Correlates of Preventive
Health Behavior
in Late Life

WILLIAM RAKOWSKI
Memorial Hospital, Pawtucket, RI

MARA JULIUS
TOM HICKEY
JEFFREY B. HALTER
University of Michigan

A sample of 172 community-resident older adults (aged 64-96) were interviewed
to investigate correlates of their preventively oriented, health-related practices.
Four health practice groupings were used: Information-Seeking, Regular
Health Routines, Medical and Self-Examination, and Risk Avoidance. Results
indicated modest associations among individual behaviors and among the four
health practice groups. Gender (i.e., women) and a supportive family environ-
ment were among the consistent predictors of good health practices, although
each of the four behavior groups tended to have its own set of major predictors.

An increasing numbers of studies are appearing that contribute to
our understanding of the personal health behaviors of older
adults and of the factors that influence those behaviors. One line

of research is represented by studies of health services utilization, usually employing indices such as the number of physicians visits, dental visits, and hospitalizations during a year (Hibbard and Pope, 1986; Wan and Arling, 1983; Wolinsky et al., 1983). These investigations have often used the analytical framework of predisposing, enabling, and need factors advanced by Anderson and his colleagues. The importance of perceived and objective "need" for care, and of having a regular source of health care, are major findings from these studies.

More recently, reports on other arenas of older adults' personal health behavior have begun to appear with greater frequency. These have included provider-patient interaction (Haug, 1981), self-care (Dean, Hickey, and Holstein, 1986), symptom experience and health perceptions (Prohaska et al., 1985), oral care (Hunt et al., 1985), treatment compliance (Morisky et al., 1982), and preventive health practices (Celetano, Shapiro, and Weisman, 1982; Jajich, Ostfeld, and Freeman, 1984). In addition, a body of epidemiological literature is evolving pertinent to the significance of risk factors of major chronic diseases (Benfante, Reed, and Brody, 1985; Colditz et al., 1985; Curb et al., 1985; Kannel and Gordon, 1980). These reports have often been a natural outgrowth of the aging of initially middle-aged samples, and promise a wealth of data over the coming years. At the same time, they are often concerned with the clinical endpoints of mortality and diagnosed morbidity as a function of a select group of risk factors.

Despite this increased attention, any given investigation has tended to examine one or at best only a small set of behaviors. Additional research is clearly necessary on the diversity of health-related behaviors that older adults undertake. Our information on the preventively oriented practices of older adults is especially at an early point of development. For example, do reserving time for exercise, restricting calories from fat to 30% of total caloric intake, reading health articles in the media, checking medicine expiration dates, and not smoking show strong intercorrelations?

Are individuals preventive across different types of practices, or is prevention largely specific to a particular area of their lives? Do older women have a slight advantage in their reports of health-conscious or preventive practices, as is sometimes though not always observed in earlier adulthood (Verbrugge, 1985)? It is not likely that a single preventive model can be developed that is applicable across the entire range of health-related behaviors. However, some common predictors may be observed across behaviors, which will facilitate the definition of at-risk groups in the older population and the design of intervention programs.

The present report examines the predictors of several types of preventive health practices among a sample of community-resident older adults. Various studies have considered a range of disease prevention and health promotion practices, with the objective of identifying clusters of similar practices, a strategy that complements investigating a series of individual behaviors (Elder et al., 1985; Harris and Guten, 1979; Langlie, 1977; Mechanic and Cleary, 1980; Tapp and Goldenthal, 1982; Turk, Rudy, and Salovey, 1984; Williams and Wechsler, 1972). Results have indicated that clusters or groupings of practices that have similar characteristics can be identified (e.g., daily health habits and routines, risk-avoidance practices, periodic medical exams and checkups). Investigations have so far reported relatively low correlations among the clusters and among individual health behaviors. This degree of independence suggests that major predictors may also differ across different groups of behaviors. Recently, Prohaska et al. (1985) reported only low to modest correlations among health practices in a sample of persons aged 20-89, that included 112 persons aged 60-89, recruited at a health fair. However, categories or groups of conceptually similar practices were not used in analyses, nor were predictors compared across a diverse range of preventive behaviors.

At present, there is also a need to refine theoretical frameworks around which the study of personal health practices in late life can be organized. The approach derived from Anderson (i.e., pre-disposing, enabling, need variables) provides one strategy (e.g., Wolinsky et al., 1983). However, its classification of predictor

variables seems better suited to studying illness-related actions and service usage, rather than preventive health behaviors. The usual illness-based definition of "need" for health care is difficult to transfer directly to investigations of preventive practices that can occur in the absence of illness or acute symptoms, such as limiting selected dietary items (e.g., salt, red meat, sugar), reserving time for regular exercise, wearing seat belts, or checking one's residence for safety hazards. In addition, given the wide diversity among preventive practices, "enabling" variables such as income, health insurance coverage, and having a regular source of medical care may not always be the most relevant predictors. A broader range of psychosocial measures should be studied, one objective being to identify the salient predictors for various types of practices, as a basis for building path analytic models of health behavior.

The present investigation was therefore designed to gather information about the preventively oriented personal health practices of older adults, using a broader domain of behaviors than has usually been reported to date. The approach taken in this report was to examine the predictors across different categories of preventive practices, insofar as each denotes a "type" of health behavior that contributes to an individual's overall orientation. The variables used to predict health practices represented socio-demographic background, health beliefs and self-health ratings, personal life outlook, and the family social network in order to cover the diversity of variables that studies such as those cited previously have indicated as important. In addition, we believed that it would also be useful to study health behaviors as predictors of each other, on the hypothesis that individuals who were preventive in one arena would be more likely to be preventive in another. This question does not appear to have been investigated, yet it is potentially important for the design of interventions to encourage adoption of good health practices. Our major hypotheses consisted of the following: (1) personal health behaviors could be grouped into meaningful clusters, with the correlations among individual behaviors and groups being only modest; (2) significant predictors would differ across the health behavior

groupings; (3) women would tend to report more preventive practices than men; (4) adding health behaviors to the prediction equation would substantially increase the accounted-for variance.

Methods

SAMPLE

A total of 172 older adults participated in this investigation (Mean age = 74.5 years, SD = 7.84 years, range = 62-96). There were 96 women (55.8%), and 76 men (44.2%), with average ages of 75.4 and 73.2 years, respectively. These individuals were part of an original random sample of 243 community-resident older adults surveyed in 1982 by one of the current investigators (MJ). Of the original 243 persons, 203 valid contacts were made (died since 1982 = 18, not located = 22). Of the 203 contacts, 31 declined participation for various reasons. Those most often mentioned were lack of interest and poor health. The 172 therefore represent 70.8% of the original sample in total, and 76.4% of those who had not died. The city in which they live is an urban suburb of Detroit, Michigan.

The group was almost exclusively Caucasian, and reflecting the ethnic composition of the area, 44.8% (n = 77) were of Jewish background. Average formal education was 12.66 years (SD = 2.92 years). Although they reported an average of 3.0 illnesses, the averaged instrumental activity of daily living scale score across 13 areas was 2.9 on a scale of 3, indicating good functional status in these basic areas. In regard to other background characteristics, the representation of married (women = 34.4%, men = 75%) and widowed (women = 54.2%, men = 15.8%) was consistent with usual statistics. Similarly, 37.2% reported living alone (women = 50%, men = 21.1%). At the same time, 83.7% stated that they knew five or more people well enough to visit. Of the 155 who reported a household income for 1983, 21.7% indicated that it was below $10,000, and 27.3% that it was above $30,000. Overall, therefore, the sample was probably slightly advantaged relative to national

averages at least in regard to income, education, and functional health status.

DATA COLLECTION PROCEDURES

Data for the project were collected through a personal interview that centered on personal health practices and psychosocial indices (discussed in the next section), and a self-kept daily diary of symptom experiences and resulting health behaviors. The diary is the subject of another report and so will not be treated in detail here.

Individuals were contacted through letter and personal telephone follow-up. Persons who had moved were traced as completely as possible with the assistance of a former senior services director for the city. Staff continuity since the original survey, including several interviewers, provided good rapport with the participants and a consistent approach to the data collection.

Interviews were conducted either at the individual's residence or at the Family Practice Center of a local hospital, in conjunction with a day-long, no-cost medical examination that coincided with this project. The medical exam was voluntary, although 122 persons took advantage of it. Project staff conducted the interviews whether at home or at the hospital. Individual interview rooms were provided at the hospital to ensure privacy and adequate space. Pretesting produced an interview of about 90-minutes average length. Most of the multi-item psychosocial measures described later were placed in a self-administered booklet, completed with interviewer supervision, because pretesting indicated that such indices with their accompanying response scales would be completed more efficiently in this form.

In total, the interview was designed to collect information on a wide range of personal health practices, self-health perceptions and health beliefs, future outlook, morale, family support and the social network, and standard sociodemographic background. The intent was to ask about a broader set of health practices than has been reported with older persons, especially those of a

preventive nature, and also to assess a diverse set of psychosocially oriented predictors that have tended to be underrepresented in reports focused more on health services utilization.

INSTRUMENTS AND VARIABLES

Health practices. Four groupings of health behaviors were derived from a set of 37 individual health practices that were asked about in the interview (see Table 1). These groups were formed based upon the behavioral clusters that have been commonly identified in the research with younger adults cited earlier, and so were considered to have face validity. The use of behavior groups (as opposed to individual practices) appears also to be preferred in investigations where the variables used as predictors (e.g., personality traits, social support) are themselves assessed with general questions, so that there is comparability in their respective levels of assessment (Turk, Rudy, and Salovey, 1984).

(1) Health routines: These were practices that would usually be performed on a regular if not necessarily a daily basis, for purposes of disease prevention and health promotion. Included were smoker versus nonsmoker; limiting red meat (yes, no); hours of sleep at night (seven or eight versus LTE six or GTE nine); snacking between meals (rarely/never versus sometimes/often); taking vitamins (sometimes/often versus rarely); and several practices coded as being done either regularly versus only sometimes/rarely, that included using ways to relieve tension, monitoring weight, controlling salt in the diet, controlling sugar in the diet, including foods with fiber, and reserving time for exercise.

These 12 items were considered to represent a general health consciousness in day-to-day life. Responses were recoded in the form noted above, where a "2" indicated a more health-conscious style and a "1" a possibly less favorable style, based upon the apparent consensus of current literature. An average score was then calculated. Subsequent calculation of coefficient alpha indicated an internal consistency reliability of .53.

TABLE 1
Health Practices Used to Constitute the Four Behavior Groups

Health Practices	Description of Coding	
I.) Health Routines:		
a.) Smoker status	1 = Smoker	2 = Non-smoker
b.) Limit red meat	1 = No	2 = Yes
c.) Snacking between meals	1 = Sometime/Often	2 = Rare/Never
d.) Hours of sleep	1 = LTE 6/GTE 9	2 = 7 or 8 hrs.
e.) Taking vitamins/		
minerals	1 = Rarely	2 = Sometime/Often
f.) Eating breakfast	1 = Rare/Never	2 = Sometime/Daily
g.) Way to reduce tension	1 = Rare/Sometime	2 = Regularly
h.) Monitor weight	1 = Rare/Sometime	2 = Regularly
i.) Control salt in diet	1 = Rare/Sometime	2 = Regularly
j.) Control sugar in diet	1 = Rare/Sometime	2 = Regularly
k.) Eat foods with fiber	1 = Rare/Sometime	2 = Regularly
l.) Reserve exercise time	1 = Rare/Sometime	2 = Regularly
II.) Information-Seeking:		
a.) Reading articles about health		
b.) Television and/or radio programs	All Questions:	
c.) Discuss health with family	1 = Rarely	
d.) Discuss health with friends	2 = Sometimes	
e.) Prepare for appointments	3 = Regularly	
f.) Ask questions of physician		
g.) Ask questions of dentist		
h.) Ask questions of pharmacist		
III.) Medical and Self-Examination		
a.) Last preventive		
physical	1 = GT 1 Year	2 = LTE 1 Year
b.) Last blood pressure		
check	1 = GT 1 Year	2 = LTE 1 Year
c.) Last preventive dental		
visit	1 = GT 1 Year	2 = LTE 1 Year
d.) Last preventive eye		
check	1 = GT 2 Years	2 = LTE 2 Years
e.) Self-exam of body	1 = Rare/Sometime	2 = Regularly
f.) Self-exam of mouth	1 = Rare/Sometime	2 = Regularly
IV.) Risk Avoidance:		
a.) Check medicine storage	1 = No	2 = Yes
b.) Have fire extinguisher	1 = No	2 = Yes

(continued)

TABLE 1 Continued

Health Practices	Description of Coding	
c.) Have smoke detector	1 = No	2 = Yes
d.) Have first aid kit	1 = No	2 = Yes
e.) Check devices or aids often	1 = No	2 = Yes
f.) Check meds expiration date	1 = Rare/Sometime	2 = Regularly
g.) Use old/expired meds	1 = Rare/Sometime	2 = Regularly
h.) use other person's meds	1 = Rare/Sometime	2 = Regularly
i.) Check oral care materials	1 = Rare/Sometime	2 = Regularly
j.) Check home for hazards	1 = Rare/Sometime	2 = Regularly
k.) Wear seat belts	1 = Rare/Sometime	2 = Regularly

(2) Information-seeking: Another set of eight questions repre-
sented a readiness to gather information about health and
personal health care from a variety of sources. These questions
were all requested on the scale of: 1 = Rarely, 2 = Sometimes, and 3
= Regularly, with an average score computed. They included
reading articles about health, getting information from the
television or radio, discussing health matters with family and
friends, preparing in advance for medical appointments, and
asking questions of one's physician, dentist, and pharmacist when
there was uncertainty. The coefficient alpha for this subgroup was
.78.

(3) Medical and self-examination: A subset of six items
designated examinations conducted by health professionals or by
oneself. Included were last preventive medical visit, preventive
dental visit, and blood pressure check (each categorized as one
year or less versus more than one year), last preventive eye
examination (two years or less versus more than two years), and
the regularity of performing self-exams of one's body and also
one's oral area (each coded as regularly versus never or only
sometimes). Scoring was again as 2 = more health conscious
versus 1 = less health conscious, and an average score calculated.

The coefficient alpha for this subgroup was .62.

(4) Risk avoidance: A fourth subset, consisting of 11 items, was as grouped an index of practices likely to *limit personal risk*, in some contrast to the concept of health *promotion*. Included here were questions regarding checking for proper storage of medications, having a charged fire extinguisher, having a smoke detector and first aid kit, and checking the condition of aids such as canes or eyeglasses (each of these five answered yes/no). Other questions were checking one's residence for safety hazards, checking for medication expiration dates, using old medications, using other persons' medications, checking the condition of oral care materials, and using seat belts (each coded as regularly versus only sometimes/rarely). Scoring was on a basis of 2 = risk-conscious versus 1 = less risk-conscious, and an average score was calculated. Coefficient alpha was .44.

Predictor variables. A selected group of predictors were used for the analysis, based upon membership in certain broad categories, and after an examination of the intercorrelation matrices to eliminate colinearity.

(1) Demographic and personal background: Included here were level of formal education; age; gender; number of reported illnesses; marital status (married versus nonmarried); ethnicity (Jewish versus non-Jewish); satisfaction with income; and a composite index to represent the availability of a personal physician, dentist, and eye care specialist (all three versus other). Because 170 of 172 persons reported having medical insurance, that variable could not be used. Functional impairment due to health problems correlated at $r = .92$ with number of illnesses, so that only the latter variable was used.

(2) Health-related perceptions: Current self-rated health was assessed with a life-graph procedure used in previous studies, and coded to represent below average, average, and above average perceived health. Health compared to two years ago (worse, same, better) was also requested.

In addition, three health belief indices were created through factor analysis of a set of 17 items responded to on a five-point

Likert-type scale, (principal components, varimax rotation), drawn from the Rand Health Insurance Study and some used by Becker and his colleagues with the Health Belief Model. The subscales were labeled as (1) *Locus of Control:* seven items worded to reflect personal versus other sources of control over health, eigenvalue = 2.982, coefficient alpha = .78, percentage of variance = 17.5; (2) *Interference:* three items designating the individual's resistance to letting illness interfere with activities, eigenvalue = 1.335, coefficient alpha = .54, percentage of variance = 7.8; and (3) *Concern:* three items related to the concern felt toward health status, eigenvalue = 1.01, coefficient alpha = .44, percentage of variance = 6.0. An average score was calculated for each scale. Intercorrelations ranged from −.10 to .28, suggesting adequate independence to be used separately.

(3) Life outlook: Three indicators of general outlook on life were used. One was the Philadelphia Geriatric Center (P.G.C.) Morale scale, employing the full scale core calculated by averaging across all items. Coefficient alpha was .83 for the scale. Another was a set of 10 items to assess the extent of future orientation, drawn from work by one of the investigators (WR), with response on a five-point Likert-type scale. Four temporal dimensions were built into the statements, but a single general factor seemed best able to represent the items, so that an average was calculated across all items (eigenvalue = 2.447, coefficients alpha = .82, percentage of variance = 24.5). The final index was a Cantril-ladder rating of current quality of life, using the 11-step format described by Bortner and Hultsch (1974).

(4) Social network: 18 items, representing two subscales of the Family Environment Scale (Expressiveness and Family Cohesion; Moos, 1981) were combined to create a single score. The two nine-item subscales correlated at r = .55, and were chosen in advance as the most appropriate of the 10-scale instrument to use in the survey. Coefficient alpha was .78 for the index. Information was also obtained on the respondent's number of surviving children and siblings, on the frequency during the week of talking with and actually visiting with others, and on their satisfaction

with how often they saw family and others.

These four groups of predictor variables were used to help arrange results of interpretation and also to avoid entering all predictors at one step. The analysis strategy is discussed below. A fifth category of predictors were the health practice groups already described in the previous section, to investigate the strength of the practices as predictors of each other and relative to the other categories.

Results

ASSOCIATIONS AMONG BEHAVIORAL REPORTS

Consistent with the original hypothesis, and with other studies cited earlier, zero-order Pearson correlations revealed only modest association among the behavioral reports. Out of a total of 666 correlations among the 37 individual practices, 154 achieved the probability level of .05 or less; about 33 would have been expected simply by chance. At the same time, only 33 correlations reached a magnitude of .30 or more.

A factor analysis was performed (principal components, varimax rotation) to determine whether the four groupings we had defined, or perhaps even a general health behavior dimension, could be identified. The primary factor that emerged consisted of those items we had previously labeled as "Information-Seeking," plus one other item (eigenvalue = 3.428, percentage of variance = 9.0). The Pearson correlation with our similar index was high, .95, as would be expected. Other potential factors were either doublets or triplets, and they were subsets of the Health Routines and Risk Avoidance behavior groups described above. The correlations among the four groups ranged from .15 to .36. All except the .15 value were statistically significant at $p \leq .01$, but the magnitudes again were not extremely large as hypothesized, and similar to findings with younger adults. It seemed, therefore, that our initial four behavior categories were appropriate for analysis.

FIRST-LEVEL REGRESSION ANALYSES

A two-step strategy was used as a means to limit the number of predictors that were entered simultaneously in any one regression, relative to the total sample size. In the first step of analysis, ordinary least squares regressions were conducted for each health behavior group, within each of the categories of predictors discussed earlier. Because this was a first step, a probability level of .10 or less was used as the criterion for entry in the next stage. Predictors that were selected from the first set of analyses are presented in Table 2.

Reading down the columns of Table 2, results at this point suggested that few individual predictors were important for all four of the health behavior groups. Gender (i.e., being female) and a supportive family environment were the two most consistent. In addition, as hypothesized, the behavior groups tended to predict each other, which was expected at least at this stage where the predictor categories were analyzed separately. Health perceptions and life outlook variables were less consistent, in that no dominant predictors emerged.

SECOND-LEVEL REGRESSION ANALYSES

In a final regression for each behavior group, the second step of analysis used all of the predictors that had achieved $p \leq .10$ (i.e., all predictors from a column in Table 2). Results are presented in Tables 3 through 6. Because a major question involved the *additional* variance that the health behavior groups could contribute, two entries are given in each table. The top entry (A) gives the result obtained when demographic, health perception, life outlook, and social network variables were forced into the equation first. The bottom entry (B) is the outcome when the health behavior groups were then allowed into the equation. Due to the relative lack of information regarding the predictors of personal health practices in late life, Tables 3 to 6 include those variables that achieved a probability level of less than .10.

Review of the R^2 values (entry B) indicates that predictability

TABLE 2
Summary of Results from the First-Level
Regression Analysis, Within the Predictor Variable Groups

Predictor Groupings	Health Behavior Groups			
	Health Routines	Risk Avoidance	Medical & Self-Exam	Information-Seeking
I.) Demographic:	---	Gender: Women Regular Source of Care	Regular Source of Care Gender: Women	No. of Illnesses: More Gender: Women
II.) Health Perceptions:	Locus of Control: Internal	Current Health: Lower Two-Year Trend: Down Interference: Resists	---	Concern About Health: Greater
III.) Life Outlook:	P.G.C. Morale Scale	Future Outlook: Stronger	---	P.G.C. Morale Scale: Higher Future Outlook: Stronger
IV.) Social Network:	Family Environment	Family Environment Fewer Siblings	Family Environment	Family Environment
V.) Health Behaviors:	Information-Seeking: More More Risk Avoidance: Greater	Information-Seeking: More Health Routines: More Examinations: Frequent	Information-Seeking: More Risk Avoidance: Greater	Daily Routines: More Examinations: Frequent Risk Avoidance: Greater

NOTE: All predictors achieved a probability level of $p < .10$ and were then used in the second-step regressions reported in Tables 3 through 6.

TABLE 3
Results of Second-Level Regression Analysis for
the Subgroup Health Routines—Predictors Are Reported With
and Without the Health Behavior Groups Entered into the Equation

Predictor	Partial $\underline{r}$	Standardized Beta	$\underline{p}$
A.) Without Behavior Groups:			
Locus of Control: Internal	.313	.316	.001
Family Environment: Supportive	.143	.139	.08

$$F = 8.38; \; \underline{p} < .0001; \; \underline{R} = .383; \; \underline{R}^2 = .147$$

Predictor	Partial $\underline{r}$	Standardized Beta	$\underline{p}$
B.) With Behavior Groups:			
Information-Seeking: More	.307	.295	.001
Locus of Control: Internal	.290	.265	.001
Risk Avoidance: Greater	.232	.225	.01

$$F = 12.50; \; \underline{p} < .0001; \; \underline{R} = .550; \; \underline{R}^2 = .303$$
$$\underline{R}^2 \text{ added by behavior groups} = .156$$

NOTE: Predictors for this analysis were the set of variables from the appropriate column of Table 2. Only those predictors achieving $p < .10$ are included in this table. F, R, and R^2 values are those from the entire regression equation.

varied somewhat across the behavior groups, ranging from .24 to .34 when considering the total set of predictors. These figures compare favorably with results of analyses to predict indices such as the number of physician and dentist visits in studies of health services utilization. Comparing entries A and B, the health behavior groups did add a relatively large portion of explained variance, ranging from .064 to .166, and in two cases (Health Routines and Information-Seeking), the increase in R^2 was approximately half of the total amount.

Review of the predictors revealed that each of the four behavior groups tended to have its own set. Table 3 (entry B)

TABLE 4
Results of Second-Level Regression Analysis for the Subgroup Medical
and Self-Exams—Predictors Are Reported With and Without
the Health Behavior Groups Entered into the Equation

Predictor	Partial $\underline{r}$	Standardized Beta	$\underline{p}$
A.) Without Behavior Groups:			
Regular Source of Care	.346	.346	.001
Gender: Women	.195	.184	.02

$$F = 9.98; \; \underline{p} < .0001; \; \underline{R} = .414; \; \underline{R}^2 = .171$$

Predictor	Partial $\underline{r}$	Standardized Beta	$\underline{p}$
B.) With Behavior Groups:			
Regular Source of Care	.348	.335	.001
Information-Seeking: More	.279	.265	.001
Gender: Women	.162	.146	.05

$$F = 11.10; \; \underline{p} < .0001; \; \underline{R} = .485; \; \underline{R}^2 = .236$$

$$\underline{R}^2 \text{ added by behavior groups} = .064$$

NOTE: Predictors for this analysis were the set of variables from the appropriate column of Table 2. Only those predictors achieving $p < .10$ are included in this table. F, R, and R^2 values are those from the entire regression equation.

shows that following *health routines* on a regular basis was more likely to be reported by persons with an internal locus of control, a tendency toward information-seeking, and a tendency to avoid personal risk. A supportive family environment was of borderline importance (entry A), but dropped out when the behavior groups were added to the analysis.

Table 4 (entry B) indicates that more regular *medical and self-examinations* were more likely to be reported by individuals with regular sources of care (medical, dental, eye), persons with a greater tendency toward information-seeking, and women. In this case, both variables that achieved significance in entry A also

TABLE 5

Results of Second-Level Regression Analysis for the Subgroup
Information-Seeking—Predictors Are Reported With and Without
the Health Behavior Groups Entered into the Equation

Predictor	Partial r	Standardized Beta	p
A.) Without Behavior Groups:			
Family Environment: Supportive	.217	.214	.01
Concern About Health: Greater	.199	.196	.02
Number of Illnesses: More	.188	.185	.03
Gender: Women	.162	.163	.06

$$F = 5.02; \; p = .0001; \; R = .423; \; R^2 = .179$$

Predictor	Partial r	Standardized Beta	p
B.) With Behavior Groups:			
Health Routines: More	.286	.269	.001
Number of Illnesses: More	.189	.168	.03
Medical & Self-Exams: Frequent	.186	.165	.03
Risk Avoidance: Greater	.178	.177	.04
Concern About Health: Greater	.165	.149	.05

$$F = 7.91; \; p < .0001; \; R = .588; \; R^2 = .345$$

$$R^2 \text{ added by behavior groups} = .166$$

NOTE: Predictors for this analysis were the set of variables from the appropriate column of Table 2. Only those predictors achieving $p < .10$ are included in this table. F, R, and R^2 values are those from the entire regression equation.

were significant when the behavior groups were added. In regard to a report of more *information-seeking* activity (Table 5), the most important predictors were expressing a greater concern about health status, following more regular health routines, reporting more regular medical/body examination, tending to avoid risk, and having a greater number of illnesses. A supportive family environment and gender (i.e., being

TABLE 6
Results of Second-Level Regression Analysis for
the Subgroup Risk Avoidance—Predictors Are Reported With
and Without the Health Behavior Groups Entered into the Equation

Predictor	Partial r	Standardized Beta	p
A.) Without Behavior Groups:			
Family Environment: Supportive	.234	.223	.01
Gender: Women	.221	.205	.01
Interference: Resists	.219	.206	.01
Number of Siblings: Fewer	− .185	− .168	.03
Future Outlook: Stronger	.162	.163	.05

$$F = 5.57;\ p < .0001;\ R = .493;\ R^2 = .243$$

Predictor	Partial r	Standardized Beta	p
B.) With Behavior Groups:			
Number of Siblings: Fewer	− .240	− .210	.01
Information-Seeking: More	.239	.228	.01
Interference: Resists	.194	.173	.02
Gender: Women	.184	.161	.03
Health Routines: More	.168	.157	.05
Two-Year Trend: Worse	− .167	− .151	.05
Current Health: Lower	− .166	− .157	.05
Family Environment: Supportive	.156	.143	.06
Future Outlook: Stronger	.151	.142	.08

$$F = 6.83;\ p < .0001;\ R = .576;\ R^2 = .333$$

$$R^2 \text{ added by behavior groups} = .09$$

NOTE: Predictors for this analysis were the set of variables from the appropriate column of Table 2. Only those predictors achieving $p < .10$ are included in this table. F, R, and R^2 values are those from the entire regression equation.

female) were also important initially (entry A), but dropped out
when the behavior groups were entered.
   Risk avoidance (Table 6, entry B) showed the largest number of

correlates. Persons with fewer siblings, women, persons who said they resisted letting illness interfere with their lives, persons who reported a two-year trend in health for the worse and with lower self-rated current health, having a stronger tendency toward information-seeking, and following regular health routines were most closely associated with also tending to minimize risk as defined by the index. A supportive family environment and a favorable future outlook became less important when the behavior categories were entered into the equation.

Discussion

The results from this investigation suggest that personal health behavior in later adulthood can be studied at varying levels of specificity or generality, depending upon the purpose for using a particular broad or narrow definition of the target behaviors. Similar to younger age groups, and as noted with older adults by Prohaska et al. (1985), the correlations among individual practices in the present study seemed to be modest at best. In addition, there was no evidence for a broadly based "general factor" of health behavior; the correlations among the behavior groups were low, suggesting relative independence; nor were the predictors of the four behavior groups very similar. Whether or not individuals are preventively oriented "across the board" in later life is an open question that clearly deserves more study. Many of these outcomes also imply that behaviors will often be studied most effectively as separate entities, although the need to consider health practices individually in all situations would pose major conceptual and analytical challenges to research and intervention programs.

Targeting single behaviors can be an appropriate strategy for intensive and highly focused programs like those that encourage individuals to stop smoking, adopt exercise regimens, or lose weight. Similarly, for example, the hierarchy of correlates of seat belt use may not correspond to those for using dental floss or having a regular eye exam, with resulting implications for the

targeting of behavior change messages in media and for inter-
vention strategies. The development of many explanatory models
may, therefore, need to proceed with individual health practices
as the outcome measure.

At the same time, the four behavioral *groups* were one of the
few consistent predictors that emerged from the first-step and
second-step regressions in the present study. The prediction of
health behavior is known to be difficult, and we cannot afford to
ignore one of the better predictors even though ideal conceptual
groups have yet to be defined. Summary behavior groups based
upon several individual practices may be helpful to form subsets
of persons for broad classification and general predictive pur-
poses. Moreover, one of the barriers to achieving *lasting* improve-
ment in behavior change programs is knowing how the highly
defined target behavior fits into the individual's *total* pattern of
preventive practices. With further conceptual refinement along
dimensions of behavior (Rakowski, 1986, pp. 98-99), categories
such as those described in this and other reports may be useful.
For example, initial assessment of individuals according to
general behavior groups may help identify persons relatively
more or less likely to achieve the objective of a *multiple* risk factor
intervention. And, assessment across broad behavior groups may
be useful for testing generalized program effects beyond the
specific target behavior.

The consistent appearance of gender, and of the index from the
Family Environment Scale in the first set of regressions (Table 2),
deserve serious attention in further research. The finding that
women were *somewhat* more likely to report favorable practices
is consistent with tendencies reported in other age groups (e.g.,
Verbrugge, 1985). The existence of such a pattern across several
cohorts suggests the need to investigate cultural influences
relevant to health behavior, and to direct attention toward
individual health practices in order to determine whether men
really are less preventive across-the-board or only in selected
areas. Although the family environment variable often dropped
out of the equation when the health behavior groups were added,
its appearance in Table 2 is consistent with the literature

indicating an association between social support and health. The success of intervention programs to modify health practices seems especially dependent upon the family environment, so that the present results strongly suggest the continuing need to build a family dimension into late life disease prevention/health promotion initiatives.

Predictor variables from the health perception and life outlook categories of Table 1 were less important in the multivariate analyses, even though their zero-order correlations often achieved statistical significance. This outcome might be explained in part by the predictive strength of the four health behavior groups. In addition, because the life outlook and health perception questions dealt with general beliefs or self-assessments, they were probably defined or interpreted by respondents at a more global level than were the behaviors. Future research might usefully examine these perceptual and belief indices as indirect effects, through strategies such as path analyses. As a first step in that direction, however, the different sets of predictors in Tables 3 to 6 suggest that a single path model may not be appropriate for all types of health behaviors.

The varying percentages of explained variance may be related to the nature of the behaviors that composed the four groupings. The Medical and Self-Exam group exhibited the lowest R^2 values of the four. In the present study, the medical/self-exam cluster was represented largely by items about contact with the formal health care system for preventive care. It is possible that the timing of clinic or office-based preventive visits (e.g., on a yearly schedule) can be more strongly influenced by the reappointment policy of individual health professionals than can other types of health behaviors. In fact, health perceptions and life outlook variables were absent from the list of predictors for Medical and Self-Exams, while the index for having regular sources of care was important almost exclusively for this behavior group. Research with health services utilization indices is beginning to distinguish between patient and physician-initiated visits, in order to improve predictive power.

In contrast, activities that need to be performed on a regular basis (such as those in the Health Routines group), or when a situation arises to obtain information (such as the Information Seeking group) can be more dependent upon personal and social context factors. The strong association of an internal locus of control with the Health Routines group might be evidence for such a relationship. Prior to including the behavior groups in the prediction equation (entry A in Tables 3 to 6), the health perception, family environment, and even the life outlook indices were in fact more central as correlates.

The present results clearly reflect a sample from only one community, with any other participant biases that might have accompanied the process of recruitment. Nonetheless, the outcomes do not seem spurious. The finding of only modest correlations among reported practices agrees well with studies of other age groups, and there is no reason to expect older adults to depart appreciably from that pattern. In addition, 142 persons took the time to complete a two-week log of daily symptoms and behavioral responses, and 120 of those persons kept the diary for up to another four weeks. Correlations of the interview data with diary data were in expected directions. For example, number of illnesses (from the interview) and average number of daily symptoms (from the diary) were strongly associated with each other, and each index had significant negative correlations with self-rated health, future outlook, locus of control, and morale (Rakowski et al., 1985).

Additional studies can contribute in several areas. The extent or absence of association among practices should continue to be investigated, not only in different types of samples (e.g., rural, foreign born), but also with other types of personal health practices (e.g., varieties of self-care, forms of compliance). Behavioral assessments may incorporate other methods, such as movement monitors for daily physical activity, dietary logs, or even visual inspection of the residence in regard to safety hazards and medication storage. Refinement of the assessment for individual practices may help to develop better-defined conceptual groups (i.e., ones that exhibit higher internal consistency).

Attention can also be given to refining the measurement of variables such as the family environment, and to further investigation of the replicability of a slightly greater preventive orientation among women. Ultimately, it will be important to know how various health practices contribute to mortality and morbidity, and whether or not interventions to change health behavior in later life can effect improvement in the all-cause mortality rate. Epidemiologic studies on morbidity and mortality will benefit from continued work to better define the social, psychological, and behavioral variables that need to be measured, which in turn will help to identify the most relevant predictors to include in data collection protocols.

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William Rakowski is with the research team of the Pawtucket Heart Health Program, an NHLBI-funded community intervention for risk factor modification. His interests lie in the areas of preventive health practices in late life and the epidemiology of cardiovascular disease risk factors with aging.

Mara Julius is Assistant Research Scientist in the Department of Epidemiology. She was Principal Investigator for the first two rounds of the Needs of the

Edlerly Survey (1982, 1983), and is currently conducting experiments investigating biological and psychosocial markers of successful aging.

Tom Hickey is Director of the Health Gerontology Program and Professor in the School of Public Health, and Research Scientist in the Institute of Gerontology at the University of Michigan.

Jeffrey B. Halter is Professor of Internal Medicine and Chief of the Division of Geriatric Medicine in the Department of Internal Medicine at the University of Michigan Medical School. He is also Head of the Geriatrics Section at the Ann Arbor Veterans Administration Medical Center. He is Medical Director of the Institute of Gerontology at the University of Michigan and of the Michigan Geriatric Education Center.