# Factors Affecting the Frequency of Health Enhancing Behaviors by the Elderly

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**Synopsis**

*The authors examined the frequency of health-enhancing behaviors practiced by the elderly living in community settings, with emphasis on the impact of disease and disability on the frequency of those practices. Data were collected through personal interviews with a probability sample of 667 respondents in a 4-county region of northeastern New York.*

*Almost all respondents said they engaged in at least one health-enhancing practice on a regular basis. The most commonly reported behaviors involved dietary practices. Results of the analysis support the importance of differentiating among health-enhancing behaviors that are undertaken as primary levels of prevention, in contrast to those undertaken as secondary or tertiary levels of prevention.*

THE CURRENT DEBATE on the medical care system has refocused attention on the financial costs of treating disease after it develops, rather than attempting to prevent its occurrence.

While prevention involves a range of behaviors, including medical and dental checkups, immunizations, and routine screening, growing emphasis has been placed on personal health behaviors. More than a decade ago, the Surgeon General's Report on Health Promotion and Disease Prevention *(1)* attributed almost half of all deaths to unhealthful lifestyles. For the previous 13 years, an accumulating body of research had documented the negative consequences of poor dietary habits, lack of exercise, smoking, and excessive alcohol consumption *(2, 3)*. As Hickey *(4)* pointed out, "impressive advances in medicine have done little to reverse the deleterious long-term health effects of negative behaviors and lifestyles."

As a result, increased attention has been directed to designing interventions intended to change unhealthful practices and to encourage health-enhancing behaviors on the personal level. We examined the frequency of health-enhancing behaviors among a sample of elderly living in community settings, with particular emphasis on the impact of disease and disability on the frequency of those practices.

Eighty percent of persons older than 65 years suffer from at least one chronic disease. Many of the diseases that affect the elderly are linked to behavioral or lifestyle factors *(5)*. Although the onset of those conditions often is insidious, developing during a period of years, disease prevention efforts among the elderly can produce substantial benefits *(6)*. Among the old, efforts to change unhealthful practices and encourage health-enhancing behaviors can be directed toward managing conditions that have already developed. The desired outcomes of health enhancing behaviors among the elderly include "maximization of functional independence, avoidance of unnecessary disability, and enhancement of the quality of life" *(7)*.

The clinical literature on preventive behavior recognizes the separate functions of health-enhancing behaviors. Edelman and Mandle *(8)* provided an interpretation of the three-level model of prevention (primary, secondary, and tertiary) first described by Leavell and Clark *(9)*. Primary prevention is prevention in its truest sense, including measures that are health promoting (that is, lifestyle changes, such as diet and exercise), as well as those that provide specific protection (such as immunizations). Secondary prevention focuses on early diagnosis and treatment to delay the onset or progress of disease. Secondary prevention is relevant especially to intervention with the elderly, who are at risk for a variety of chronic illnesses. Edelman and Mandle *(8)* observed that in the later phase of secondary

prevention the goal may become that of limiting future disability, if the disease process had gone unrecognized in earlier stages. Preventive strategies in the later phase of secondary prevention are largely therapeutic in nature, not health promoting per se. Tertiary prevention is indicated when a disease or disability is irreversible and requires rehabilitation strategies to maintain optimal levels of function in relation to the realities of physical limitations. Thus, monitoring conditions and following a regime to prevent deterioration are the foci of efforts at the tertiary level of prevention.

The lifestyle practices most often used as indicators of health-enhancing behaviors among the elderly can reflect prevention on all three levels. To illustrate, we use the behavior we noted as "reserve time for exercise." If the elderly have included exercise in their daily routines throughout their lives, that behavior truly represents primary prevention. However, another group of elders may have incorporated exercise into their daily regimes only recently to impede the progress of a newly diagnosed health problem, such as arthritis. That effort may have been recommended by a health care professional or been viewed by the person as an appropriate activity, based on advice from the popular media, family, or friends. Another group of old persons may exercise to maintain the limited joint function that remains after years of a diagnosed arthritic condition. The goal for them will be to maintain optimal function.

A prerequisite to designing effective interventions that encourage all three levels of prevention is an understanding of the underlying processes that promote health-enhancing behaviors. Although researchers have identified correlates of specific practices, no general model for explaining either positive health behavior, or changes in unhealthful practices, has emerged.

Investigators have explored the relationship of sociodemographic factors to health-enhancing behaviors. Most researchers have reported, for example, that women exhibit more preventive health behaviors than men, although men and women followed different practices *(10–14)*. Verbrugge *(15)* suggested several reasons for sex differences, including women's greater sensitivity to illness and discomfort, willingness to seek help with illness, knowledge about health, and responsibility for managing family health across the life cycle. Some writers have argued that sex differences in health become less in late life, as retirement diminishes differences in lifestyle, and prevalence of chronic illnesses increases among both men and women *(16, 17)*.

Other sociodemographic variables have been linked to preventive health practices. Socioeconomic status is related positively to health-enhancing behavior, reflecting both greater knowledge and more resources for implementing that knowledge *(11, 14, 17)*. Marital status, particularly for men, can influence preventive routines, since women often serve as "hidden providers" of health care who transmit health information, monitor health practices, and reinforce health-enhancing behaviors of people in their households *(11, 18, 19)*. Women generally possess more health-related knowledge than men. Wives are more likely than husbands to be responsible for household routines like meal preparation that have an impact on health *(20, 21)*. Further support for that interaction between sex and marital status was provided by Umberson *(22)*, who found that married men were more likely than unmarried men to experience pressures from others to engage in preventive behavior, with no difference between married and unmarried women. Brown and McCreedy *(11)* reported that marital status influenced preventive behavior of men but not of women.

Probably more attention has been focused on attitudinal variables, particularly health beliefs and locus of control. The Health Belief Model *(23, 24)* highlights the importance of perceived susceptibility to illness, the importance attached to maintaining health, and the perceived efficacy of health-related behaviors. If people are concerned about maintaining good health and believe they are susceptible to disease, they are more likely to take some action to avoid disease. Hickey agreed that perceptions of vulnerability are an important stimulus for health-enhancing behavior. He suggested that shifts in perceived vulnerability explained some of the diminished differences between the sexes in health behaviors in old age *(4)*.

> Older men may begin to exercise more preventive behavior than younger males when faced with increasing morbidity and mortality risks, or when they observe the preponderance of widowed women in their age group.

Old wives, observing the increasing prevalence of widowhood among their friends, may exercise greater diligence in monitoring their husbands' health habits. People will not undertake prevention at any level, however, unless they believe those behaviors will enhance their own health. Those elderly who have little sense of personal control over health outcomes, who attribute disease to fate, chance, or the inevitable results of aging, are less likely to undertake health-enhancing behavior.

A final set of explanatory variables includes indicators of social support networks. Family and friends can provide information about health and can encourage or reinforce health-enhancing behaviors. Rakowski and coworkers, for example, reported that a supportive family environment was a consistent predictor of four types of health behavior. They concluded that the "success of intervention programs to modify health practices seems especially dependent on the family environment" *(13)*. Gottlieb *(25)* and Riffle and coworkers *(26)* found that social networks were positively related to health practices for both men and women.

Not all investigators, however, have confirmed a link between social networks and preventive practices. A study involving cohort differences revealed no significant impact of either social contacts or group participation on five health habits among people ages 54–65 years, although married respondents were somewhat more likely than unmarried respondents to engage in those practices *(27)*. Dean *(28)* concluded that social support indicators exert more impact on self-care responses to illness than on health protective behavior. After reviewing literature on the impact of social network structure on involvement in health-related discussions, Gore *(29)* concluded that social networks set constraints on the conditions under which social assistance or influence can occur and mediate access to lay consultants. The outcome of lay consultation depends on the content of the norms and values of the particular network culture. What is crucial is not the structure of an informal network, but whether or not those networks transmit health information and reinforce health-enhancing behavior.

Most of the research on health-related behavior has conceptualized those practices as primary prevention strategies, as behavior undertaken to prevent future occurrence of disease. Elderly persons, however, are more likely than younger persons to exhibit chronic conditions. As suggested by distinctions among the three levels of prevention described, practices that are followed by relatively healthy people to prevent the onset of disease may be prescribed for less healthy people to delay the progress or manage the consequences of already diagnosed conditions *(7, 30)*. For example, persons may limit the amount of sugar they consume to decrease the chance of developing diabetes, whereas the elderly with geriatric-onset diabetes will be instructed by their physicians to limit the amount of sugar in their diet.

Within that context, Hickey and coworkers distinguished between preventive health behavior, which refers to "activities intended by the individual to reduce his or her risk of developing a serious illness condition," and health maintenance behavior, which refers to "activities which are intended to continue and, if possible, improve one's current level of health for as long a time as possible" *(31)*. Their definition of preventive health behavior is analogous to Edelman and Mandle's *(8)* concept of primary prevention, while their definition of health maintenance behavior encompasses both secondary and tertiary prevention. As Hickey and coworkers concluded, "the preventive actions that healthy individuals practice may be quite different from what someone does in the presence of serious or disabling illness" *(31)*.

*'Reports of a lack of consistency of predictors within and across behaviors suggests the need for a new approach to studying preventive behavior.'*

Disease and disability can discourage health-related practices in old age. Chronic disease and increasing frailty can undermine an old person's ability to undertake preventive practices, such as regular exercise. Within that context, disease and disability operate as barriers to health promotion *(32–34)*. Some researchers have concluded that the perceived difficulty of adopting a particular health-enhancing practice is a more powerful predictor of that practice than is its perceived effectiveness *(35)*. Poor health can undermine motivation for maintaining preventive behaviors. "Unless countered by the positive reinforcements derived from good life-long habits, the psychological motivation to practice preventive health behavior is more difficult to sustain in the face of inevitable decline" *(4)*.

We explored both health-protective (primary preventive) and health maintenance (secondary and tertiary preventive) behaviors among a sample of the elderly living in the community. The analysis concerns two questions: *(a)* how do sociodemographic variables, attitudinal factors, social network characteristics, and health status relate to the frequency with which the elderly engage in a series of health-enhancing behaviors? *(b)* how do the presence of disease and disability modify the frequency of those health-enhancing behaviors?

## Methods

**Data collection techniques.** To gather data on lay care in illness, we interviewed a probability sample

of people 65 years and older living in community settings and responsible for managing their own health care. The indepth interviews ranged from 90 minutes to 3 hours, and were conducted in the respondents' homes by members of the project field staff from October 1989 through September 1990.

**Sample design.** Area probability sampling techniques were used to identify 850 persons who were eligible for inclusion in the study. Eligible respondents were those 65 years and older, living in a community setting, and managing their own health care decisions. Of them, 669 participated in the study, producing a response rate of 78.7 percent.

The sample was identified by a telephone screening survey, based upon a two-stage sample design using listings from telephone directories. Telephone directories were used rather than random-digit-dialing because of the rural nature of part of the survey geographic area. In rural areas, a smaller percentage of numbers are unlisted, a smaller percentage of numbers generated by random-digit-dialing are working household numbers, and there can be more problems in ascertaining the status of numbers than in urban areas *(36)*. Using telephone directories can miss unlisted or new numbers, but the efficiency in this case outweighs those problems.

The number of telephone listings sampled was determined by census estimates of the proportion of the population 65 years and older in each of the four counties. A two-stage sampling procedure was implemented within the four rural counties. Telephone exchanges were grouped into clusters to correspond to political subdivisions for which Bureau of the Census population data are available. Those clusters were selected at random with replacement, with probability proportional to the size of their elderly population in 1980. Within each selected cluster, a systematic random sample of telephone numbers was selected from telephone directories, with subsample size proportional to the 1980 elderly populations *(37)*. In households with more than one eligible person, the respondent was selected through a technique modified from Groves and Kahn *(38)*.

**Geographic area.** The geographic area from which the sample was drawn consisted of a four-county area in the northeast corner of New York State. The counties represented a variety of living environments, ranging from sparsely populated rural regions to a community designated as a small Standard Metropolitan Statistical area by the Bureau of the Census. Thirty-four percent of the respondents lived in rural settings. Fifty percent lived in communities with populations between 2,500 and 25,000. The remainder lived in urban areas with populations of more than 25,000.

**Sample characteristics.** The mean age of the sample was 74.1 years, with a standard deviation of 6.6 years; 29.7 percent were ages 65–69 years, 29.1 percent were 70–74 years, 20.0 percent were 75–79 years, 12.5 percent were 80–84 years, and 8.6 percent were 85 years or older. Most (60.1 percent) of the respondents were women.

Because our sample design called for selecting only one old person per household, the percentage of married respondents was lower than the percentage of married elderly in the population; 43.8 percent of our respondents were married, 47.1 percent were widowed, 4.1 percent were divorced or separated, and 5.0 percent had never married. Almost half (46.8 percent) were living alone at the time of the interview; 37.3 percent lived with a spouse in a two-person household, 7.9 percent lived with a spouse and other people, 6.7 percent lived with adult children (no spouse), and 1.3 percent reported other living arrangements. Sixteen percent of the respondents were employed. The median level of education was 12 years; 20.6 percent had an eighth-grade education or less, 17.8 percent reported some high school, 30.4 percent were high school graduates, 15.7 percent reported some postsecondary education, and 15.5 percent had baccalaureate degrees. Reflecting the ethnically homogeneous population in the area, 99.3 percent of the respondents were white.

**Measures.** Questions regarding health enhancing behaviors were preceded by the following statement: "Everyone gets sick at one time or another. Some people try to avoid illnesses by following certain behaviors. I'm going to read you a list of things people sometimes do to affect their health. Could you tell me whether you do these things on a regular basis, sometimes, rarely, or not at all?" Respondents rated the frequency with which they engaged in each of nine health-enhancing behaviors, using a four-category scale: never, 1; rarely, 2; sometimes, 3; or regularly, 4 (defined as almost every day). The list of health behaviors was synthesized from lists used by previous researchers *(10, 14, 17, 39)*.

Three sociodemographic indicators were incorporated into the analysis. Information on the sociodemographic characteristics of the sample was summarized previously. Education was coded as the number of years of formal education completed; the mean grade level of education was 11.7, with a standard deviation of 3.2. Given previous documenta-

tion of an interaction between sex and marital status, those two variables were combined into four categories: married women (14.2 percent), unmarried women (46.2 percent), married men (29.5 percent), and unmarried men (9.9 percent). In the multivariate analysis described subsequently, married women were the reference category.

Measures of health attitudes were developed. To assess the extent to which respondents believed they were responsible for their own health, or whether their health was a result of fate or chance, we administered the Internal Health Locus of Control and the External Locus of Control (health attributable to chance) indices, developed by Wallston and Wallston *(40)*. The mean score on the Internal Health Locus of Control scale was 4.4, with a standard deviation of 1.6 and a range of 0 to 7. For the External Locus of Control (chance) scale, the mean was 2.3, with a standard deviation of 1.6 and a range of 0 to 6.

Health motivation and beliefs regarding susceptibility to illness incorporated measurement techniques developed by Berkanovic and coworkers *(41, 42)*. Three items pertained to health motivation: concern when sick, importance of health, and frequency of thoughts about health. The mean on that three-item summated rating was 1.3, with a standard deviation of 1.0 and a range of 0 to 3. Two items measured perceptions of susceptibility to illness: beliefs about resistance to illness and frequency of illness relative to other people. The mean of that two-item rating was 0.2 with a standard deviation of 0.5 and a range of 0 to 2.

On the basis of research stressing the importance of health-related content, rather than structure of informal networks, several indicators of source of health-related information were incorporated into the interview schedule. Following the strategy used by Rakowski and coworkers *(43)*, respondents were asked how often they learned about health-related matters from articles, radio and television, discussions with family, discussions with friends, or asking questions of their physician, dentist, pharmacist, or a nurse in a physician's office. Those questions were used to create three dichotomous indicators pertaining to sources of health information: family or friends, the news media, or formal practitioners.

Respondents were given a code of 1 if they said they sometimes or regularly sought health-related information from those sources, a 0 if they did not. Fifty-eight percent of respondents said they sometimes gathered information from family or friends, 81 percent from the news media, and 74 percent from formal practitioners. Interviewers recorded if the respondent, the respondent's spouse, or another member of the respondent's informal network ever had been employed in a health occupation.

Health status was estimated, using a subjective assessment and a more objective indicator. Respondents used Cantril *(44)* ladders to rate their overall health on a scale from 1 (''worst possible'') to 10 (''best possible''). The average score on that scale was 7.4, with a standard deviation of 2.0 and a range of 1 to 10. Respondents were asked to indicate whether they had been diagnosed with any of 26 conditions included in the older Americans resources and services (OARS) assessment of physical health *(45)*. For each diagnosis, they were asked to indicate whether the condition bothered them a great deal, somewhat, or not at all. The average number of conditions that presented the respondent with any difficulty was 1.4, with a standard deviation of 1.6 and a range of 0 to 12.

To explore the extent to which illness impeded respondents' ability to pursue health-related activities, we created a measure of symptom-related barriers to mobility by summing the level of difficulty an elderly person reported with each of the following symptoms: difficulty walking, falling, excessive fatigue, fainting, and weakness or numbness. The mean score on that rating was 0.3, with a standard deviation of 0.7 and a range of 0 to 5; 22.5 percent of the respondents reported some mobility barrier.

## Analysis and Results

Virtually all respondents reported some health-enhancing behaviors. Only three (0.4 percent) said that they did not follow any of the nine practices on a regular basis, but only eight (1.2 percent) said they regularly practiced all nine. The mean number of regularly practiced behaviors was 4.6 with a standard deviation of 1.9. Slightly more than one-quarter (27.3 percent) regularly followed between one and three practices, 38.2 percent followed four or five practices, 19.9 percent followed six practices, and 12.9 percent followed seven or eight.

The frequencies with which the respondents reported each of nine health-enhancing behaviors are summarized in table 1. The respondents most often followed preventive practices that involved diet; 60.9 percent regularly limited the amount of fat in their diet, 70.2 percent regularly limited the amount of salt they consumed, and 68.1 percent regularly consumed foods with fiber. More than one-third (35.9 percent) supplemented their diet with vitamins on a regular basis. Only 36.6 percent regularly reserved time for exercise, and fewer than half (44.8 percent) said that they regularly found ways to reduce tension. Fewer

Table 1. Percentage of 667 elderly reporting health enhancing and related behaviors in a telephone survey, northeastern New York, 1989–90

| Practice | Never | Rarely | Sometimes | Regularly | Number responding |
|---|---|---|---|---|---|
| Do you monitor your weight? | 24.0 | 20.4 | 33.5 | 22.1 | 667 |
| Do you limit the amount of fat and cholesterol in your diet? | 22.6 | 5.7 | 10.7 | 60.9 | 664 |
| Do you take vitamins or minerals? | 57.4 | 2.6 | 4.2 | 35.9 | 667 |
| Do you find ways to reduce tension? | 22.1 | 9.6 | 23.5 | 44.8 | 644 |
| Do you try to control the amount of salt in your diet? | 17.5 | 3.8 | 8.6 | 70.2 | 665 |
| Do you include foods with fiber in your diet? | 7.2 | 6.0 | 18.7 | 68.1 | 664 |
| Do you reserve time for exercise? | 38.4 | 8.0 | 17.0 | 36.6 | 664 |
| How often do you smoke? | 81.0 | 1.4 | 1.5 | 16.1 | 664 |
| How often do you drink alcoholic beverages? | 42.9 | 29.5 | 16.3 | 11.3 | 657 |

Table 2. Predictors of the elderly practicing health enhancing behaviors, by 667 respondents in a telephone survey, northeastern New York, 1989–90[1]

| Predictor | Weight (N = 658) | Fat (N = 645) | Vitamins (N =648) | Tension (N = 626) | Salt (N = 646) | Fiber (N = 646) | Exercise (N = 656) | Smoke (N = 646) | Drink (N = 640) |
|---|---|---|---|---|---|---|---|---|---|
| Sociodemographic: | | | | | | | | | |
| High school education | [2].18 | .06 | [3].13 | .03 | [3].08 | [4].08 | [3].11 | −.06 | [2].20 |
| Married men | −.08 | −.07 | [3]−.14 | −.06 | [3]−.13 | −.07 | .06 | [3].15 | [2].26 |
| Single men | −.06 | [3]−.11 | [2]−.16 | [3]−.11 | −.07 | −.02 | .00 | [3].14 | [3].10 |
| Single women | −.05 | [4]−.08 | −.08 | −.09 | .00 | [4]−.09 | −.07 | .13 | −.01 |
| Age | −.05 | −.06 | .02 | [4]−.09 | −.04 | −.03 | −.02 | [4]−.14 | −.05 |
| Health status: | | | | | | | | | |
| Health assessment | .01 | .02 | .03 | [3].10 | .03 | −.02 | [3].14 | .00 | .04 |
| Number of problematic diagnoses | [2]−.12 | −.02 | −.04 | .01 | [3].09 | [3]−.10 | [3]−.14 | .07 | −.04 |
| Attitudinal: | | | | | | | | | |
| Internal locus[5] | .00 | [4].08 | [4].08 | .03 | .02 | .06 | .02 | .01 | .03 |
| External locus[6] | .01 | −.04 | −.03 | −.06 | −.05 | [3]−.11 | −.01 | .02 | −.03 |
| Motivation | .02 | .04 | [4].08 | .04 | .04 | [3].09 | [4].07 | −.05 | −.03 |
| Susceptibility | .01 | −.04 | [3].09 | −.01 | .04 | [4]−.07 | −.04 | −.04 | .02 |
| Source of information: | | | | | | | | | |
| Family or friend | −.04 | .04 | [4].08 | [4].08 | .06 | .04 | .00 | .04 | .04 |
| News media | [3].09 | [3].11 | −.03 | .04 | [2].14 | [3].10 | .03 | −.04 | −.03 |
| Formal provider | [2].17 | [2].16 | .03 | [3].09 | .04 | [3].08 | [3].11 | −.06 | −.02 |
| $R^2$ | [2].10 | [2].09 | [2].07 | [2].07 | [2].10 | [2].08 | [2].11 | .05 | [2].13 |

[1]Standardized regression coefficients.
[2]$P < 0.001$.
[3]$P < 0.05$.
[4]$P < 0.10$.
[5]Internal Health Locus of Control Index, Wallston and coworkers *(40)*.
[6]External Locus of Control (health attributable to chance), Wallston and Wallston *(40)*.
NOTE: Behaviors predicted are weight control, fat reduction in diet, use of vitamin supplements, reducing tension, limiting salt in diet, including high fiber foods in diet, exercise, smoking cessation, and reducing alcohol intake.

than one-quarter (22.1 percent) monitored their weight on a regular basis.

Eighty-one percent reported that they never smoked, whereas 16.1 percent said they smoked on a regular basis. Among those who said they did not smoke at that time, 56.0 percent said they had smoked at some time. Among those who said they currently smoked on a regular basis, 68.9 percent said they had tried to quit. Almost three-quarters (72.4 percent) of the respondents said they never or rarely consumed alcohol; 16.3 percent said they sometimes drank, and 11.3 percent reported drinking regularly. Among those who said they rarely, sometimes, or frequently drank alcohol, 4.2 percent said they sometimes drank too much. Among those who reported regular drinking, 12.3 percent said they sometimes drank too much. Smoking and alcohol consumption were recoded for the multivariate analyses that follow, since lower frequencies for those behaviors are associated with health enhancement.

Investigators have found minimal relationships among different health-enhancing behaviors and few consistent predictors of specific practices. The data supported the finding of limited correlation among most of the health-enhancing behaviors. The zero-order correlations among dietary practices were the largest; the correlation between limiting fat and

limiting salt was 0.50, the correlation between limiting fat and including fiber in one's diet was 0.36, and the correlation between limiting salt and including fiber was 0.30. Bivariate associations between all of the other pairs of preventive or health maintenance practices were less than 0.30. Cronbach's alpha for the entire set of health-enhancing behaviors was only 0.48, a result that further supports the interpretation that those practices should not be interpreted as a scale for measuring a propensity for health enhancing behavior. Consistent with the bivariate correlations reported previously, a factor analysis produced three significant factors. Dietary practices (limiting fat, limiting salt, and including fiber in the diet) loaded most heavily on the first, and Cronbach's alpha for those items was 0.65. Exercise, monitoring weight, and alcohol consumption loaded on the second factor, but Cronbach's alpha for those items was only 0.31. The third factor was represented only by smoking.

**Predicting the frequency of health-enhancing behaviors.** Multiple regression analysis was used to assess the relationship of sociodemographic background, health status, health-related attitudes, and sources of health information, with the frequency with which respondents said they engaged in each of the nine health-enhancing practices. Because of the failure of efforts to identify a general model for explaining either positive health behavior or changes in unhealthful practices, Rakowski and coworkers *(13)* recommend developing multiple explanatory models with individual health practices as the outcome variable, rather than attempting to predict the existence or number of health-enhancing behaviors.

We followed that strategy in our analysis. Results are presented in table 2. Results significant at the 0.10 level are indicated in the table, but are not discussed in the text. Because of a skewed distribution of the frequency of smoking, that variable was recoded as a dichotomy (never vs. rarely, sometimes, and regularly, and never or rarely vs. sometimes or regularly), and the prediction equation was estimated using logistic regression. Those results, which are not presented in the table but are available upon request from the authors, did not produce any differences in the significance or relative magnitude of the coefficients.

Consistent with the results of previous research, few variables emerged as consistent predictors of health-enhancing practices *(13)*. People with high levels of education monitored their weight, took vitamins, limited the amount of salt in their diet, and reserved time for exercise more frequently than people with less education. Education was positively related to frequency of alcohol consumption, reflecting that indicator as showing frequency of drinking rather than either the amount of alcohol or problematic outcomes *(46)*. Men, regardless of marital status, consumed alcohol more frequently and took vitamins less frequently than either married or single women. Single women smoked more frequently (and were more likely to smoke) than married women. In comparison to the reference category of married women, married men were less likely to limit the amount of salt in their diet, whereas single men were less likely to find ways to reduce tension, or to limit the amount of fat they ate. Older respondents were less likely to smoke and less likely to find ways to reduce tension than were younger respondents. Education, age, sex, and marital status were not significantly related to the frequency of other health-enhancing practices.

Self-assessed health status exerted minimal predictive impact on the frequencies of those behaviors. Persons who assessed their health positively were those who often exercised and found ways to reduce tension, but the coefficients for self-assessments of health were not significant in any of the other equations. The number of problematic diagnoses was related negatively to the frequency with which people monitored their weight, included fiber in their diet, or reserved time for exercise, but positively related to the frequency with which people limited the amount of salt in their diet.

Although coefficients for several of the attitudinal variables achieved significance, no consistent pattern was observed across behaviors. The Health Locus of Control Index scores exhibited little association with frequency of health-enhancing behaviors. The coefficient for Health Internal Locus of Control was not significant in any of the equations. Persons with low scores on Health External Locus of Control were less likely to include fiber in their diets, but that indicator was not significantly related to the frequency of any of the other behaviors. Persons who agreed with the most items on the motivation index tended to include fiber in their diets most frequently. Believing oneself to be susceptible to illness was positively related to the frequency of taking vitamins.

Variables reflecting sources of health-related information were more consistently associated with the frequency of health-enhancing practices, although the relative importance of particular sources varied across different behaviors. Discussions of health issues with family and friends was not significantly related to the frequency of any of the health-enhancing behaviors.

Table 3. Predictors of the elderly practicing the health enhancing behaviors of limiting salt and fat in their diets, in the presence of illness (hypertension), 667 respondents in a telephone survey, northeastern New York, 1989–90[1]

| Predictor | Limiting salt in diet | | | Limiting fat in diet | | |
|---|---|---|---|---|---|---|
| | All (N = 643) | With diagnosis of hypertension (N = 242) | No diagnosis of hypertension (N = 401) | All (N = 643) | With diagnosis of hypertension (N = 242) | No diagnosis of hypertension (N = 401) |
| Sociodemographic: | | | | | | |
| High school education | [2].08 | [3].12 | .05 | .06 | .10 | .02 |
| Married men | [3]–.10 | [3]–.14 | –.08 | –.06 | –.04 | –.06 |
| Single men | –.05 | –.11 | –.02 | [3]–.09 | –.08 | –.09 |
| Single women | .00 | .04 | –.00 | [3]–.09 | –.09 | –.08 |
| Age | –.05 | –.08 | –.04 | –.07 | –.08 | –.06 |
| Health status: | | | | | | |
| Health assessment | .05 | –.11 | [2].12 | .03 | –.02 | .07 |
| Number of problematic diagnoses | .05 | .01 | .06 | –.05 | –.11 | –.01 |
| Attitudinal: | | | | | | |
| Internal locus[4] | .03 | .02 | .04 | [2].08 | .06 | [2].11 |
| External locus[5] | –.05 | .11 | [2]–.13 | –.03 | .05 | [3]–.09 |
| Motivation | .05 | –.02 | .08 | .05 | .02 | .06 |
| Susceptibility | .05 | .09 | .05 | –.03 | .04 | –.06 |
| Source of information: | | | | | | |
| Family or friend | .06 | .05 | .06 | .04 | .05 | .03 |
| News media | [6].14 | [3].13 | [2].15 | [2].11 | –.01 | [2].16 |
| Formal provider | .03 | –.01 | .07 | [6].15 | .10 | [6].19 |
| Presence of illness: | | | | | | |
| Hypertension | [6].20 | ... | ... | [2].12 | ... | ... |
| Rs[2] | [6].13 | [2].11 | [6].11 | [6].10 | [6].06 | [6].09 |

[1] Standardized regression coefficients.
[2] $P < 0.05$.
[3] $P < 0.10$.
[4] Internal Health Locus of Control Index, Wallston and coworkers *(40)*.
[5] External Locus of Control (health attributable to chance), Wallston and coworkers *(40)*.
[6] $P < 0.001$.

The elderly who said they gathered information about health from the media were found to monitor their weight, limit the amount of fat in their diet, restrict their salt intake, and include fiber in their diet more frequently than other people. Finally, gathering health-related information by asking questions of health care professionals was positively related to monitoring weight, limiting the amounts of fat and salt in the diet, finding ways to reduce tension, eating foods with high fiber content, and reserving time for exercise. The positive coefficients may indicate that people are exposed to information that stresses the beneficial effects of health-enhancing behaviors through conversations with health care practitioners and through media exposure, and that this information increases the frequency with which people pursue those behaviors. Seeking out health information can be conceptualized as another form of health-enhancing behavior; in that case the effects of those variables would be correlational rather than causal *(43)*.

Neither the indicator for a health-related occupation for the respondent (or the respondent's spouse), or for a health-related occupation of another member of the respondent's informal network, had a significant impact on the frequency of any of the health-enhancing behaviors. Since deleting those two variables from the equations did not significantly change the other coefficients, they were not included in the final equations.

An interaction term involving motivation and susceptibility was tested, because it was hypothesized that motivation regarding health would be most relevant when people believed they were susceptible to illness. A second interaction term identified people who consulted family and friends and reported at least one person with a health-related occupation in their informal network. Those interaction terms were neither significant nor improved the fit of any of the equations, so they were not included in the equations presented in table 2.

**Health-enhancing behavior in the presence of illness.** As Hickey *(4)* suggested, health-enhancing behaviors undertaken by healthy people (that is, primary prevention) may be quite different from health-enhancing behaviors undertaken in the presence of serious or disabling illness (that is, secondary or tertiary prevention). To explore that hypothesis, we examined the impact of a diagnosis of hypertension on the frequency of the following behaviors, all of which

are associated with a regimen for managing hypertension: restricting salt, limiting fat, finding ways to reduce stress, exercising, monitoring weight, smoking avoidance or cessation, and limiting alcohol consumption. First, a dichotomous variable indicating whether the person had been diagnosed with hypertension was introduced into the equations predicting each of those behaviors; 37.2 percent of the respondents reported a diagnosis of hypertension. Second, the equations were estimated separately for persons with and those without a diagnosis of hypertension.

A diagnosis of hypertension was significantly related to the frequency with which people restricted salt intake and limited fat in their diet, but it did not significantly influence the frequency of the other behaviors. Results of the analyses involving salt and fat restrictions are presented in table 3.

The coefficient for hypertension indicates that the elderly who had been diagnosed as hypertensive restricted dietary intake of both salt and fat more frequently than did the elderly without that diagnosis. Comparing the equations for persons without a diagnosis of hypertension to those for persons with such a diagnosis provides some support for the hypothesis that health-enhancing behavior in the presence of illness differs from similar behavior in the absence of illness. Among people diagnosed as hypertensive, none of the coefficients in the equations predicting salt or fat restriction achieved statistical significance ($P < 0.05$). The explanatory model incorporated in the regression was more applicable to explaining dietary restriction of salt and fat among people without a diagnosis of hypertension.

Persons who assessed their health more positively were more consistent in limiting the amount of salt in their diet. The coefficients for Health Locus of Control indicators suggest that the elderly who attribute their health to chance were less likely to restrict salt in their diet, and that persons who believe that they can control their own health were more likely to limit fat in their diet. Respondents who rely on the news media for information about health were more consistent in following both of those dietary practices. Reliance on formal providers for health information was positively related to the frequency of restricting the amount of fat but had no effect on the frequency of restricting salt in one's diet.

**Ability to perform health-enhancing practices.** The frequency with which the elderly engage in health-enhancing behaviors can be influenced by their ability. To explore this issue, we examined the relationship between symptom-related barriers to mobility and the frequency with which older respondents said they reserved time for exercise. Following the procedures described, the summated rating of symptom-related barriers to mobility was introduced into the equation predicting exercise. That equation was estimated separately for people who reported no barriers and for people who reported one or more barriers. Results of those analyses are presented in table 4.

Table 4. Predictors of the elderly practicing the health enhancing behavior of reserving time for exercise, with and without reporting a barrier to personal mobility, from 667 elderly reporting in a telephone survey, northeastern New York, 1989–90[1]

| Predictor | All elderly (N = 646) | One or more barriers (N = 139) | No barriers (N = 507) |
|---|---|---|---|
| Sociodemographic: | | | |
| High school education | [2].11 | .02 | [2].13 |
| Married men | .06 | [3].22 | .02 |
| Single men | .00 | .09 | −.03 |
| Single women | −.08 | −.03 | −.10 |
| Age | −.02 | .04 | −.01 |
| Health status: | | | |
| Health assessment | [2].11 | −.02 | [2].15 |
| Number of problematic diagnoses | [2]−.11 | −.06 | [2]−.14 |
| Attitudinal: | | | |
| Internal locus[4] | .02 | −.08 | .04 |
| External locus[5] | −.01 | −.05 | −.00 |
| Motivation | [3].08 | .15 | .06 |
| Susceptibility | −.03 | −.14 | .02 |
| Source of information: | | | |
| Family or friend | .00 | −.01 | −.00 |
| News media | .03 | −.04 | .03 |
| Formal provider | [2].10 | [3].18 | [2].12 |
| Presence of illness: | | | |
| Mobility barrier | [2]−.10 | ... | ... |
| $R^2$ | [2].12 | .10 | [2].10 |

[1] Standardized regression coefficients.
[2] $P < 0.05$.
[3] $P < 0.10$.
[4] Internal Health Locus of Control Index, Wallston and coworkers *(40)*.
[5] External Locus of Control (health attributable to chance), Wallston and coworkers *(40)*.

People who reported barriers to mobility were less likely to reserve time for exercise, regardless of their sociodemographic background, health status, health attitudes, or sources of health information. The importance of health-related barriers is further supported by the coefficients for the two indicators of health status. Those who assessed their health more positively exercised more frequently; those who reported a larger number of bothersome diagnoses said they exercised less frequently.

None of the independent variables were statistically significant in the equation predicting exercise among people who reported one or more health-related barriers to mobility. The coefficient for married men, although significant only at the 0.06 level, was consistent with Umberson's *(22)* finding that wives

operate as social control agents in encouraging health-enhancing behaviors among their husbands. In this context, it is interesting to observe that the coefficient did not approach significance among respondents without mobility barriers ($P > 0.75$).

The prediction equation for people who did not report mobility barriers most closely resembled the general equation. Years of education were positively related to frequency of exercising among those respondents. Those who assessed their health most positively and who reported few troublesome diagnoses were more likely than other respondents to exercise on a regular basis. Discussing health issues with formal providers was positively related to frequency of exercising. None of the attitudinal or other sociodemographic variables had a significant impact on frequency of exercise among people without mobility barriers.

## Discussion

Almost all of the older respondents said that they regularly engaged in at least one health-enhancing practice. The most commonly reported behaviors involved dietary practices. That is not surprising, given the emphasis on diet in magazine and newspaper articles and on "healthful" food products in advertisements.

Consistent with previous research, few consistent predictors of health-enhancing practices emerged in the multivariate analyses. Men were less likely than women to follow most health-enhancing behaviors. Education and sources of health-related information were most consistently related to the frequency of those behaviors. Those who said they actively sought out health-related information were more likely to say they followed most practices, with asking questions of health care professionals and gathering information from the news media related to the broadest range of behaviors.

Our analyses supported the importance of considering the impact of illness or disability on the frequency with which the elderly report preventive health practices. Results are consistent with Hickey's *(4)* argument that behaviors undertaken by healthy persons to avoid disease should be separated from behaviors undertaken to retard the progress or cope with the consequences of already existing disease. Poor health and symptom-related mobility problems can create barriers and limit the ability of the elderly to pursue preventive practices. For those with certain diagnoses, behaviors that are considered preventive of disease in the general population become part of health management strategies that are prescribed to impede development of a disease process, to restore previous levels of functioning, or to maximize current abilities. Within that context, the behaviors illustrate secondary or tertiary, rather than primary, prevention.

The conceptual model of preventive health care most often used in the literature emphasizes primary prevention and is more applicable to persons without those types of diagnoses and without health-related barriers to performance; the model is more applicable to primary than to either secondary or tertiary prevention.

General models of health behaviors have been developed from studies of adults of all ages. The results we report highlight the need to modify those predictive models for use with older populations to consider the impact of higher prevalence of chronic disease and functional impairments. Since people in the different categories experience different motivations and encounter different obstacles in pursuing the health-enhancing behaviors, it is not surprising that attempts to develop a single model of preventive behavior have met with limited success.

We selected hypertension to illustrate the impact of diagnosed disease on health-enhancing behaviors. Results indicated that a diagnosis of hypertension significantly increased the frequency with which people restricted their salt and fat intake. The diagnosis had no impact on several other behaviors that often are recommended for managing that condition.

Several explanations are consistent with this seeming discrepancy. The elderly have probably been exposed to more media messages for a longer period about salt and fat intake than about the other practices. An increasing number of commercial food producers have developed products with reduced salt and fat content as well as salt or fat substitutes. Low salt and low fat products have been the subject of extensive marketing campaigns. Furthermore, limiting salt or fat may in some ways be an easier strategy for regulating hypertension than reducing tension, pursuing a regular exercise regimen, or changing long standing habits regarding smoking or alcohol consumption. That is particularly true for tobacco and alcohol consumption, which Dean describes as more complex. "Behaviors that are deep-seated habits involving substances used in social environments have both cultural and psychological functions, and also physiological effects. These behaviors are learned in social environments and become cemented over time in patterns of social interaction and personal satisfaction" *(47)*.

We found limited evidence of the hypothesized interaction between sex and marital status. To the extent that women accumulate a broader base of health

knowledge and are more likely to monitor and supervise the health of other persons in their household, we expected that married men would engage in more health-enhancing behaviors than unmarried men, but that marital status would not affect health promotion among women.

There are several alternative interpretations that should be explored, however, before concluding that the data fail to support the hypothesized interaction. First, married men may be unaware of the extent to which they are adhering to preventive practices within domains handled by their wives. A man whose wife prepares attractive, low-cholesterol meals, using salt substitutes and incorporating dietary fiber, may not realize that he is following preventive practices. Evening walks with their wives may not be considered exercise by men socialized to define exercise in terms of regimented workouts or competitive sports, although their wives may ask their husbands to accompany them on those walks with the importance of cardiovascular conditioning paramount in their minds. In other words, the social control functions Umberson *(22)* discovered among those wives she studied may operate subtly enough that husbands are unaware that their behavior is being affected. Unstructured interviews with wives would provide insights into the strategies they use in promoting health within their households *(18)*. Second, most unmarried people within the sample were widowed, rather than never married, divorced, or separated. The small differences between married and unmarried men in the sample can reflect continuation of behaviors established during the life cycle and continued into widowhood. Although shifting from a married to an unmarried state is associated with some decline in health-enhancing behaviors *(26)*, those changes may not totally erase the effects of 4 or 5 decades of socialization by a spouse. Finally, the small number of unmarried men in this sample, 65 men, may attenuate the impact of marital status on male behavior.

The indicators of health attitudes did not demonstrate any consistent pattern in predicting health-enhancing behaviors. Dean *(47)* attributed the modest impact of health attitudes in her study of health maintenance behaviors to the relatively narrow scope of standard measurement strategies. That inconsistency may reflect lack of knowledge of the importance of those practices. It may also indicate that the patterns of influence of motivation, perceived susceptibility, and belief in personal control are more complex than the linear relationships implied by a multiple regression model. As Davison and coworkers explained, "a major cause of noncompliance is the existence of an attitude that sees health as being largely determined by forces outside of the individual, and thus denies the possible relevance of personal behavioral change" *(48)*. That element of fatalism, however, does not imply ignorance of the impact of lifestyle choices on health.

Belief that one cannot necessarily exercise complete control over one's life, regardless of the importance one attaches to avoiding illness, reflects lay awareness that pronouncements about the therapeutic or deleterious effects of certain behaviors are probabilistic, rather than deterministic. Observing cases of illness and death in personal networks as well as in the public arena demonstrates that not all people who follow health-enhancing practices escape serious illness, and not all people who engage in risky behavior become ill. The popular idea of the classic candidate and common observations of victims are not coextensive categories *(48)*. People associate risk of disease not only with behavior, but with factors such as heredity, upbringing, access to resources, occupational risks, environmental pollution, and chance (that is, luck, randomness, personal destiny, or divine plan).

Davison and coworkers stressed the need for recognizing the complexity in ideas about personal control over health that are masked by a dichotomy or even a continuum anchored by fatalism and lifestylism: "Rather we have encountered a somewhat delicate and reflective balance between the pursuit of an almost universally valued goal (good health) and the realistic recognition that some barriers exist on the road that may not be surmountable through personal, individual effort *(48)*.

That complexity of beliefs regarding individual control in avoiding illness has implications for both future research and for health education. The complexity of attitudes and beliefs that comprise lay repertoires of health-related knowledge can best be tapped by qualitative studies, which allow participants to present their views of health and illness using their own words and reflecting their own categories. Such studies would enable researchers to better model the impact of that cluster of beliefs, which Davison and coworkers have characterized as lay epidemiology, on both preventive behaviors and responses to illness. Such knowledge would assist health educators in addressing at-risk populations more effectively. Exaggerated claims for the outcomes of healthy lifestyles run counter to Davison and coworkers' illustrative observation that "some fat smokers really do live until advanced ages, and some svelte joggers really do 'fall down dead'" *(48)*. Those claims are probably less likely to be accepted than statements consistent with lay observations and beliefs.

Despite the inconsistency in the coefficients for health attitudes, our study results, coupled with the

positive effect of educational achievement and the importance of sources of health information, suggest that increased emphasis on health education has the potential for generating greater compliance with recommended practices. The significance of the coefficient for information provided by health practitioners underlines the importance of emphasizing health-enhancing practices in conversations with clients. Health education campaigns in the news media have the potential to promote healthy lifestyles, not only in their direct impact on the elderly, but indirectly through health-related discussions within informal networks. As Arkin *(49)* noted, awareness of health risks and provision of external motivation to change unhealthful lifestyles through increased media coverage of health issues could dramatically decrease death and disability. To maximize the effectiveness of the information that is communicated, health promotion efforts will need to discover ways to address the interrelationships between the beneficial effects of health-enhancing lifestyles and the common sense observation of causes beyond the control of persons *(48)*.

A major limitation in our analyses of health-enhancing behaviors is the cross-sectional nature of the data, which limited our ability to infer causality in the relationships we reported. For example, our multivariate analyses indicated that health status measures influenced the frequency of several health-enhancing behaviors. Because the data were cross-sectional, we did not know if failure to follow primary preventive behaviors during the life course undermined current health, or whether current poor health discouraged or limited people's ability to follow secondary or tertiary preventive practices.

For a second example, we discussed the relationship between beliefs in susceptibility and health-enhancing behaviors. Believing that one is susceptible to illness can increase one's motivation to engage in preventive behavior. That interpretation is consistent with the positive coefficient for susceptibility in the equation predicting frequency of taking vitamins. Yet, practicing preventive behaviors can lower a person's belief that they are susceptible to illness, a pattern illustrated by the finding that beliefs about susceptibility were negatively related to incorporating fiber in the diet. Furthermore, to the extent that those two patterns are differentially distributed in the sample, their countervailing effects can mask the effects of beliefs about susceptibility. Better understanding of the direction of causality requires longitudinal designs that monitor health behaviors, health attitudes, and health status during the life course.

Although we identified significant predictors of a range of health behaviors, neither our analyses nor the work of other researchers has succeeded in explaining a significant proportion of variation in the frequency of those behaviors. Reports of a lack of consistency of predictors within and across behaviors suggests the need for a new approach to studying preventive behavior. We have suggested one strategy: recognizing and decomposing the substantively distinctive behaviors subsumed under the rubric of preventive behavior.

To the extent that primary, secondary, and tertiary behavior reflect different phenomena and that people who are healthy represent a different population from people who are ill, population parameters for the two groups cannot be expected to be the same. We encourage future investigators to use qualitative methodologies to explore the extent to which categories implicit in standard indices of basic constructs capture the meanings that the elderly bring to the three levels of preventive behavior. We encourage them to explore as well the extent to which a linear specification captures the process through which those constructs promote or discourage health-enhancing behaviors.

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