4 Healthiness, Education, and Marital Status

Paul Taubman and Sherwin Rosen

In this paper we begin to explore the interrelationships of a number of health variables with several sociodemographic and economic variables for white men using the Retirement History Survey.

The dependent variables we use are categorical and are analyzed by fitting models with various degrees of interaction to frequency tables. Since nearly all the variables discussed in the text are statistically significant (as judged by likelihood ratio and Chi square tests), we will concentrate on the sign and the magnitude of the differences.

The health variables used in this study ask an individual to compare his health with others of the same age and with himself at the time of the prior survey. We recognize that these are both subjective and not particularly finely grained questions. We think, however, the questions convey much information and are not biased by choices as are questions on days lost from work because of illness.[1] We also think that the pattern of empirical results is consistent with what would be expected from an unbiased, objective measure. The text is organized in terms of the results of each dependent variable. A better feel for the results and a more coherent story can be had by looking at the impacts of the various independent variables.

A person's education can affect his health because education is correlated with income, with consumption and life styles, with decision making ability, and with occupational and residential health risks. Thus it is not surprising that we, like others, find that the more educated are more likely to be in better health. As people age, the percentage in better health falls and the decrease (in terms of percentage points) is larger for the more educated.

The more educated can be in better health for a variety of reasons. If the effects of education flow through the greater income of the more educated, then we would expect the education effect to vanish when we control for income. Yet the available evidence suggests that the education results are fairly robust to inclusion of other variables, such as 1968 earnings, number of medical visits, amount of doctor bills, marital status, and education. The effect of education on health is reduced only modestly when we control for spouse's education. It is not reduced further when we control for 1968 earnings of the head. When we condition on prior level of health, we are studying health deterioration functions. These functions need not be parallel. Health deteriorates more slowly for the more educated. Education, however, has little impact on improving health.

For married men we have examined the effect of spouse's education. The most educated women are more likely to have mates in better health than the least educated, though the effect of spouse's education is not monotonic. Own education has bigger impacts than spouse's education, and the impacts of spouse's education are changed very little when we condition on prior health and doctor bills.

Economists have often examined the effects of education. Marital status has not received intensive study; nevertheless, one expects marriage to be important. Spouses can provide physical and mental aid to one another. Divorce and widowhood are associated with substantial stress. Of course severely ill people may not be able to marry or remarry. We find strong impacts of marital status on health but smaller effects on health change. Married men are much more likely to remain alive in a worse health condition rather than to die. Divorced men have the worst health prospects.

Model and Data

Our data source is unusual in that it follows people over time, and thus has indicators of change in a person's health status as well as the level of health at each point in time. With this data it is possible to estimate the determinants of the change in health status conditioned on initial health status:

(1) $$\Delta H = H_{t+1} - H_t = f(H_t, X, t)$$

where H_t is the level of health at time t, and X is a vector of personal characteristics.

In principal we can solve this difference equation given an initial condition, H_o, to obtain an equation for H_t.

(2) $$H_t = G(H_o, X, t)$$

Equation (2) is the one usually estimated in a cross-section, with H_o treated as an unobserved random variable. The coefficients on X in (2) may be biased because of the omission of H_o, which is generally not measured, and because some components of X may be partially determined by H_o or intervening health status. Our estimates of (2) are subject to the same difficulties.

Equation (1) can be thought of as a transform of a reduced form production function in which investments in health have been optimized out. Because we control for H, we eliminate a large share of the reverse causality running from H to X. We also control those omitted variables that remain constant from period to period. Since X generally remains constant from period to period, what we are measuring is the effect of X on the change in health, not on its level. Therefore, these estimates are not quite comparable to those in the literature, which estimate equation (2).

On average, health deteriorates with age for different levels of X. This is shown in Figure 4.1. The usual cross-section study measures the distance CD. Our equation (1) measures the difference in the slopes at A and B. It is therefore possible that X has no effect in equation (1) but has an effect in equation (2); that would occur if the deterioration functions were parallel. This would imply that all the effects of X in equation (1) operate via prior health and do not cumulate during the life cycle.

In the work that follows we estimate equations (1) and (2) using data from three years of a panel survey, 1969, 1971, and 1973. While our data include crude indicators of life cycle risks, such as occupation of longest job, we concentrate on the effects of marital status and education here. However, we also examine the effects of spouse's schooling, income, and medical expenditures on the evolution of health status over time.

The Retirement History Survey (RHS) commenced in 1969. In that year a random sample of some 11,000 men and women between the ages of 58 and 63 (inclusive) were interviewed, and data were collected on the participants' current and past labor force activity, current earnings and income, family structure, education, health-related and other expenditures, and health status. The same people or their widows were reinterviewed every second year until 1979. We currently have the 1969, 1971, and 1973 waves.

The health data come in various forms. Several questions are subjective but don't reflect economic choices. For example, in each interview a person is asked how his health compares to others of the same age. In the post 1969 waves, he is also asked how his health has changed during the last two years. There are also several potentially choice-contaminated questions. For example, a person not at work is asked why and may respond "poor health." For our purposes this question can be contaminated because wage rates and available health benefits may influence
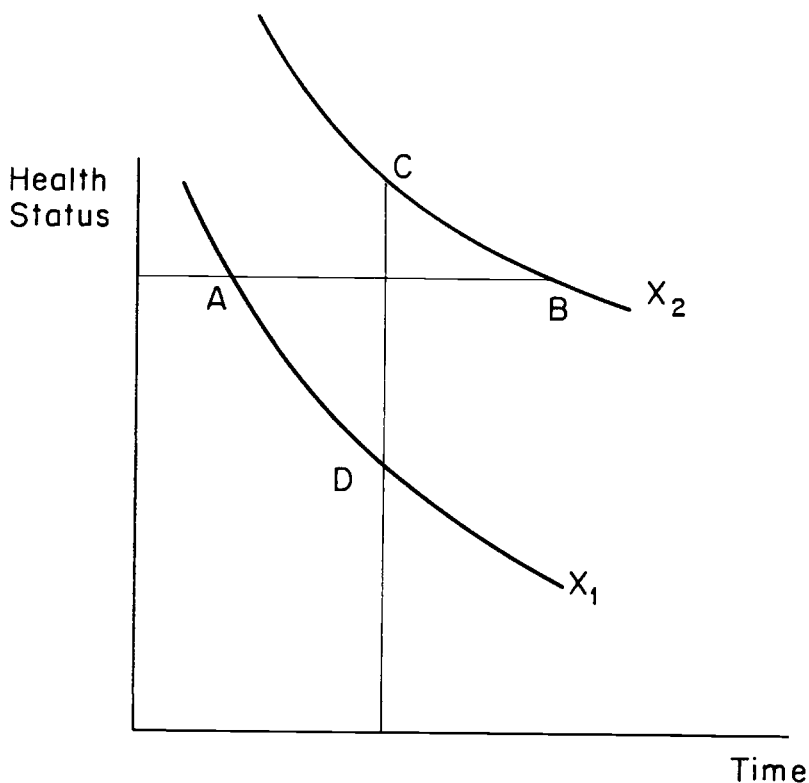
Fig. 4.1   Hypothetical health deterioration functions.

whether a person of a given degree of healthiness chooses to work or to stay home.

The health status variables in level form has four possible responses: health better-than-others (the same age), same-as-others, and worse-than-others, and, for the 1971 and 1973 surveys, deceased. Given the nature of these equations, there are no easy identities in the difference between two successive levels and responses about change in health from one date to the next; therefore, we use both the levels and the changes in health.

With these categorical data the use of conventional regression methods requires arbitrary scaling of categories (better, same, worse, deceased). To eliminate this kind of arbitrary decision, we use instead a linear model based on contingency tables of three or four categories. (See Goodman 1968). Qualitative dependent variables are analyzed by fitting models to frequency tables using the PF3 program in the BMDP package.

Any qualitative model with three variables can be written as:

$$lnF_{ijk} = \alpha\lambda^{A} + \beta\lambda^{AB} + \gamma\lambda^{ABC}$$

where F_{ijk} is the expected cell frequency, λ^{A} is a vector of means, λ^{AB} is a vector of first-order interaction terms, and λ^{ABC} is a vector of second-order interaction terms. We can test for interactions of the various factors by restricting parameters to zero. The computational algorithm allows us to estimate the statistical significance of individual variables and their interactions. For the qualitative variables we present a selection of the *estimated* cell means and describe the significance and pattern of the results.

Means and variances of several variables are shown in Table 4.1. It clearly indicates that health worsens with age. It also shows that there are

Table 4.1   **Sample Means or Proportions and Variances**

	Mean	Variance
Married	.88	.10
Widowed	.04	.04
Divorced	.04	.03
Never married	.05	.04
58 years old	.19	.15
59 years old	.17	.14
60 years old	.16	.14
61 years old	.17	.14
62 years old	.16	.14
63 years old	.15	.13
ED·0–8	.39	.24
ED 9–11	.20	.16
ED 12	.23	.18
ED 13–15	.09	.08
ED 16+	.10	.09
Death (1969–1973)	.15	.12
Number of times received medical care including hospital, 1968	10.03	174.07
Amount of doctor bills, 1968	62.6	289828.4
Amount of doctor bills, 1970	167.5	434808.4
Amount of doctor bills, 1972	89.7	177620.1

Sample Proportions

Health compared to others same age				Health change		
	1969	1971	1973		1969–1971	1971–1973
Better	.35	.29	.25	Improving	.12	.11
Same	.46	.49	.47	Same	.57	.52
Worse	.19	.18	.17	Worsening	.26	.26
Dead	—	.05	.11	Dead	.05	.11

wide variations in healthiness and medical expenditures. An obvious question, however, is whether the data are sufficiently trustworthy for analysis. In particular, are individuals able to assess and give reasonably accurate accounts of: (1) the level in their health compared to others in the same age group, and (2) the change in their own health? Moreover we must ask if such crude categories as "better" and "worse" convey much information.

In making comparisons with others of the same age, people may well use the mode as the reference value. Since health need not be distributed symmetrically about the mode, there is no reason why the level variable need retain the same distribution over time, and it is not illogical that more people pass to the unhealthy state as they age. Thus it makes sense that the change in health becomes worse over time.

One can also judge the appropriateness of an empirical measure of a theoretical construct by the results obtained in empirical work. In the results that follow, the subjective health variables often act the way one would expect a true health variable to behave. To provide but one example, between 1969 and 1973, 23% of those in worse health in 1969 died, while only 7% of those who were in better health died.

Health Compared to Others of the Same Age

We have fit a variety of models to individuals' 1969, 1971, and 1973 subjective evaluations of their health compared to others of the same age in the particular year.[2] Since the comparison group ages over the time period, the time series comparisons indicate how the distribution of health varies about a changing reference point. Table 4.2 shows that the shape of the health distribution changes systematically with age. Fewer people appear in the better-than-other health category in successive surveys. Apparently people do in fact use the mode as a reference point.

Some estimates of equation (2) are shown in Table 4.2 where the level of health in each survey year is related to education and marital status in 1969. We have used 0–8, 9–11, 12, 13–15, and 16+ as the education categories in our analysis but omit some of these classifications in the tables for ease of presentation. Similarly we have used the marital status categories of married, widowed, divorced, and single in the analysis though each is not always included in the tables. Qualitatively the results for education and marital status are similar to those found by other investigators.

The education and marital status vectors are statistically significant and have independent effects. The effects of education are quite large in each year. Consider, for example, married men (see Table 4.2, panel 1). In 1969, the percentage of white men in better health than others rises from

Table 4.2 Health Compared to Others by Education[a] and Marital Status[b]

Health compared to others same age	Education 0–8				Education 12				Education 16 +			
	Mar-ried	Wid-owed	Di-vorced	Single	Mar-ried	Wid-owed	Di-vorced	Single	Mar-ried	Wid-owed	Di-vorced	Single
1969												
Better	.28	.28	.24	.19	.40	.40	.37	.29	.47	.47	.45	.36
Same	.47	.46	.37	.50	.46	.45	.40	.53	.44	.43	.39	.52
Worse	.25	.26	.39	.30	.14	.14	.23	.18	.09	.09	.16	.12
1971												
Better	.22	.20	.21	.18	.33	.30	.32	.28	.43	.40	.43	.37
Same	.50	.50	.43	.53	.49	.49	.43	.52	.43	.44	.38	.47
Worse	.23	.22	.27	.21	.13	.13	.15	.12	.10	.10	.12	.09
Dead	.04	.08	.09	.08	.05	.08	.10	.08	.04	.07	.08	.07
1973												
Better	.19	.19	.16	.16	.29	.27	.25	.23	.35	.34	.32	.29
Same	.47	.47	.33	.46	.40	.47	.35	.48	.46	.45	.35	.47
Worse	.23	.17	.27	.19	.13	.09	.16	.11	.10	.07	.13	.09
Dead	.11	.18	.23	.19	.10	.17	.23	.18	.08	.13	.19	.14

[a]Education in years.
[b]Marital status as of 1969.

28% to 47% as education rises from elementary school to college comple-
tion. Comparable increases occur in the intervening categories. The
pattern for worse health and death is the opposite for those in better
health. The fraction in worse-than-others falls sharply with education. In
1969 higher education is associated with substantial reductions in the
percentage in health worse-than-others, from 25% for married
elementary school men to 9% for college graduates. For married men in
1971, the fraction in the educational extremes falls from 23% to 10%.
The effect of education is approximately the same in each year as shown
in the other two panels of Table 4.2.

Now examine the effects of marital status. In 1969, married men and
widowers have very similar distributions at all education levels. (We do
not know how long men have been widowed or divorced). Single (never
married) men are less likely to be in better or in worse health than
divorced men, while the latter are a bit less likely to be in better health but
substantially more likely to be in worse health than others. The patterns
in the other two years are similar except that the disadvantage of single
men in better health has narrowed, and married men have a substantially
lower death rate even though we suspect more complete reporting of
death for this group.

To try to understand better why married men remain alive longer, we
have examined that group in more detail. In all three years studied, own
and spouse's education have statistically significant and independent
impacts on health. Table 4.3, presents some estimated proportions taken
from an equation which uses own and spouse's education without interac-
tions.

For a given spouse's education level, own education continues to show
substantial positive effects. For example, if the spouse has 12 years of
schooling, the percentage in better health in 1969 rises from 30% to 46%,
and the percentage in worse health falls from 21% to 8% as own educa-
tion rises from elementary school to college graduate. These effects are
only slightly smaller than those found in Table 4.2.

For a given level of own education there is a definite tendency for the
percentage in better health to increase with spouse's education, the jump
between elementary and high school being particularly noticeable. There
is an even more marked tendency for the percentage of those in poor
health to decline as spouse's education increases—generally about 5
percentage points between spouses with elementary school and college
education. However, the group with the lowest percentage in worse
health are those whose spouse has 13–15 years of schooling (not shown).

An increase in one's own education is much more effective than an
increase in spouse's education. For example, in 1969, going from
elementary school to college graduate raises the fraction in better health
by about 15 points for own education but by 7 points for spouse's

Table 4.3   **Married Men's[a] Health Compared to Others by Own and Spouse's Education[b]**

Health compared to others	Own Education 0–8			Own Education 12			Own Education 16 +		
	Spouse's Education			Spouse's Education			Spouse's Education		
	0–8	12	16 +	0–8	12	16 +	0–8	12	16 +
1969									
Better	.26	.30	.33	.35	.40	.42	.41	.46	.49
Same	.46	.49	.46	.46	.47	.43	.46	.46	.43
Worse	.28	.21	.22	.19	.13	.14	.12	.08	.09
1971									
Better	.20	.26	.26	.28	.34	.35	.37	.44	.44
Same	.50	.51	.49	.50	.49	.47	.46	.44	.42
Worse	.26	.19	.22	.16	.12	.14	.13	.09	.10
Dead	.04	.04	.04	.06	.05	.04	.04	.03	.03
1973									
Better	.19	.24	.21	.25	.31	.28	.33	.39	.35
Same	.47	.47	.53	.47	.47	.52	.44	.43	.48
Worse	.24	.20	.17	.15	.13	.10	.14	.12	.09
Dead	.10	.08	.09	.12	.10	.10	.09	.07	.07

[a]Marital status as of 1969.
[b]Education in years.

education. Similarly the decline for worse health is about 14 and 6 points respectively.

In 1971, the decrease in percentage points of health better-than-others is approximately the same at all spouse's education levels. There is an increase in the "same" group with worse health down only slightly. The percentage decrease is very small and unrelated to either education variable. In this year, as in 1969, own education has a much larger impact on health than spouse's education. Moreover, the effect of either variable is about the same in both years in percentage point terms.

By 1973, the percentage in better-health-than-others has fallen even more at all education levels. The decrease, however, is more noticeable at higher levels of spouse's education. By 1973, the differential between spouse having 0–8 and 16 or more years of schooling is only about 2 percentage points, while for own education the corresponding differential runs about 14 points. The percentage in worse health has generally declined slightly from 1971. The percentage who have died decreases slightly with either education measure.

Health Levels Conditioned on Previous Health

The results to be discussed next examine variants of equation (1). Adding H_t to both sides of equation (1) gives us an equation relating H_{t+1} to H_t and X. We can then use health compared to others in two surveys. Alternatively we can relate a person's own change in health to prior health compared to others and to X.

Table 4.4 shows 1971 and 1973 health status respectively, cross-classified by education, marital status, and health status in 1969. Table 4.5 conditions on 1971 health status rather than on 1969 health status. Before turning to the detailed results, we may state the general conclusions: the direct effects of schooling are quite strong within given health status classifications; thus, the slopes of the health change functions illustrated in Figure 4 are different. The effects of marital status on the slopes of the health change function are less strong than those of education. However, there are indications that the presence of a spouse prolongs life by keeping an ill mate, who would probably die if the spouse were absent, alive but in a state of ill health.

Let us examine the effects of schooling first. Of those in better health in 1969 the fraction in better health in both 1971 and 1973 increases with the level of schooling (Table 4.4). For example, for married men, the percentages for elementary and college graduates are 47% and 63% in 1971 and 41% and 52% in 1973. Conversely, for those in worse health in 1969, the fraction in worse health or dead in either 1971 or 1973 decreases with the level of schooling. The estimated percentages for the same two groups

are 66% and 58% in 1971 and 67% and 60% in 1973. The first of these examples suggests that the effects of education diminish with age.

1969 health status may be a poor conditioning variable for 1973 health. However, when we recomputed using 1971 health as the conditioning variable, the results in Table 4.5 are very similar to those in the top panel of Table 4.4 except for the divorced, who are much less likely to be found in better health in 1973. Furthermore, the effects of schooling on 1973 health conditional on 1971 health is somewhat smaller than the effect of schooling on 1971 health status conditional on the state of health in 1969. One might well expect this, because only the more hardy individuals, whatever their background and circumstances, survive, and so the population distribution changes over time. The much greater differences in levels between the 1969–73 and 1969–71 comparisons shown in Table 4.4 would be expected on purely statistical grounds since random events tend to change individuals' health status classifications as time marches on. Thus, if a married person was in better health in 1969 the probability of remaining in better health in 1971 is about .44. With no state dependence this would imply a probability of remaining in better health in 1973 of about .25 (= .47 × .53). Of course the significantly higher observed proportions of more than .4 suggest more persistence than independent distributions imply, but the point is clear that the proportions should decline over time.

Since deceased is an absorbing state and the other classifications are not, there is some ambiguity in examining the worse-than-others and deceased categories, though surely the latter is the ultimate subclass of the former. These tables indicate a general worsening of health with age. They also suggest that recovery from worse health in 1969 to better-health-than-others in subsequent years occurs very infrequently, though at a slightly greater rate for the more educated. In almost every case the probability of recovery to the better-than-others state given a prior worse-than-others state is smaller than the probability of worse and/or deceased states given prior better-than-others state. For example, for divorced men with elementary school education, the recovery rate in 1971 is 5%, while the deterioration rate (including dead) is 11%. Furthermore, the difference between the off diagonal elements in the transition matrix increases over time. It is interesting to note that the more educated are more likely to recover if they start with worse health, and are less likely to get ill or die if they start in better health.

Let us turn now to marital status differences. In the top panel of Table 4.4 divorced and widowed men have respectively the largest and smallest fractions in better health, given prior better health. For those with elementary school education, the percentages in better health are 50% and 43% respectively. The same pattern occurs in 1973 conditioned on

Table 4.4   **Level of Health in 1971 and 1973 Conditioned on 1969 Health**

	Married		Widowed		Divorced		Single	
	Better 1969	Worse 1969	Better 1969	Worse 1969	Better 1969	Worse 1969	Better 1969	Worse 1969
1971								
Education 0–8								
Better	.47	.04	.43	.04	.50	.05	.45	.05
Worse	.07	.58	.07	.54	.06	.53	.05	.47
Dead	.03	.08	.05	.14	.05	.15	.04	.14
Education 12								
Better	.54	.07	.50	.05	.58	.07	.52	.07
Worse	.05	.48	.05	.44	.04	.43	.03	.37
Dead	.03	.11	.05	.19	.05	.20	.05	.19
Education 16 +								
Better	.63	.09	.56	.08	.66	.10	.60	.09
Worse	.04	.47	.04	.43	.03	.41	.03	.36
Dead	.02	.11	.04	.18	.04	.19	.04	.19

Education 0–8								
Better	.41	.04	.40	.04	.40	.03	.37	.03
Worse	.09	.49	.06	.35	.10	.45	.07	.38
Dead	.07	.18	.11	.31	.15	.33	.12	.30
Education 12								
Better	.46	.05	.45	.05	.45	.04	.42	.04
Worse	.06	.38	.04	.26	.06	.34	.05	.28
Dead	.07	.23	.11	.36	.15	.40	.12	.36
Education 16+								
Better	.52	.06	.50	.06	.51	.05	.47	.05
Worse	.05	.39	.04	.26	.05	.35	.04	.29
Dead	.06	.21	.09	.33	.13	.37	.10	.33

Same-as-Others categories excluded. Column sums within each education class sum to 1.0 when Same is included.

Table 4.5   **Level of Health in 1973[a] Conditioned on 1971 Health Relative to Others**

1973 Health Level	Married[b] Better 1971	Worse 1971	Widowed Better 1971	Worse 1971	Divorced Better 1971	Worse 1971	Single Better 1971	Worse 1971
Education 0–8								
Better	.48	.04	.49	.05	.44	.03	.42	.03
Worse	.09	.55	.05	.42	.12	.56	.09	.49
Dead	.04	.12	.05	.20	.10	.23	.07	.20
Education 12								
Better	.54	.06	.55	.06	.50	.04	.48	.04
Worse	.05	.44	.04	.32	.08	.45	.05	.38
Dead	.03	.14	.05	.23	.09	.28	.06	.24
Education 16+								
Better	.58	.08	.59	.08	.55	.05	.52	.05
Worse	.05	.31	.03	.31	.07	.45	.05	.38
Dead	.03	.20	.04	.20	.07	.26	.05	.21

[a]Includes only those who were alive in 1971.
[b]Marital Status Classified as of 1969.

1971 health. In 1971, widowers and divorced men have somewhat larger
proportions in worse health or dead, given that their health status was
initially worse than that of married or single men. However, by 1973 the
widowers are on a par with both single men and married men, while the
divorced have significantly more adverse experience.

Married men who start off in worse health have significantly smaller
probabilities of subsequent death than other groups. It is well known
from other studies that married men have higher survival rates than other
men. The findings suggest that the presence of a spouse prolongs life even
given illness.

The probability of recovery to better than average health from worse
than average health appears to be independent of marital status in all
comparisons. On the other hand the probability of going from better than
average health to worse than average or dead is much larger for divorced
males, as shown in Table 4.5. There is a slight advantage for widowers in
the 1971–73 comparison though widowers have worse experience than
singles in 1969–71 and exhibit about the same effects in 1969–73.

Married men and more educated men earn more and are generally
wealthier than others. Therefore it is possible that the effects of educa-
tion and marital status work through the effects of wealth and its atten-
dent correlates of medical care and consumption patterns. To check on
these possibilities we have examined 1969 health status by education,
marital status, medical care, doctors' bills, and earnings. The full set of
interactions, too numerous to be reported in detail, revealed: (1) those
spending more on doctors tend to be in worse health—while hardly
earth-shaking, this is worth mentioning as a remark on the quality of the
self-assessment of health status; (2) those with lower incomes tend to be
in worse health within any given education-marital status-medical ex-
pense category, though this might well reflect the well known fact that ill
persons have lower propensities to work than those in good health, as
well as the reverse causation; and (3) the effects of schooling and marital
status are of the same order of magnitude within medical expense and
income categories as between them. In sum, the results suggest that
independent life style or knowledge effects exist in addition to pure
wealth effects.

The changes in own health during the previous two years are shown in
Tables 4.6 and 4.7. In the top panel of Table 4.6 we present some
percentages for the change in health for 1969 to 1971 estimated from a
model which includes 1969 health compared to others. The probability of
health improving is independent of 1969 health level and marital status.
The results for health worsening, however, are strongly related to 1969
health and marital status. Those in worse health than others in 1969 are
much more likely to have deteriorating health or to die during the
following two years. The probability of death by 1971 for the various

Table 4.6   Change in Health 1969–71 and 1971–73 Conditioned on 1969 Level of Health

Education and change in health 69 to 71	Married[a]			Divorced			Single		
	Health in 1969 of others			Health in 1969 of others			Health in 1969 of others		
	Better*	Same*	Worse*	Better*	Same*	Worse*	Better*	Same*	Worse*
Education 0–8									
Improving	.11	.10	.10	.11	.10	.10	.10	.09	.10
Same	.67	.57	.30	.63	.53	.26	.71	.61	.34
Worsening	.19	.29	.51	.21	.31	.50	.15	.24	.42
Dead	.02	.03	.08	.05	.06	.15	.04	.06	.14
Education 16+									
Improving	.14	.14	.15	.14	.13	.14	.12	.12	.14
Same	.72	.64	.38	.68	.60	.33	.75	.67	.41
Worsening	.12	.19	.36	.13	.20	.35	.09	.15	.29
Dead	.03	.04	.10	.05	.07	.18	.04	.06	.17

Education and change in health 71 to 73									
Education 0–8									
Improving	.14	.10	.08	.16	.11	.07	.10	.08	.06
Same	.58	.52	.29	.44	.38	.18	.66	.60	.36
Worsening	.22	.30	.45	.26	.34	.43	.15	.21	.33
Dead	.05	.08	.18	.14	.17	.31	.09	.11	.26
Education 16+									
Improving	.12	.09	.08	.15	.11	.08	.09	.07	.06
Same	.67	.62	.39	.53	.47	.24	.73	.69	.44
Worsening	.15	.21	.35	.18	.25	.34	.10	.14	.24
Dead	.06	.08	.19	.13	.17	.34	.08	.10	.26

[a]Marital status as of 1969.
*Health in 1969 as compared to others.

Table 4.7 Change in Health 1971–73 Conditioned on 1971 Level of Health[b]

Education and change in health 71–73	Married[b] Health in 1971 of others Better*	Same*	Worse*	Divorced Health in 1971 of others Better*	Same*	Worse*	Single Health in 1971 of others Better*	Same*	Worse*
Education 0–8									
Improving	.13	.10	.10	.16	.12	.09	.10	.08	.08
Same	.62	.55	.28	.47	.40	.17	.70	.63	.36
Worsening	.22	.30	.50	.28	.38	.51	.16	.23	.41
Dead	.03	.04	.12	.08	.10	.23	.04	.05	.15
Education 16+									
Improving	.12	.10	.11	.15	.12	.10	.09	.07	.09
Same	.70	.65	.38	.57	.50	.23	.77	.73	.46
Worsening	.15	.21	.40	.20	.28	.42	.10	.15	.31
Dead	.03	.04	.12	.08	.10	.24	.03	.05	.15

[a]The known Dead in 1971 are not shown. The unknown Dead in 1971 are in the same health as others category in 1971.
[b]Marital status in 1969.
*Health in 1971 as compared to others.

nonmarried groups are nearly identical given 1969 health. The probability of health worsening, however, is greater for divorced men than for widowers or single men. For example, among college graduates in worse health in 1969, the percentages whose health worsens are 35% for divorced and 29% for single men. Interestingly, married men's health generally worsens at the same rate as divorced men's, but married death rates are much smaller. This finding again suggests that spouses can keep sick men alive for some period of time.

The bottom panel of Table 4.6 presents the estimated fractions for the 1971–73 change in a model that conditions on 1969 health level. The corresponding estimates obtained from conditioning on 1971 health are given in Table 4.7. In both instances the probability of one's own health improving is generally smaller than in the 1969–71 period. In contrast to the 1969–71 interval the probability of health improving in the 1971–73 interval is related to prior health status, with those in better prior health more likely to improve. For example, as shown in Table 4.7, for married men who attended elementary school, the percentage with improving health is 13% for those in better health and 10% for those in worse health than others in 1971.

Single men have a slightly smaller fraction than married men with improving health, a much smaller fraction with worsening health, and a larger fraction dying, though the sum of the last two categories is about the same for these marital groups. Divorced men are much more likely to die—about 10 percentage points—than married men, but have the same percentage of worse health.

Tables 4.6 and 4.7 condition change in own health on level of health compared to others. When we condition the 1971–73 change on the change in the prior two years, there is positive serial correlation. Those who improved between 1969 and 1971 are more likely to continue to improve, and those worsening in health are more likely to worsen or die. The improvement rate, however, is much smaller than the deterioration rate. The results by marital status and education are similar to those presented above.[3]

The effects of education are also shown in Tables 4.6 and 4.7. For the improving group the largest differential is only 5 percentage points, and most differentials are smaller. Yet the effect of education on the sum of the worsening and dead category is substantial. For example, in the top panel of Table 4.6, the estimates for married men in worse health in 1969 are 59% for elementary school and 46% for college graduates. For the 1971–73 health change variable, the combined estimates for elementary school and college graduates in worse health in 1969 are 63% and 54% respectively. However, the death rates differ little by education, contrary to most previous findings. Thus schooling primarily affects the conditional probability of health worsening.

In conclusion, we observe that self-assessed health measures apparently yield useful information about the state of a person's health, and that health at one time and its change over time are strongly related to education and marital status, even when controlling for family income, use of medical resources, and previous health.

Notes

1. For example, in work not reported here, those reporting worse health than others are much more likely to be working if they are more educated and presumably have higher wage rates.

2. When the health question is not answered and the person is alive, health is placed in the "same" category.

3. We have also fit a model relating the 1971–73 change to the 1969–71 change and the 1969 level. The results of the second order difference equation are similar to the first order model shown above.

References

Brenner, H. 1976. Estimating the social cost of national economic policy: Implications for mental and physical health and criminal agression. Joint Economic Committee, Congress of the United States. Washington: U.S. Government Printing Office.

Fuchs, V. 1974. Some economic aspects of mortality in developing countries. In M. Perlman, ed., *The economics of health and medical care.* London: Macmillan.

Goodman, L. 1968. The analysis of cross classified data: Independence, quasi-independence, and interaction in contingency tables with missing entries. *Journal of the American Statistical Association* 63: 1091–1131.

Grossman, M. 1972. On the concept of health capital and the demand for health. *Journal of Political Economy* 80: 223–55.

Kitagawa, E., and Hauser, P. 1973. *Differential mortality in the United States.* Cambridge: Harvard University Press.

Rosen, S., and Taubman, P. 1979. Changes in the impact of education and income on mortality in the U.S. *American Statistical Association, Social Statistics Section, Proceedings,* Washington, D.C., Vol. 21.