
Lifebalance	Hlcontrol	.24	2.26**
Negdiet	Hlcontrol	-.26	-2.31**
Consumers with higher health behavioral control levels will perform more health behaviors than will consumers with lower health behavioral control levels when health motivation is high as opposed to low:			
Profinteract	Bcontrol	.34	4.35**
Lifebalance	Bcontrol	.75	9.71**
Negdiet	Bcontrol	.58	6.99**
Posdiet	Bcontrol	.34	4.04**
Tobacco	Bcontrol	.33	2.17*
Consumers with higher education levels will perform more health behaviors than will consumers with lower education levels when health motivation is high as opposed to low:			
Mediainfo	Educate × Hmotive	-.54	-2.56**
Younger consumers will perform more health behaviors than will older consumers when health motivation is low as opposed to high:			
Mediainfo	Age	-.59	-2.55**
Casualinfo	Age	-2.38	-7.93**
Lifebalance	Age	1.09	4.30**
Negdiet	Age	.55	2.02*
Posdiet	Age	.86	3.09**
Alcohol	Age × Hmotive	-1.18	-2.75**
Higher-income consumers will perform more health behaviors than will lower-income consumers when health motivation is low as opposed to high:			
Mediainfo	Income × Hmotive	.05	1.62*
Profinteract	Income	.10	2.60**
Tobacco	Income	.24	3.50**

NOTE.—Only significant predictors are reported. Betas are standardized. In addition to the multivariate test of significance, each univariate test was also significant: Mediainfo ($R^2 = .09, F = 3.17^*$); Casualinfo ($R^2 = .26, F = 9.19^*$); Profinteract ($R^2 = .15, F = 5.12^*$); Lifebalance ($R^2 = .39, F = 15.50^*$); Negdiet ($R^2 = .32, F = 11.58^*$); Posdiet ($R^2 = .27, F = 9.33^*$); Tobacco ($R^2 = .13, F = 4.57^*$); Alcohol ($R^2 = .07, F = 2.76^*$).

* $p = .05$.

** $p = .001$.

education and health motivation are not present, however, indicating that this effect cannot be generalized to all health behaviors.

Results indicate little support for Hypothesis 7, which predicted that age would have a detrimental impact on health behaviors only when health motivation levels are low. Results indicate only one significant interaction: at low motivation levels, there is a positive relationship indicating that older consumers moderate alcohol consumption more than younger consumers ($\beta = 1.79$). However, at high motivation levels, there is a negative relationship indicating that younger consumers moderate alcohol consumption more than older consumers ($\beta = -.83$). No other interactions were found. This lack of interactions also does not support the idea (not formally hypothesized) that high motivation would attenuate differences between older and younger consumers. Instead, age has a negative main effect on consumers' use of media and casual sources, and a positive main effect on life balancing, diet restriction, and diet addition.

Hypothesis 8 postulated that low income would have a detrimental impact on health behaviors only when health motivation levels were also low. Results indicate one interaction, in which, among the unmotivated, lower-income consumers acquire more media information than higher-income consumers ($\beta = -.03$). However, among the motivated, higher-income consumers acquire more than lower incomes ($\beta = .09$). As these effects are not found for the other health behaviors, they indicate limited support for Hypothesis 8. Furthermore, although not formally hypothesized, high health motivation levels contributed to, as opposed to attenuating, differences due to income. Finally, income has a positive main effect on professional contact and tobacco nonuse.

DISCUSSION

This research modeled the relationships between a series of consumer characteristics, classified as either health ability or health motivation, and eight health behaviors, classified as either health information acquisition behaviors or health maintenance behaviors. The general structure of the relationships was that health motivation would individually facilitate health behaviors, whereas the effect of health ability would be strengthened by the presence of health motivation. A key objective was to provide insight into the mixed results found in the literature and to arbitrate alternative theories regarding the effects of various consumer characteristics on health behaviors, especially those involving health knowledge, health status, health locus of control, age, and income. At a general level, results suggest that the interaction approach does increase predictive validity over the main effects. This fact indicates that more investigation into the complex nature of health behavior determinants is warranted.

Despite the added complexity, the interaction of health motivation and the health abilities does not uni-

formly drive consumers' health behaviors in positive ways. Instead, the effectiveness of the interaction appears to depend on the particular manifestation of the ability variable. To illustrate, higher use of media sources of health information was found for highly motivated but less able (i.e., low health locus of control, low education, and low health status) consumers. On the other hand, higher use of media sources was found for highly motivated but more able (i.e., high health knowledge, high income) consumers. Discovery of the mixed nature of these interactions contributes to future theory development by suggesting that ability and motivation are not always critical precursors of behavior, as past research has theorized.

Future research, therefore, should consider a wider array of consumer characteristics and incorporate a more interactive view of these characteristics in theory development and theory testing. This recommendation may indicate that consumer researchers who have typically studied consumers' health behaviors through tightly controlled experimentation (see Cole and Gaeth 1990; Moorman 1990; Scammon 1977) should shift to the larger, more complex studies typically performed in public health, epidemiology, and behavioral medicine (see Russo et al. 1986). A big study approach allows for a wider range of consumer characteristics and health behaviors, which the present research indicates will result in more realistic and complex results. This recommendation also points to a limitation of this research which is that the samples are confined to a particular geographic area. Future research may wish to replicate these results in a national probability sample.

Another important, albeit not formally hypothesized, lesson of the interaction approach is its findings regarding age and income. Health motivation does not attenuate the negative effects of older age and lower income on health behaviors and especially fails to explain the mixed past results associated with age. Instead, the present research indicates that age has considerable predictive value as a main effect, affecting health maintenance behaviors positively and health information acquisition behaviors negatively. Income, on the other hand, has considerably less value as a main effect predictor. Both results have important implications for the design of health programs. For example, the interaction effect results suggest that using health programs to increase consumers' health motivation levels will not eliminate differences attributable to age or income. Furthermore, segmenting income or age groups on the issue of health motivation does not appear to be useful. As a result, different programs will need to be developed for groups distinguished by age and income. To illustrate, this research indicates that health information programs targeting older consumers should disseminate information through health professionals (one information source that is not negatively related to age) and should reinforce their current high health maintenance behaviors through provider channels or other noninformation-based channels.

An important set of results concerns the issue of how knowledge relates to behavior. We theorized that health knowledge would relate to health behaviors only when health motivation was present. This prediction was supported by significant interactions involving the acquisition of media information and the restriction of negative dietary elements. Therefore, for these two behaviors, health knowledge and health motivation, produce the highest health behavior levels. We also discovered that health knowledge alone is sufficient to facilitate nearly all of the health behaviors, while reducing only the use of casual sources. Together, these results allow us to conclude that there is little risk that health knowledge may interfere with health information acquisition behaviors, a conclusion that past research has drawn. On the contrary, our results suggest that knowledge facilitates most health behaviors including health information acquisition.

Unlike knowledge, health locus of control was negatively associated with health outcomes, both alone (except for life-balancing behaviors) and when interacting with health motivation. These results run counter to a great deal of research that has suggested that control over health outcomes facilitates health behaviors. We did, however, see that control over health behaviors (i.e., behavioral control) was an effective predictor. Our findings indicate that future theory should address the interrelationship among these control orientations to determine the extent to which they work together, as opposed to independently, to influence health behaviors (Bandura 1977). It appears that in practical terms health programs should focus on control over health behaviors, not control over health outcomes.

One health ability greatly influenced by health motivation is perceived health status. Results indicate that, contrary to expectations, motivated consumers with an unhealthy status perform more health behaviors than motivated consumers with a healthy status. One way to interpret these findings is that motivated consumers with an unhealthy status use their lack of health as a way to justify the need for action. If true, a currently healthy status could be viewed as a health *liability* as opposed to a health *ability* as it may create an illusion of well-being that reduces consumers' health behaviors (Taylor and Brown 1988). Further research should investigate why consumers do not utilize health status as a resource for engaging in further health behaviors and why an unhealthy status appears to contribute more than a healthy status. One approach would be to examine the alternative explanation that healthy consumers underrate their health status because of their likely awareness of health issues and potential problems, whereas unhealthy consumers tend to overrate their health status because of their lack of awareness and denial of health problems. One way to overcome this problem would be to utilize a different operationalization of health status, such as perceived health status relative to average person of the same age (which would provide a common frame of reference) or more objec-

tive indicators of health (e.g., physical examination information or performance on a mental health assessment instrument). These approaches would overcome possible limitations of the adopted health status measure.

In terms of health behaviors, most of the characteristics influence consumers' use of media sources. Fewer, however, influence the use of casual sources. The ineffectiveness of the predictors may be understood by considering the nature of health information. Health information typically involves an idea, product, or practice that is essentially new for consumers; hence, health information may be thought of as an innovation. Given this, theory suggests that the information provider and the receiver should be different enough (in terms of expertise, values, or beliefs) from one another that the receiver perceives the provider as having credibility and, in turn, values the innovation (Rogers 1983). Perhaps, then, casual sources are too similar to consumers to be valued as important information sources. Future research should attempt to understand the conditions under which casual sources are effective in disseminating health information. The conditions might include accounting for information complexity, the ease with which it is communicated, the availability of other information sources, and the perceived costs associated with these sources. Research may also consider how the composition of casual information networks, especially whether they contain information facilitators such as opinion leaders, innovators, or mavens (Feick and Price 1987), influences their effectiveness in disseminating health information.

Despite the wide range of consumer characteristics and health behaviors considered in this research, future research may benefit from considering other factors in theory development. Such consumer characteristics as health self-consciousness (Gould 1990), ethnicity, subjective health knowledge (Brucks 1985), and objective health status levels may increase explanatory power. Additionally, our model does not consider several health behaviors, such as exercise and disease detection behaviors. Furthermore, because of its already-complex nature, this research does not formally model the relationships between health information acquisition and health maintenance behaviors, despite linkages found in the health literature (Rakowski et al. 1990). Future research should consider such characteristics, behaviors, and relationships in theory development.

Another direction for future research to consider is how consumer characteristics interact with stimuli (e.g., information) that have either motivation-enhancing characteristics (e.g., uses novel stimuli to enhance attention) or ability-enhancing characteristics (e.g., provides a context that creates relevant knowledge structures). How, for instance, do motivation-enhancing stimuli affect consumers with varying health motivation levels? Are ability-enhancing stimuli more effective with low-ability consumers? Further, given that stimuli can "trade off" certain processing out-

comes depending on their nature (e.g., attention-getting stimuli can be motivating but also difficult to understand; see MacInnis et al. 1991), understanding how

consumer characteristics like those examined here may mitigate these trade-offs is an interesting question for future research.

APPENDIX
TABLE A1
STUDY MEASURES

Measure	Source
Mediainfo: (7) all of the time, (1) none of the time ^a Ads Books, magazines, or pamphlets about health Newspaper Television and radio programming Product labels	New scale
Casualinfo: (7) all of the time, (1) none of the time ^a Friends and work associates Spouse, parents, relatives	New scale
Profinteract: (7) all of the time, (1) none of the time Doctors ^a Other health care professionals (e.g., physical therapist) ^a Pharmacist ^a Obtain a physical exam See my dentist for a checkup Visit my eye doctor	New scale
Posdiet: (7) all of the time, (1) none of the time Eat a well-balanced diet Eat fresh fruits and vegetables	New scale
Negdiet: (7) all of the time, (1) none of the time Reduce my sodium intake Watch the amount of fat I consume Eat a well-balanced diet Moderate my sugar intake Eat fresh fruits and vegetables Moderate my red meat consumption Cut back on snacks and treats Avoid foods with additives and preservatives	New scale
Lifebalance: (7) all of the time, (1) none of the time Get enough rest and sleep Reduce stress and anxiety Maintain a balance between "work" and "play"	New scale
Alcohol: (7) all of the time, (1) none of the time Moderate my alcohol consumption	New item
Tobacco: (7) all of the time, (1) none of the time Smoke or chew tobacco products*	New item
Hmotive: (7) strongly agree, (1) strongly disagree I try to prevent health problems before I feel any symptoms. I am concerned about health hazards and try to take action to prevent them. I try to protect myself against health hazards I hear about. I don't worry about health hazards until they become a problem for me or someone close to me.* There are so many things that can hurt you these days. I'm not going to worry about them.* I often worry about the health hazards I hear about, but don't do anything about them.* I don't take any action against health hazards I hear about until I know I have a problem.* I'd rather enjoy life than try to make sure I'm not exposing myself to a health hazard.*	Moorman (1990)

TABLE A1 (Continued)

Measure	Source
Hknow: link the nutrient to the correct health outcome	Moorman (1990)
A. Sodium —May cause high blood pressure	
B. Calcium —Builds strong bones	
C. Vitamin A —Maintains eyes, skin, and hair	
D. Protein —Forms amino acids to build your body	
E. Vitamin C —Fights colds and has anticancer power	
F. Iron —Carries oxygen in the blood	
G. Vitamin D —Helps absorb calcium	
H. Carbohydrates —Converts to sugar and fuels the body	
I. Saturated Fat —Causes cardiovascular disease	
J. Potassium —Balances sodium in the body	
Hstatus	New scale
Rate your overall current health: (7) excellent (1) poor	
How serious have your health problems been? (7) very serious (1) not at all serious*	
Hlcontrol: (7) strongly agree, (1) strongly disagree ^b	Lau and Ware (1981)
Anyone can learn a few basic health principles that can go a long way in preventing illnesses.	
I have a lot of confidence in my ability to cure myself once I get sick.	
“Taking care of yourself” has little or no relation to whether you get sick.*	
In the long run, people who take care of themselves stay healthy and get well quickly.	
There is little one can do to prevent illness.*	
People’s ill health results from their own carelessness.	
Doctors can rarely do very much for people who are sick.*	
Many times doctors do not help their patients to get well.*	
Recovery from illness requires good medical care more than anything else.	
Doctors can do very little to prevent illness.*	
Doctors relieve or cure only a few of the medical problems their patients have.*	
Most sick people are helped a great deal when they go to a doctor.	
Seeing a doctor for regular checkups is a key factor in staying healthy.	
I only do what my doctor tells me to do.	
Medical technology can handle health problems.	
Doctors can almost always help their patients feel better.	
Whether or not people get well is often a matter of chance.*	
When it comes to health, there is no such thing as “bad luck.”	
People who never get sick are just plain lucky.*	
Good health is largely a matter of good fortune.*	
Staying well has little or nothing to do with chance.	
Recovery from illness has nothing to do with luck.	
Healthwise, there isn’t much you can do for yourself when you get sick.*	
Some kinds of illnesses are so bad that nothing can be done about them.*	
In today’s world, few diseases are totally debilitating (crippling).	
No matter what anybody does, there are many diseases that can just wipe you out.*	
There are a lot of medical problems that can be very serious or even can kill you.*	
Bcontrol: (7) strongly agree, (1) strongly disagree	New scale
It’s difficult to reduce my sodium intake.*	
It’s too hard for me to exercise three days a week.*	
It’s not easy to cut back on snacks and treats.*	
It’s too hard to eat fresh fruits and vegetables regularly.*	
I find it easy to moderate my red meat consumption.	
I find it hard to get enough rest and sleep.*	
It’s difficult to minimize the additives I consume.*	
Going for an annual physical exam is easy for me.	
It’s easy to see my dentist on a regular basis.	
As hard as I try, I can’t reduce the stress in my life.*	
It’s hard to go for an eye examination.*	
I find it easy to maintain a balance between work and play.	
Educate:	
What is highest level of formal education you have completed?	
a. Grade 8 or less	d. 1–3 years of college
b. Grades 9–11	e. Graduated college (4 years)
c. Graduated high school	f. Attended or completed graduate school

TABLE A1 (Continued)

Measure	Source
Age: Please note your current age: ___ years old	
Income: Please estimate your gross household income?	
a. below \$10,000	d. \$30,001 to \$40,000
b. \$10,000 to \$20,000	e. \$40,001 to \$50,000
c. \$20,001 to \$30,000	f. above \$50,000

NOTE.—Starred items were recoded.

^aThese questions were preceded by instructions asking respondents to note the amount that they utilized these sources for health information.

^bTwo items, "Medical technology can handle health problems" and "Doctors can almost always help their patients feel better," were added to the original scale.

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