Self-Rated Health and Mortality in the NHANES-I Epidemiologic Follow-up Study

ELLEN L. IDLER, PHD, AND RONALD J. ANGEL, PHD

Abstract: The ability of self-rated health status to predict mortality was tested with data from the National Health and Nutrition Examination Survey (NHANES-I) Epidemiologic Follow-Up Study (NHEFS), conducted from 1971–84. The sample consists of adult NHANES-I respondents ages 25–74 years (N = 6,440) for whom data from a comprehensive physical examination at the initial interview and survival status at follow-up are available. Self-rated health consists of the response to the single item, "Would you say your health in general is excellent, very good, good, fair, or poor?" Proportional hazards analyses indicated that, net of its association with medical diagnoses given in the physical examination, demographic factors, and health related behaviors, self-rated health at Time 1 is associated with mortality over the 12-year follow-up period among middle-aged males, but not among elderly males or females of any age. (*Am J Public Health* 1990; 80:446–452.)

Introduction

A rather intriguing and consistent finding concerning the predictors of mortality has been reported by several researchers in recent years. Studies based on four different sets of data indicate that a simple, one item self-report of health status is as powerful a predictor of mortality as more detailed health status indicators.[1–3] In these studies the response to some variant of the question, "Would you say your health is excellent, very good, good, fair, or poor?" is significantly associated with the risk of mortality over periods of four to nine years, even when prior information about health and all other major known risk factors are accounted for. Without good baseline health indicators, this finding would not be particularly surprising. But the varieties of methods used and the consistency of the findings in these studies leads to the rather profound realization that what we learn from this simple question carries a great deal of clinically relevant information, making it as powerful a predictor of mortality as simultaneous reports of serious chronic disease or functional disability.

The first of these studies was published in the *American Journal of Public Health* in 1982.[1] In it, Mossey and Shapiro reported that in a large elderly Canadian sample of the province of Manitoba, respondents' self-ratings of health outweighed the extensive health care utilization and medical history data available in predicting survival over a seven-year period. The editor of the Journal, realizing the importance of the finding, highlighted it in an accompanying editorial.[4]

Subsequent studies in California, Connecticut, and Iowa have replicated the finding. Adults in Alameda County, California, who assessed their health as poor had increased relative risks of mortality of approximately 1.95 compared to those who said they were in excellent health, even when self-reports of chronic and acute illnesses, sex, age, income, education, health practices, and social networks were controlled.[2] Elderly adults in New Haven, Connecticut, and Iowa and Washington Counties, Iowa, had increasing risks of mortality for every level of self-assessed health other than excellent, despite controls for chronic conditions, disability, pain, medications, demographic factors, and health practices.[3] Together, these studies suggest that individuals have access to very important internal information with which they are able to make informed predictions of their probability of survival.

The primary methodological problem that makes attempts to assess the medical significance of self-reported health status difficult arises from the inability to unambiguously control for actual physical health status. In models in which self-assessments are used as predictors of some outcome, their impact may in fact be due to inadequately measured physical health status. In other words, it is difficult to establish that self-assessed health has an influence above and beyond that it shares with actual physical health. The studies mentioned above all took different approaches to isolating the net effect of self-assessed health, but all of these controls for physical health relied heavily on the self-reports of respondents and, as a result, none could be considered ideal controls for "objective" health status. Even the Canadian study, which depended to a smaller extent on respondent information, substituted records of medical care utilization which the authors acknowledged were subject to biases of their own.[1,4] No population-based study of self-assessed health and mortality has had as its physical health status control the results of a comprehensive, standardized physical examination carried out by trained physicians. Such an examination could be considered objective because it would consist of observations made by an external and impartial observer, and because a single standard would be applied to all participants in the study. Only this form of measurement would have the possibility of detecting untreated, undiagnosed, and otherwise unreported conditions.

Methods

Such a methodology is precisely the one employed by the National Center for Health Statistics's National Health and Nutrition Examination Survey (NHANES-I),[5] conducted from 1971 to 1975, and the NHANES-I Epidemiologic Follow-up Study (NHEFS),[6] conducted from 1982 to 1984. Specifically, the NHANES-I provides data from a detailed physical examination of a 20 percent subsample of the first-stage NHANES-I sample (N = 3,854), and an additional sample which is called the augmentation component (N = 3,059); together these make up a baseline sample of 6,913 adults ages 25 to 74 years who constitute a probability sample of the United States population. The first-stage NHANES-I sample deliberately oversampled certain population subgroups believed to be at risk for nutrition-related health

Address reprint requests to Ellen L. Idler, PhD, Assistant Professor, Department of Sociology, and Institute for Health, Health Care Policy and Aging Research, Rutgers University, 30 College Avenue, New Brunswick, NJ 08903. Dr. Angel is Associate Professor at that Department and the Institute.
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problems: persons living in poverty areas, women of child-bearing age, and the elderly. This sample is thus simultaneously very heterogeneous and nationally representative.

The follow-up to the NHANES-I, the NHEFS, successfully traced 92.9 percent of the original NHANES-I cohort;[7] for the subsample analyzed here the proportion traced was slightly higher, 93.2 percent. Those who were lost to follow-up tended to be younger, especially Black males and White females.[7] Respondents are included in the present analysis if they were successfully traced (by being contacted in person or having a proxy and/or a death certificate to verify their death), regardless of whether or not they completed the follow-up interview. This yields a usable sample size of 6,440. We might note that tracing over 90 percent of the sample 10 years after the initial survey is a truly commendable feat and it makes these data one of the best sources available for studying the predictors of mortality. The death rate for the subsample was 12.9 percent, somewhat lower than the 15.1 percent reported for the total sample.[7] This is likely due to the fact that the augmentation component was added to the sample at the end of the NHANES-I data collection period, thus making follow-up periods shorter for a substantial portion of our sample. The outcome variable used in this study is survival time following the initial interview.

The NHANES-I and the NHEFS are ideal for our purposes because they contain a fully objective source of information on the respondent's medical diagnoses at Time 1, as well as the respondents' self-ratings of health. The physicians made direct physical examinations of the respondents, including standing and sitting blood pressure and pulse, examination of the ears, head, eyes, mouth, neck, abdomen, major and minor joints, and skin, percussion of the liver, and auscultation of the heart. Based on positive responses to screening questions, the physician then administered supplemental questionnaires for arthritis, respiratory, and cardiovascular diseases. In addition, the physicians had immediately available to them the results of the following laboratory and other tests: hemoglobin, hematocrit, red and white blood cell counts, height and weight, body and skinfold measurements, audiometry, spirometry, electrocardiogram, single breath diffusing capacity, goniometry, and X-rays of the chest, hand and wrist, hips and knees.[5] The examination is as detailed as one could reasonably expect in a population survey of this scale. The physicians recorded their findings by coding any abnormalities they found in terms of the International Classification of Diseases Revision Eight (ICD-8) categories[8] and judged the severity of these conditions on a three-point scale as either minimum, moderate, or severe.[9] To create a set of variables which would summarize this information we grouped the ICD diagnosis codes by the ICD's own 15 broad categories: infectious diseases, cancers and neoplasms, metabolic disorders, blood diseases, mental disorders, diseases of the nervous, circulatory, respiratory, digestive, and genitourinary systems, diseases of the skin and musculoskeletal systems, congenital anomalies, symptoms of ill-defined conditions, and accidents.*

An individual received a score of one for that category if they had one or more diagnoses present; the score was then weighted by one, two, or three for the most severe grading the physician had given that individual for any diagnosis in that ICD category. Respondents were scored zero if they received no diagnosis in a category. In addition, to account for the additive effects of comorbidity, we created a variable that consists of the sum of unweighted separate diagnoses each respondent received. This complete set of variables is introduced first into all models as a control for medical diagnoses. It represents a distinct alternative to the methods used in previous studies in that it distills a large amount of information from a comprehensive physical examination that was conducted by a small team of physicians in a structured and standardized manner, and it incorporates a weight for the clinical severity of the condition, a feature which even the most accurate or extensive self-report data cannot claim.

Certainly a physical examination of the sort administered in the NHANES-I is not unerring. In a single cursory examination, the physician is likely to miss subtle conditions or syndromes in their prodromal state. Diagnosis is a complex task that depends on the physician's judgment and any single assessment of a person's state of health is always subject to observer variability.[10] The examination represents no more than the physician's informed clinical judgment arrived at after a brief encounter with a new patient. However, because the examination was performed by an external, independent, medically trained observer, and because these observers relied on standardized criteria for assessing the presence or absence of specific conditions, these diagnoses avoid confounding the impact of self-rated health on mortality with that of self-reported controls for health.

The independent variable of primary interest in this study is the response to the single item, "Would you say your health in general is excellent, very good, good, fair, or poor?" The question wording used here, and the labels for the five response categories differ slightly from those used in other studies;[1–3] in some cases the categories are excellent, good, fair, poor, and bad; sometimes only four categories are included and "poor" is omitted; sometimes the eliciting question contains a relativizing phrase such as "compared to other people your age . . ." The significance of these alternate forms in unknown; however, to date no two published studies have used the same form, although all have reported similar effects. Because of low frequencies in the "poor" category, the "poor" and "fair" categories were combined in this analysis, reducing the five response categories to four; the responses are treated as a set of n-1 dummy variables with the omitted category being "excellent" health.

The following sociodemographic variables are included in the analysis as controls: age (treated as a continuous variable); and dummy variables for race, 9 to 12 years of education or 13 or more years (compared with 8 or fewer), marital status, income less than $5000, income less than $15,000, and being currently employed. Health behavior variables included dummy variables for current smoking and past smoking (compared with never having smoked); an index of alcohol use based on the frequency of consumption multiplied by the number of drinks usually consumed, weighted by their alcohol content; the physician's indication of the presence of obesity; and a measure of inactivity based on frequency of exercise and other physical activity.

Proportional hazards models based on the SAS statistical procedure PHGLM[11,12] are used to estimate the effect of self-rated health on the probability of survival during the follow-up period. This procedure was used because of the censored nature of the data and because we wish to identify the predictors of survival time over the entire follow-up period. A complete, parallel set of logistic regression analy-

*Two additional categories, for pregnancy complications, and perinatal morbidity and mortality, were omitted as irrelevant and of negligible frequency.

ses on the dichotomous mortality outcome was also performed, which in effect measured the probability of survival at just one time point, the end of the follow-up period. The results of these logistic regressions were nearly identical to those from the survival analyses, hence we present only the latter. Odds ratios are calculated from the hazard models by taking the antilog of the estimated coefficients.[13] Three models are estimated, one containing just the physician's examination variables and self-rated health, one which adds sociodemographic variables in a block, and a third which adds health behavior variables. In this way, any changes in the relation between self-assessed health and mortality can be attributed to the various control variables.

Results

Figures 1 and 2 show the unadjusted relationship between self-assessed health at the time of the first interview and the probability of survival over the 12-year follow-up period for men and women. These figures show that: 1) mortality risks increase for individuals with progressively poorer self-perceptions of health; and 2) the risks are apparently greater for males than for females. Only 60 percent of males with poor self-assessed health survive to the end of the 12-year period, while nearly 80 percent of the women do. Further, the lines are more straight than curved indicating that the increased risk of mortality is spread throughout the follow-up period. Because of the differences in the risk of mortality, all analyses are performed separately by sex.

The full proportional hazards models are presented in Tables 1 and 2. In the first models, which contain only physician examination variables as controls, self-assessed health explains a significant amount of the remaining unexplained variation in survival time; odds ratios for the extreme category are 3.3 for men and 2.1 for women. There are also progressively elevated risks for the intermediate categories for men, but not for women.

The models which add sociodemographic variables reveal a diminished effect of self-assessed health on mortality for men, with lower odds ratios of 1.7 for poor/fair health and 1.5 for good health. Among the women all effects of self-rated health disappear. Stepwise logistic regressions not shown here reveal that age accounts for most of the association between self-assessed health and mortality for men and for all of the association for women. In this sample older people were more at risk for both poor self-assessments of health and mortality. Among the males, some of the apparent initial

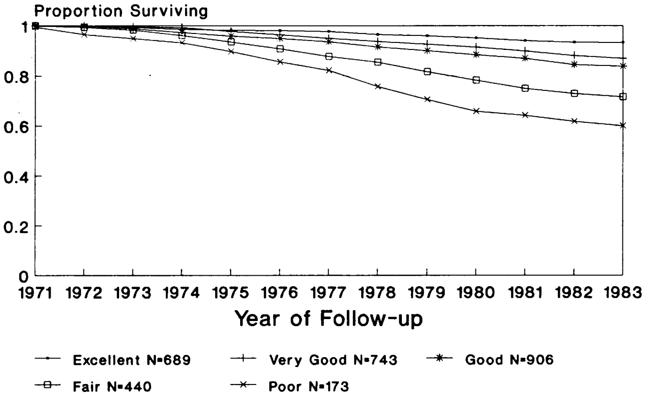

FIGURE 1—Male Mortality in NHANES-I Epidemiologic Follow-up Study by Levels of Self-rated Health

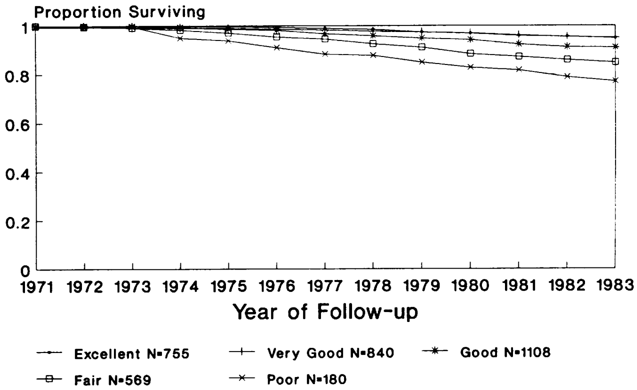

FIGURE 2—Female Mortality in NHANES-I Epidemiologic Follow-up Study by Levels of Self-rated Health

effects of self-assessed health on mortality were also due to confounding effects of employment, marital status, and race. Taking all these variables into account reduces the odds ratio for the extreme category by half.

It should be noted that the model with sociodemographic factors taken into account fits the data much better than the model with health variables alone. The models' likelihood ratio chi squares (G^2) reported at the bottom of Tables 1 and 2 double when these variables are added, and the difference in G^2 is highly significant (588.2, 27 df - 285.9, 19 df = 302.3, 8 df, $p < .000$ for men; 429.0 27 df - 211.8, 19 df = 217.2, 8 df, $p < .000$ for women).

The third model introduces variables for smoking, alcohol use, obesity, and lack of exercise. The inclusion of these factors does not alter the already nonexistent relationship for women. It further reduces the association for men, so that only the extreme category contrast remains. A second stepwise procedure (not presented) revealed that the addition of current smoking to the model had the biggest impact on the association; males who smoke were both more likely to give poor self-assessments of health and to die. The final adjusted odds ratio for the poor/fair category in the men's hazard model is 1.5 (95% CI = 1.1, 2.2).

These models too have a substantially better fit than the sociodemographic models which preceded them. Adding the measures of health behaviors adds 54.1, 5 df ($p < .000$) to the G^2 for men, and 12.3, 5 df ($p < .05$) for women.

Given the literature on the ways in which self-ratings of health vary according to the respondent's social location, certain interactions were considered. We have already seen that self-rated health predicts mortality marginally for men, but not at all for women. But does it predict mortality better for some men (or women) than others? The issue of age is especially salient given that so many of the previous studies have been done with elderly samples. To test an age-self-rated health interaction, we divided the males and females into three groups, those ages 25 to 44, 45 to 64, and 65 to 74. Because deaths were extremely rare (31 males and 27 females) in the under-45 age group, making parameter estimates from these models unreliable, we do not report the results from the youngest group.

The results can be seen in Tables 1 and 2. A substantial difference emerges between the middle-aged and elderly men. The relation between self-rated health and mortality for the male sample as a whole disappears altogether for elderly men, and emerges very strongly for middle-aged men. In the

TABLE 1—Proportional Hazards General Linear Model Coefficients for Survival Time in the NHANES-I Epidemiologic Follow-Up Study (NHEFS) by Levels of Self-Rated Health, Males

	Model 1 Physician Controls	Model 2 Sociodemographics	Model 3 Health Behaviors	Model 3 By Age Group	
				45–64	65–74
ICD-9 Categories					
Infection	−.331 (.220)	−.214 (.222)	−.218 (.216)	−.554 (.418)	−.109 (.304)
Neoplasm	.249 (.105)	.108 (.114)	.125 (.115)	.228 (.213)	.131 (.154)
Endocrine	−.208 (.097)	−.111 (.100)	−.155 (.111)	.012 (.149)	−.309 (.182)
Blood	.050 (.417)	−.055 (.546)	−.141 (.572)	−6.160 (27.3)	.145 (.758)
Mental	−.024 (.165)	.047 (.159)	−.064 (.159)	−.072 (.206)	−.117 (.280)
Nervous	.007 (.072)	−.038 (.073)	−.004 (.073)	.070 (.114)	−.120 (.103)
Circulatory	.242 (.054)	.120 (.059)	.137 (.059)	.202 (.091)	.058 (.086)
Respiratory	.154 (.069)	.190 (.068)	.167 (.070)	.134 (.124)	.201 (.094)
Digestive	.170 (.098)	.112 (.104)	.144 (.109)	.142 (.160)	.084 (.155)
Genital	−.852 (.730)	−.574 (.692)	−.431 (.681)	.084 (.699)	−1.859 (10.2)
Skin	−.050 (.106)	−.122 (.117)	−.161 (.119)	.036 (.185)	−.278 (.163)
Muscle	−.011 (.061)	−.119 (.064)	−.114 (.064)	−.038 (.101)	−.161 (.090)
Congenital	−.249 (.188)	−.280 (.206)	−.369 (.224)	−.822 (.586)	−.334 (.275)
Illness Symptoms	.207 (.082)	.278 (.087)	.260 (.088)	.326 (.127)	.184 (.140)
Accident	−.270 (.136)	−.156 (.131)	−.225 (.132)	.081 (.167)	−.916 (.444)
Sum of conditions	.147 (.042)	.089 (.047)	.068 (.047)	−.046 (.075)	.159 (.066)
Self-rated Health					
Poor/Fair	1.203 (.167)	.552 (.184)	.436 (.189)	1.026 (.330)	−.071 (.258)
Good	.748 (.166)	.396 (.178)	.292 (.182)	.793 (.322)	−.144 (.247)
Very good	.543 (.176)	.287 (.187)	.251 (.190)	.646 (.342)	−.248 (.259)
Sociodemographics					
Age		.059 (.005)	.066 (.006)	.060 (.014)	.083 (.025)
White		−.327 (.127)	−.309 (.129)	−.487 (.195)	−.215 (.191)
High school education		.136 (.115)	.086 (.116)	.077 (.176)	.044 (.176)
College education		.194 (.158)	.158 (.160)	.131 (.241)	.405 (.236)
Married		−.387 (.116)	−.305 (.118)	−.409 (.184)	−.083 (.178)
Income < $5000		.451 (.180)	.384 (.181)	.464 (.269)	.260 (.307)
Income < $15000		.273 (.157)	.210 (.157)	.255 (.213)	.076 (.295)
Working		−.460 (.117)	−.460 (.118)	−.370 (.181)	−.444 (.180)
Health Behaviors					
Present smoker			.616 (.135)	.835 (.230)	.551 (.191)
Past smoker			.027 (.141)	.426 (.244)	−.222 (.187)
Alcohol use			.001 (.000)	.001 (.000)	−.000 (.000)
Obesity			.209 (.124)	.156 (.186)	.220 (.183)
Inactivity			.090 (.044)	.139 (.069)	.090 (.065)
N	2931	2796	2772	1225	514
G^2	285.9	588.2	642.3	186.6	95.3
degrees of freedom	19	27	32	32	32

latter group, odds ratios for the poor/fair, good, and very good categories are 2.8 (95% CI = 1.5, 5.3), 2.2 (95% CI = 1.2, 4.1), and 1.9 (95% CI = 1.0, 3.7), respectively. Self-rated health does appear to predict mortality very strongly for middle-aged men and it predicts better for them than for any other group.

Because we were interested in the relative contributions of the self-rated health and physician examination variables to the explained variance in mortality, we compared the fit of the full models (Model 3 in Tables 1 and 2) with the fit of models from which we had alternately removed the variables for self-assessed health and physician-assessed health. This would allow us to assess the relative contribution of the two health status measures by their contribution to the G^2 for the full model. We estimated these models for the whole sample, and also by age group. Our findings varied, both by sex and by age, and were somewhat surprising; for the women in the sample, neither the physicians' diagnoses nor self-assessed health make any significant contribution to the model G^2 when sociodemographic and health behavior variables are controlled. While some of the individual physician measures were significant predictors of female mortality (notably diagnoses of circulatory and mental disorders), the removal of the entire set of diagnoses from the model failed to reduce the G^2 by a significant amount. For the males, on the other hand, the physician measures (diagnoses of circulatory and respiratory disorders, and ill-defined illness symptoms in particular) did contribute to G^2, both for the male sample as a whole (642.3, 32 df - 606.2, 16 df = 36.3, 16 df, $p < .01$) and for the elderly men (95.3, 32 df - 57.5, 16 df = 37.8, 16 df, $p < .01$). In none of these groups did the block of self-assessed health variables have an impact on G^2. Among the middle-aged men, however, where the effect of self-assessed health on mortality was strong, self-assessed health does alter G^2 (186.6, 32 df - 174.8, 29 df = 11.8, 3 df, $p < .01$). The effect of the physician-assessed measures within this group is marginal (186.6, 32 df - 162.0, 16 df = 24.6, 16 df, $.10 > p > .05$). These comparisons corroborate the findings regarding the importance of self-assessments of health among middle-aged men, and show the findings from the physicians' examinations to be better predictors of male mortality than female mortality.

To focus a little more closely on the role of self-assessed health vis-a-vis the other important predictors of mortality, we compared the odds ratios and partial Rs for the various levels of self-assessed health with those for other variables in

TABLE 2—Proportional Hazards General Linear Model Coefficients for Survival Time in the NHANES-I Epidemiologic Follow-Up Study (NHEFS) by Levels of Self-Rated Health, Females

	Model 1 Physician Controls	Model 2 Sociodemographics	Model 3 Health Behaviors	Model 3 By Age Group 45–64	Model 3 By Age Group 65–74
ICD-9 Categories					
Infection	−.198 (.223)	.209 (.223)	.163 (.223)	.544 (.274)	.071 (.553)
Neoplasm	.171 (.203)	.023 (.211)	.037 (.210)	.038 (.538)	−.069 (.272)
Endocrine	.081 (.079)	.109 (.080)	.142 (.085)	.047 (.149)	.201 (.113)
Blood	.022 (.553)	−.039 (.534)	−.021 (.531)	−7.601 (86.3)	.171 (.483)
Mental	.189 (.183)	.440 (.183)	.419 (.187)	.038 (.372)	.861 (.281)
Nervous	.042 (.102)	−.036 (.105)	−.045 (.105)	.186 (.183)	−.146 (.137)
Circulatory	.443 (.067)	.241 (.071)	.253 (.072)	.360 (.131)	.235 (.093)
Respiratory	−.144 (.148)	.010 (.141)	−.034 (.141)	.100 (.242)	.002 (.181)
Digestive	.051 (.186)	.156 (.183)	.105 (.191)	.180 (.325)	.015 (.268)
Genital	−.197 (.353)	.008 (.352)	.028 (.354)	−6.614 (62.4)	.221 (.426)
Skin	.002 (.190)	.102 (.192)	.088 (.195)	.147 (.307)	.136 (.277)
Muscle	.268 (.071)	.012 (.073)	.020 (.073)	.074 (.145)	.029 (.089)
Congenital	−.401 (.305)	−.183 (.299)	−.236 (.293)	−6.458 (29.3)	.008 (.290)
Illness Symptoms	.112 (.104)	.000 (.106)	.012 (.107)	.064 (.204)	−.068 (.148)
Accident	−.164 (.327)	.056 (.315)	.051 (.315)	−.080 (.527)	.393 (.668)
Sum of conditions	.061 (.046)	−.009 (.049)	−.012 (.049)	−.096 (.105)	.021 (.060)
Self-rated Health					
Poor/Fair	.735 (.188)	.184 (.196)	.204 (.202)	.256 (.354)	.084 (.287)
Good	.324 (.187)	−.029 (.191)	−.010 (.194)	−.009 (.330)	−.037 (.278)
Very good	−.129 (.219)	−.321 (.222)	−.246 (.224)	−.195 (.372)	−.456 (.339)
Sociodemographics					
Age		.067 (.006)	.071 (.007)	.049 (.019)	.049 (.029)
White		−.458 (.151)	−.466 (.152)	−.485 (.259)	−.341 (.214)
High school education		−.022 (.138)	−.056 (.139)	.195 (.248)	−.097 (.185)
College education		−.020 (.191)	−.064 (.193)	−.051 (.377)	−.387 (.269)
Married		−.391 (.128)	−.378 (.129)	−.322 (.229)	−.304 (.170)
Income < $5000		.271 (.228)	.301 (.230)	.553 (.356)	.085 (.395)
Income < $15000		.114 (.213)	.123 (.214)	.046 (.328)	.202 (.387)
Working		−.380 (.164)	−.381 (.165)	.053 (.227)	−.813 (.400)
Health Behaviors					
Present smoker			.384 (.145)	.596 (.222)	.455 (.225)
Past smoker			.332 (.172)	.206 (.330)	.335 (.227)
Alcohol use			.000 (.000)	.000 (.000)	.000 (.001)
Obesity			−.175 (.132)	.158 (.234)	−.305 (.176)
Inactivity			.040 (.057)	.059 (.104)	.015 (.074)
N	3417	3267	3242	1358	557
G^2	211.8	429.0	441.3	74.2	61.4
degrees of freedom	19	27	32	32	32

the full models. For the male sample as a whole, age is the most important predictor of mortality, followed (in this order) by smoking, unemployment, alcohol use, illness symptoms, marital status, race, respiratory diagnoses, poor self-assessed health, circulatory diagnoses, low income, and lack of exercise. Among the middle-aged men, poor self-assessed health ranks fourth as a predictor, behind (in this order) alcohol use, age, and smoking. Among the women the order is age, circulatory diagnoses, race, marital status, smoking, unemployment, and mental disorders. We conclude that health behaviors (especially smoking and high levels of alcohol use) and demographic variables (particularly employment) are more important predictors of mortality in age-adjusted models than either physician- or self-assessed health. Among the physician measures, however, we would note that ill-defined illness symptoms, and diagnoses of respiratory and circulatory problems are the best predictors of mortality for men, and diagnoses of circulatory and mental disorders are most important for women.

In understanding the impact of self-rated health on mortality, one of the other concerns has been that poor self-assessments of health may simply be reflecting the greater severity level or better respondent knowledge of conditions which are leading to imminent mortality.[1] If people with poor self-assessed health only survive for a short follow-up period then the effects of self-assessed health are more easily explained as inadequate controls for physical health status than as indicators of some more subtle process.

To test this possibility, we identified deaths which occurred in three "early mortality" periods of two, three, and five years following the year in which the respondent entered the NHANES-I study, and compared them with the deaths that occurred in the remaining years. We then performed logistic regression analyses with the full set of variables on just the subset of deaths to see if self-assessments of health predicted early mortality better than late mortality. The results (not shown) revealed that, among both males and females, self-rated health did not predict early mortality better than late. This confirms the findings of Mossey and Shapiro,[1] who concluded that ". . . while objective health status may change over time, self-ratings of health represent a relatively stable perception held by the individual." (p 804) This suggests that the effects of self-assessed health on mortality cannot be explained by superior respondent knowledge of the poor prognoses for existing conditions that are leading to imminent mortality.

Discussion

These analyses have shown that the ability of self-rated health to predict mortality in this national sample is in large part explained by the sociodemographic characteristics, health risk behaviors, and the medical diagnoses of the respondents. Only among middle-aged men was there any substantial independent increased risk of death from self-assessments of health after these other factors were taken into account. In this NHANES-I sample, older people, smokers, alcohol abusers, the unmarried, the unemployed, and Blacks were initially less likely to give positive assessments of their health and subsequently less likely to survive, and these factors, by and large, account for the initial association of self-rated health with mortality.

Our findings, then, do not fully corroborate the findings of the earlier studies reviewed above in which self-assessments remained strongly significant predictors of mortality in full samples, in spite of controls for physical health indicators and other factors. Our analysis differs from these earlier studies in two major respects: 1) the NHANES-I provides an alternate indicator of physical health, medical diagnoses; and 2) the analysis is based on a large and heterogeneous national sample. The previous studies were of localized and/or elderly samples, and employed controls for physical health status that were at least in part based on self-reports. We attribute the differences between our results and those of previous studies to these differences in study design.

No other population-based prospective study of self-assessed health has had medical diagnoses derived from a standardized medical examination as statistical controls for physical health status. The NHANES-I detailed examination could potentially yield information on previously undiagnosed as well as treated and self-reported illness. Indeed, this was a primary purpose of the NHANES-I: ". . . to obtain information on unrecognized and undiagnosed conditions—in some cases, even nonsymptomatic conditions."[5] (p 3) In studies which depend on self-reports of conditions for their measure of physical health status, the same optimistic or pessimistic response bias may influence specific reports of conditions as well as global assessments. The current study is unique in basing its controls for physical status on information gathered from an external observer and hence applies the same standard to all respondents, regardless of their race, income status, education level, or access to medical care.

Having said this, it should be noted that however theoretically advantageous these controls for medical diagnoses are, they do not on their own eliminate the association of self-assessed health with mortality in this sample. In fact, they explain very little of the observed variation in survival. Perhaps this should not be surprising; this was a fundamentally healthy young and middle-aged sample and few cases of serious illness were diagnosed. Moreover, in making their diagnoses, the physicians were not asked to consider longevity as a criteria. In any case, among both men and women, self-assessed health remained a strong predictor of survival when the diagnoses alone were controlled. In this analysis, the relationship of self-assessed health to mortality was better explained by age (primarily) and, to a lesser extent, by smoking, alcohol abuse, unemployment, race, and marital status than it was by its confounding with physical health status as judged by these physician examinations.

The second major difference between the present study and those which have preceded it concerns the sample. The NHANES-I sample is large and heterogeneous, quite unlike the community, county, or even provincial samples discussed earlier. One concrete example of the differences is in the role that age plays in the analyses. In the Connecticut and Iowa samples,[3] which contained only elderly respondents, age acted as a suppressor variable on the relation between self-assessed health and mortality; that is, because older (elderly) respondents gave better self-assessments of health at any given level of objective health status than younger (elderly) respondents, controlling for age in the analysis *increased* rather than decreased the effect of self-assessments on mortality. In the NHANES-I sample of young and middle-aged adults and only relatively young elderly, the effect of age is very much the opposite: adding a main effect of age to the models sharply curtails or eliminates the association of self-assessed health with mortality.

Only in one age/sex group do we see the hypothesized effect. In a sense, however, this is the group for which the public health significance of the findings is potentially greatest, since male mortality in this age group greatly exceeds female mortality, and since most deaths which occurred in this group could be considered premature and conceivably preventable. The limited findings in this study may provide some clue to the origins and meaning of these subjective perceptions. One might speculate that the apparently accurate predictions of survival made by the middle-aged male respondents in this study could be derived in part from a knowledge of their family's history. Having had a close family member who suffered a premature death from heart disease or cancer could lend ominous significance to symptoms such as a persistent cough or a mildly high cholesterol level which might appear unimportant to someone from a long-lived family. One might also observe that the strength of the association in this age group underscores the fact that, in our society, "excellent" health is the norm for the nonelderly, and any deviation from the norm indicates a potentially serious risk.

Even in comparison with the urban and nonelderly Alameda County sample with which it has more in common, however, the NHANES-I sample is diffuse and geographically unbounded. It encompasses the complex ethnic and cultural diversity of the nation. The cognitive processes by which individuals make global judgments about internal states are by no means well understood, but there is strong evidence that they somewhat consistently vary from one social, ethnic, or cultural setting to another.[14–17] Self-assessments appear to be made by some process of reference-group comparison, in which the individual chooses an appropriate group and judges the state of his or her own health by the health levels typical of the group in question. In other words, these judgments have no absolute reference point. The national sample in a sense removes these judgments from the cultural and community contexts in which they were formed, causing the variation in mortality to be explained primarily by the more objective and also more diverse physical health, demographic and health behavior factors. This analysis should remind us that demographic and health risk behavior factors remain potent predictors of mortality.

Self-assessments of health should continue to be of interest as mortality predictors, not only within homogeneous community samples, but also in large national samples where their impact appears more limited. Self-ratings of health are inexpensive, easy to obtain, and already available in nearly all health surveys. Even if they act as sensitive indicators of mortality risk only for certain subgroups in the population, they should remain valuable tools for health researchers.

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Lowell Levin to Edit New International Journal

Lowell S. Levin, EdD, MPH, professor of public health at the Yale University School of Medicine, has been named editor of the new *International Journal of Iatrogenic Complications*. The quarterly journal, associated with the Copenhagen-based International Society for the Prevention of Iatrogenic Diseases, will begin publishing in February 1991.

Dr. Levin explains that although "iatrogenic" translates literally as "physician-produced," the study of such problems has come to emcompass the negative consequences brought on by any segment of the increasingly complex health care system. When a part of that system harms a patient either by accident, negligence or imcompetence, the ramifications go beyond the medical, to the legal, social and economic. Hence, each article submitted to the new periodical will be reviewed by a jury of three readers from various disciplines, rather than the two readers used by many journals. In addition to physicians, the reviewer roster will include attorneys, economists, social scientists, epidemiologists and others, drawn from a broad geopolitical spectrum.

Dr. Levin is an internationally recognized authority in the field of self-care, which emphasizes education to empower the public in health matters and to prevent illness. He has helped pioneer this concept in both the developed and developing worlds, and has served on various World Health Organization (WHO) committees, including the WHO Committee on Information and Education for Health.

Scholars or other researchers who would like to submit articles to the *International Journal of Iatrogenic Complications* may contact Dr. Levin at (203) 785-2849.