

# Supplemental Insurance and Mortality in Elderly Americans

## Findings From a National Cohort

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**Context:** As the burden of out-of-pocket health care expenditures for Medicare beneficiaries has grown, the need to assess the relationship between uncovered costs and health outcomes has become more pressing.

**Objective:** To assess the relationship between risk for out-of-pocket expenditures and mortality in elderly persons with private supplemental insurance.

**Design:** Retrospective cohort study using proportional hazards survival analyses to assess mortality as a function of health insurance, adjusting for sociodemographic, access, and case mix–health status measures.

**Setting:** The 1987 National Medical Expenditure Survey, a representative cohort of the US civilian population, linked to the National Death Index.

**Participants:** A total of 3751 persons aged 65 years and older.

**Main Outcomes Measures:** Five-year mortality rate.

**Results:** After 5 years, 18.5% of persons at low risk for out-of-pocket expenditures, 22.5% of those at intermediate risk, and 22.6% of those at high risk had died. After multivariate adjustment, a significant linear trend ( $P = .02$ ) toward increasing mortality with increasing risk category was observed. Compared with the low-risk group, persons in the intermediate-risk group had an adjusted hazard ratio of 1.2 (95% confidence interval, 0.9-1.6), whereas those in the high-risk group had an adjusted hazard ratio of 1.4 (95% confidence interval, 1.0-1.9).

**Conclusions:** Increasing risk for out-of-pocket costs is associated with higher subsequent mortality among elderly Americans with supplemental private coverage. Although research is needed to identify which specific components of out-of-pocket expenditures are adversely associated with health outcomes, findings support policies to decrease out-of-pocket health care expenditures to reduce the risk for premature mortality in elderly Americans.

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**E**FFORTS TO control growth in costs have led to an increasing financial burden placed on elderly Medicare beneficiaries. Various cost-sharing requirements and benefit limitations in the Medicare program leave beneficiaries, especially those without supplemental coverage, vulnerable to high levels of out-of-pocket costs. Consequently, to fill some of these gaps in Medicare coverage, many beneficiaries are covered by private supplemental insurance, through employer-provided or individually purchased (“Medigap”) plans.<sup>1-3</sup> However, because premiums have risen rapidly in recent years, even beneficiaries with private supplemental plans increasingly face substantial out-of-pocket costs.<sup>3</sup> Little is known about the impact of these shifts in costs on health outcomes.

From 1977 through 1987, out-of-pocket health care expenditures for Ameri-

cans older than 65 years rose by more than 3 times the consumer price index.<sup>4</sup> By 1996, excluding nursing home costs, Medicare beneficiaries spent an average of \$2600 out-of-pocket on health care costs above what Medicare and private insurers paid.<sup>5,6</sup> This represented 21% of household income for elderly individuals, up from 15% in 1987.<sup>5</sup> Recent withdrawals of Medicare health maintenance organizations (HMOs) from Medicare contracts<sup>7</sup> are likely to exacerbate the problem of out-of-pocket costs for the elderly.

Landerman et al<sup>8</sup> recently reported that the odds of development of disability were higher among Medicare enrollees without private supplemental coverage compared with those with such coverage after adjustment for education, income, and other risk factors. Although additional data examining uncovered expenditures and health outcomes are lack-

## MATERIALS AND METHODS

### SAMPLE

We used data from the Household Survey component of the NMES.<sup>21</sup> The Household Survey consisted of a 1-year, cross-sectional survey of nearly 38 000 individuals from approximately 15 000 households representing the 1987 US civilian, noninstitutionalized population. The survey used a stratified, multistage area probability design with oversampling of minorities, poor persons, disabled persons, and the elderly. Four rounds of interviews were completed during 1987, and a wide range of information regarding medical care, health expenditures, and health insurance coverage was collected. Respondents were asked to complete a self-administered questionnaire that included items on subjective health status, a checklist of medical conditions, health care access, and attitudes toward the value of health care and health insurance. The overall survey response rate for the Household Survey component was 80%.<sup>22</sup>

A unique aspect of the 1987 NMES was the detailed information on health insurance benefits. The Health Insurance Plans Survey (HIPS)<sup>23</sup> collected health insurance policy booklets for households with private insurance in a follow-up survey of employers, insurers, and unions. Detailed benefit provisions were abstracted from the booklets, including covered services, deductibles, copayments and coinsurance rates, out-of-pocket stop-loss limits, and annual and lifetime maximum payments. Benefit provisions were abstracted separately for dozens of different services, including prescription drugs. Medigap policies were coded with respect to the gaps in Medicare coverage. The HIPS response rate was 62%. This analysis uses imputed premium and benefit data assigned to the 38% of the HIPS sample that did not respond. Respondents aged 65 years and older with private coverage supplemental to Medicare were included in the analyses. These included persons with employment-sponsored retirement coverage as well as persons with individually purchased Medigap policies. The final sample included 3751 subjects.

### MEASURES

#### Estimated Liability for Out-of-Pocket Expenditures in the Catastrophic Illness Scenario

In our sample of Medicare beneficiaries with private supplemental health insurance coverage, policies are characterized by hundreds of specific provisions that make it difficult to measure the breadth and depth of coverage. Medigap plans designed specifically to supplement Medicare benefits cover about 53% of our sample.<sup>2</sup> These plans vary by whether they cover the part A deductible and copayments or the part B deductible and coinsurance, and whether they provide other benefits not covered by Medicare, such as prescription drugs. In 1987, there was more variation in Medigap plans than today, since federal legislation

specified 10 standardized Medigap plans.<sup>24</sup> The rest of our sample are covered by employer-sponsored insurance, which is not usually designed to supplement Medicare. These plans are governed by more provisions than most Medigap plans. Patient cost-sharing provisions reduce coverage at the front end in the form of deductibles and copayments, which also may vary by type of service. At the back end, plans vary in the degree of protection they offer against catastrophic events. Some plans set annual or lifetime maximums that limit insurance payments after a certain amount. Other plans offer more protection to patients with serious illness by setting stop-loss limits on out-of-pocket expenses.

To simplify this complexity into one summary measure of coverage generosity, we calculated the share of total expenditures that is covered by Medicare plus private insurance and the share paid out-of-pocket by the patient for a stylized illness scenario. This approach to evaluating insurance benefits has been used elsewhere and has the advantage of summarizing the multidimensional concept of insurance plan generosity by a single continuous variable.<sup>25,26</sup> To compute these out-of-pocket expenses, we used detailed benefit data collected from the health policy booklets of every person in our sample. Coverage information was collected on more than 16 types of health care services, including hospital facility care, inpatient and outpatient physician services, emergency department care, dental care, prescription drugs, durable medical equipment, supplies, home health care, and more. We used these data in conjunction with the claims processing program BENSIM, a component of the MEDSIM microsimulation model developed by researchers at the Agency for Health Care Policy and Research.<sup>27</sup> The BENSIM program replicates the standard calculations of insurance payments and out-of-pocket responsibility that Medicare and private insurance plans would make for each person in our sample. Coordination of benefits between Medicare and private supplemental policies was determined by information collected from policy booklets.

We defined a catastrophic illness scenario corresponding to the 99th percentile of the distribution of total expenditures for all persons aged 65 years and older in the NMES sample. Thus, each person in our study sample was estimated to have a 1% chance of experiencing such an event. The total expenditure for the catastrophic illness scenario, including payments from all sources, was \$76 729 in 1987 dollars. The scenario included inpatient hospital expenditures of \$59 235. The rest of the expenditures were for physician services, emergency department care, physical therapy, prescription drugs, home health care, and other types of care. Simulated out-of-pocket payments were calculated based on this illness scenario and expressed as a percentage of the total illness expenditure. Simulated out-of-pocket expenditures in the event of a catastrophic illness was categorized as low (<2% of total expenditure), intermediate (2%-10% of total expenditure), and high risk (>10% of total expenditure), and also examined as a continuous variable.

ing in Medicare populations, studies in persons younger than age 65 years have documented adverse associations between insurance status and health outcomes. Results from the Rand Health Insurance Experiment showed that financial barriers in the form of greater copayments resulted in clinically important adverse health outcomes

for certain groups, including those with poor vision, high blood pressure, and low incomes.<sup>9</sup> Observational studies also have documented adverse associations between lacking health insurance coverage and health outcomes. Persons losing health insurance benefits suffer measurable declines in their health,<sup>10-12</sup> and persons lacking health

### Sociodemographic Factors

Several sociodemographic variables were examined to adjust for potential confounding and included age in years; level of education (less than high school, high school, and greater than high school); household income as percentage of poverty level for 1987 (poor, <100%; near poor, 100% to <125%; low income, 125% to <200%; middle income, 200%-400%; and high income, >400%); wealth, defined as asset income (annuity, dividend, estate, cash contribution, interest, non-home gain [or loss], rental, and royalty income); race or ethnicity (white and nonwhite); and marital status (married or unmarried living with a partner and single).

### Regular Source of Care

A national study showed that 79% of Americans could identify a regular personal physician by name,<sup>28</sup> so presence or absence of a self-reported personal physician was assessed.

### Health Status Factors

Subjective health status was measured using items that constitute subscales of the Medical Outcomes Study general short-form health survey, a measure of the health effects of chronic disease with demonstrated reliability and validity.<sup>29,30</sup> The subscales included 5 questions each on health perceptions, including self-reported health status (Cronbach  $\alpha = .90$ ), mental health ( $\alpha = .88$ ), physical functioning ( $\alpha = .85$ ), and 2 questions on role functioning ( $\alpha = .79$ ), and exhibited excellent internal reliability in the NMES as demonstrated by the high Cronbach  $\alpha$  scores.

### Self-Reported Morbidity

Respondents were asked whether a physician had ever told them they had any of the following chronic medical diagnoses: gallbladder disease, stroke, cancer, emphysema, diabetes, arthritis, high blood pressure, heart attack, hardening of the arteries, or heart disease. From these items, a continuous scale was derived as well as a dichotomous self-reported medical diagnosis variable (any diagnoses and no diagnoses).

### Body Mass Index

Body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) was calculated for each subject from self-reported weight and height and categorized to reflect extremes that have been associated with excess mortality ( $\leq 19$  or  $\geq 30$ ).<sup>31,32</sup>

### Medical Skepticism Scale

Ten health attitude questions, derived from a 1970 Center for Health Administration Studies–National Opinion

Research Center study,<sup>33</sup> were included in the NMES. For our report, 5 questions that contributed to reliability (Cronbach  $\alpha = .62$ ) were selected to form a unidimensional scale to measure the adult respondent's attitude toward health insurance and health care. Increasing medical skepticism has been shown to be adversely associated with mortality in the NMES.<sup>34</sup>

### Tobacco Use

Self-reported smoking status was categorized for each subject as current, former, or never.

### Expenditure and Health Care System Utilization Measures

The NMES includes detailed corroborated data on 1987 health care expenditures and utilization. Total annual medical care expenditures were examined as a continuous variable. The number of hospitalizations was assessed as a continuous variable and also as a dichotomous variable (none or  $\geq 1$ ).

### Mortality

We used the 5-year mortality experience of respondents in NMES ascertained through the National Death Index, which is available on a public-use tape.<sup>35</sup> The National Death Index is a computer file of all deaths in the United States since 1979 and is maintained by the National Center for Health Statistics.<sup>36</sup> The National Death Index has been shown to be an effective and accurate means of ascertaining deaths for large-cohort studies.<sup>37-41</sup> Deaths were ascertained if a match occurred between identifying data for persons in the Household Survey and identifying data for persons whose deaths were recorded in the National Death Index from January 1, 1987, through December 31, 1992. Identifying data, including first and last name; month, day, and year of birth; sex; and race, were available for more than 99% of the NMES sample persons. Social security number was available for 70% of the NMES sample persons.<sup>35</sup>

### STATISTICAL ANALYSES

Weights provided on the public-use tapes were used to yield population estimates adjusted for survey oversampling and nonresponse. Because of the complex survey design of NMES, analyses were conducted with the statistical package SUDAAN,<sup>42</sup> which uses the method of Taylor series linearization to produce appropriate SEs and 95% confidence intervals (CIs) in surveys involving cluster sampling. To examine the relationship between liability for out-of-pocket expenditures in the event of a catastrophic illness and total mortality, proportional hazards survival analyses were performed to obtain hazard ratios (HRs) adjusted for potential confounders. Interaction between insurance category and education, income, wealth, age, sex, race or ethnicity, and health status was assessed.

insurance describe relatively lower self-reported health status<sup>13,14</sup> and functional status.<sup>15</sup> Lacking health insurance in persons younger than 65 years has been shown to be adversely associated with mortality.<sup>16,17</sup>

Because of the growth of the problem of out-of-pocket costs in the elderly and the limited information

about possible implications of these changes, we examined the relationship between the risk for out-of-pocket expenditures for persons older than 65 years and subsequent mortality. Our study is based on linked 1987 National Medical Expenditure Survey (NMES)–National Death Index data, a representative cohort of the US popu-

**Table 1. Relationships Between Liability for Out-of-Pocket Expenditures in the Catastrophic Illness Scenario and Mortality and Selected Characteristics\***

Characteristic	Risk Level†		
	Low (n = 3078)	Intermediate (n = 417)	High (n = 256)
Died	18.5	22.5	22.6
Age, mean (SE), y	73 (0.1)	73 (0.4)	74 (0.5)
Female	58.7	55.6	57.4
Education level			
Less than high school	41.5	45.6	43.4
High school	34.9	33.2	29.3
Greater than high school	23.7	21.2	27.3
Income level			
<200% poverty	33.3	28.5	33.1
200%-400% poverty	37.8	45.1	40.7
>400% poverty	28.9	26.4	26.2
No earned income, mean (SE), \$	4856 (331)	4264 (476)	4200 (492)
Married	59.1	60.2	53.1
White race or ethnicity	93.0	91.0	94.9
Smoking history			
Current smoker	15.0	17.1	13.5
Former smoker	37.9	36.1	42.4
Never smoker	47.1	46.9	44.1
No. of medical diagnoses, mean (SE)	2.3 (0.04)	2.4 (0.1)	2.1 (0.1)
Hospitalized in past year	17.7	15.7	20.4
BMI category‡§			
<20	8.1	8.3	3.6
20-30	79.9	76.9	83.4
>30	12.0	14.9	13.0
MOS scales, mean (SE)			
Health perceptions	55 (0.7)	52 (1.9)	54 (2.2)
Physical functioning	59 (0.9)	56 (2.5)	58 (3.0)
Role functioning	68 (0.9)	65 (2.7)	68 (3.0)
Mental health	74 (0.4)	75 (1.1)	75 (1.6)
Medical skepticism score‡¶	2.1 (0.02)	2.2 (0.05)	2.0 (0.05)
Covered medical expenditures in 1987, mean (SE), \$	3023 (210)	2823 (468)	2618 (402)
Out-of-pocket medical expenditures in 1987, mean (SE), \$	936 (59)	741 (91)	1124 (234)
Has a regular physician	91.8	91.2	91.4

\*BMI indicates body mass index; MOS, Medical Outcomes Study. Unless otherwise indicated, data are given as percentage of subjects.

†Low risk is defined as liable for less than 2% of total expenditures; intermediate, 2% to 10% of total expenditures; and high risk, more than 10% of total expenditures. Because of rounding, percentages may not all total 100.

‡Determined by dividing weight in kilograms by the square of height in meters.

§P < .05 (analysis of means or  $\chi^2$  analysis for differences among groups).

||Higher scores indicate higher perception of functioning for health status, mental health, role functioning, and physical functioning.

¶Higher scores indicate more negative attitudes.

lation with 5 years of mortality follow-up. We examined a relatively homogeneous subset of the elderly in that sample, those with supplemental health insurance. Based on previous theoretical research,<sup>18-20</sup> the adequacy of health insurance coverage is viewed as an enabling factor facilitating access to care. We hypothesized that, after adjusting for potential confounders, as the liability for out-of-pocket expenditures increases, the risk for mortality also increases.

Baseline characteristics of the sample stratified by insurance risk category are presented in **Table 1**, which also provides national population estimates for each covariate. The 3 risk categories in Table 1 measure different levels of estimated liability for out-of-pocket expenditures as a percentage of total health care expenditures in the catastrophic illness scenario (low risk, <2%; intermediate risk, 2%-10%; high risk, >10%). Overall, the 3 risk groups had similar characteristics, with significant differences across groups present for only BMI and medical skepticism score. Low body mass (BMI, <20) was less likely to be reported by persons in the high-risk group (3.6%) than persons in the low- (8.3%) or intermediate-risk groups (8.1%), whereas the likelihood of large body mass (BMI, >30) was similar across groups. The mean medical skepticism score was greatest in persons in the intermediate-risk group (mean score, 2.2), but was lower in persons in the high- (mean score, 2.0) and low-risk (mean score, 2.1) groups. Age, sex, education and income levels, wealth, marital status, and race or ethnicity did not vary significantly across groups. More than 90% of persons in each group identified a personal physician. Smoking status did not vary substantially across groups. Self-reported health status, measured by mean Medical Outcomes Study scale scores and the mean number of medical diagnoses, was similar across groups. Mean medical expenditures that were covered by insurance did not vary significantly by risk group, nor did mean uncovered (out-of-pocket) expenditures.

## UNADJUSTED MORTALITY

After 5 years of mortality follow-up, 18.5% of persons classified as low risk for out-of-pocket expenditures in the event of catastrophic illness, 22.5% of those classified as intermediate risk, and 22.6% of those classified as high risk had died (Table 1).

## ADJUSTED MORTALITY

Examination of the measure of liability for out-of-pocket expenditures in the event of a catastrophic illness as a continuous variable revealed a significant association with mortality. An adjusted HR of 1.03 (95% CI, 1.00-1.05; P = .04) for each percentage increase in risk was found (data not tabled). Categorization of this measure into the low-, intermediate-, and high-risk groups (**Table 2**) showed a significant linear trend (P = .02). Persons in the high-risk group (ie, underinsured subjects) had a significantly increased risk for mortality compared with those in the low-risk group (HR, 1.4; 95% CI, 1.0-1.9), whereas persons in the intermediate-risk group had a modestly elevated, although not statistically significant, risk for mortality (HR, 1.2; 95% CI, 0.9-1.6). Assessments of interaction between liability for out-of-pocket expenditures in catastrophic illness and other covariates made no statistically significant (P < .05) contributions to the proportional hazards regression models.

Our observations suggest that strategies aimed at increasing out-of-pocket health care expenditures to contain Medicare costs may result in adverse health outcomes. Most Medicare beneficiaries have obtained private supplemental coverage for protection, to varying degrees, from the copayments, deductibles, and other uncovered costs of Medicare. However, even for persons with private supplemental coverage, out-of-pocket health care costs can be substantial and are rising.<sup>3,5,6</sup> Because our observations reveal an adverse association between liability for out-of-pocket expenditures in the event of catastrophic illness and mortality after adjustment for covariates, support is provided for policies that would reduce, rather than increase, financial barriers to care for elderly Americans.

The observed relationship may be the result of confounding by incompletely measured or unmeasured factors. Persons with less comprehensive supplemental coverage may value health less than those with more generous coverage. Consequently, persons placing less value on health may fail to secure comprehensive supplemental coverage and may also experience higher mortality because of individual lifestyle factors. However, we controlled for a far wider range of measures than usually are found in secondary data sets, including a medical skepticism scale measuring attitudes toward health insurance and health care, sociodemographic factors, self-reported health status, and lifestyle measures of smoking status and other unhealthy behaviors.

The inferences that can be drawn from these results are strengthened by the study design and the use of a comprehensive measure of insurance protection. The study population was limited to the relatively homogeneous group of persons covered by private insurance supplemental to Medicare. These persons are likely to be similar along a variety of unobserved factors.

The measure of the generosity of insurance protection used is less subject to endogeneity concerns than other potential measures. For example, measuring the generosity of insurance coverage by selecting a few specific provisions, such as coverage for the Medicare hospital deductible or coverage for Medicare coinsurance on physician office visits, could be directly correlated with a person's health status. Individuals in ill health in 1987 may not have been able to purchase a Medigap policy including those specific provisions, and may be more likely to experience subsequent mortality. Similarly, measuring insurance generosity by using actual out-of-pocket expenditures in 1987 (as reported in the NMES) would clearly be correlated with individuals' health status and likelihood of subsequent mortality. In contrast, the measure of insurance generosity used is less likely to be correlated with subjects' health status in 1987 because it estimated liability for out-of-pocket expenditures in the event of a simulated catastrophic illness.

The reported hazard ratio may underestimate the relationship between liability for out-of-pocket expenditures in the event of catastrophic illness and mortality. First, insurance status was measured only once, at baseline, and no account of changes into, and out of,

**Table 2. Proportional Hazards Model for Survival Time Adjusted for Baseline Characteristics\***

	Adjusted HR	95% CI
Liability for out-of-pocket expenditures in the event of catastrophic illness		
Low risk	1.0	...
Intermediate risk	1.2	0.9-1.6
High risk†	1.4	1.0-1.9
Age, y		
65-74	1.0	...
75-84‡	2.0	1.6-2.4
≥85‡	4.4	3.0-6.3
Male‡	2.0	1.6-2.4
Education level		
Less than high school	1.0	0.8-1.2
High school	0.9	0.7-1.2
Greater than high school	1.0	...
Income level		
<200% poverty	1.0	0.8-1.3
200%-400% poverty	1.0	0.8-1.3
>400% poverty	1.0	...
Wealth (nonearned income)	0.99	0.99-1.00
Married	0.9	0.8-1.2
White	1.1	0.7-1.6
Smoking category		
Current smoker‡	1.7	1.4-2.3
Former smoker	1.1	0.9-1.4
Never smoker	1.0	...
Body mass index§		
≤20†	1.5	1.1-1.9
>20 to <30	1.0	...
≥30	0.9	0.6-1.1
No. of medical diagnoses‡	1.07 per Dx	1.02-1.13
Medical Outcomes Scale		
Health status†	0.99	0.99-1.00
Mental health	1.00	1.00-1.01
Role functioning	1.00	0.99-1.00
Physical functioning†	0.99	0.99-1.00
Medical skepticism score¶	1.2	1.1-1.3
Hospitalized in 1987	0.9	0.7-1.1
Total medical expenditures‡	1.00002 per \$1	1.00001-1.00002
No regular physician	1.2	0.7-1.7

\*HR indicates hazard ratio; CI, confidence interval; and Dx, diagnosis. Hazard ratios were simultaneously adjusted for each listed factor.

†P<.05 (analysis of variance of means or  $\chi^2$  analysis for differences among groups).

‡P<.01 (analysis of variance of means or  $\chi^2$  analysis for differences among groups).

§Determined by dividing weight in kilograms by square of height in meters.

||Higher scores indicate higher perception of functioning for health status, mental health, role functioning, and physical functioning.

¶Higher scores indicate more negative attitudes.

private health plans could be performed. Migration of persons in the high-risk group to lower-risk groups and vice versa likely would bias the observed association toward the null hypothesis. Second, the variables included in the survival analysis may have resulted in overadjustment of the true relationship between insurance status and mortality. If inadequate insurance in the elderly adversely affects health, as suggested in studies examining lack of insurance in younger persons,<sup>13,14</sup> then adjustment for baseline health status will tend to reduce the observed relationship between health insurance and mortality.

Observational studies cannot completely exclude the possibility of unmeasured confounding, nor prove causality. It is unlikely, however, that a randomized, controlled trial to assess different levels of liability for out-of-pocket expenditures in catastrophic illness and adverse health outcomes will be performed. Similarly, it is unlikely that randomized, controlled trials to assess specific aspects of uncovered expenditures, such as varying levels of prescription medication coverage, will be conducted. In the absence of prospective trials, more detailed analyses from diverse data sources are warranted.

Although the findings reported herein provide evidence that cost-sharing in the elderly is adversely associated with mortality, alternative strategies to reduce the growth of Medicare could also result in undesired outcomes. Relying on reducing payments to providers such as physicians, hospitals, and HMOs ultimately would reach limits beyond which additional cutbacks would become impossible. Medical savings accounts would be more likely to be used by relatively affluent persons, whereas the sickest persons would likely remain in the traditional fee-for-service programs, driving up fee-for-service costs.<sup>43</sup> Although Medicare HMO enrollment offers relatively greater protection against out-of-pocket costs, cost savings appear to occur through biased selection of relatively healthy enrollees.<sup>44</sup> If Medicare HMOs eventually were to begin enrolling elderly Americans nonselectively, an increased reliance on cost-sharing would almost certainly result.

Most health plans in the United States require beneficiaries to meet cost-sharing requirements that are unrelated to income.<sup>45</sup> This reliance on cost-sharing is not only inequitable, but it ultimately may not result in significant slowing in Medicare spending.<sup>45,46</sup> Although the critical issue of cost containment will not be resolved soon, the health consequences of the current economic imperative must be considered: Might our current efforts to contain costs through market-driven solutions ultimately result in more harm than good for a vulnerable segment of society?

Our study indicates that increasing risk for out-of-pocket expenditures in catastrophic illness is associated with increased subsequent mortality among elderly Americans with supplemental private coverage. The impending bankruptcy of the Medicare part A trust fund and Congressional overtures to limit Medicare eligibility to those older than 67 years suggest that Medicare coverage will be eroded further and that cost-sharing will increase. This trend may have an adverse impact on the health of elderly persons in our society, especially low-income individuals who bear the greatest burden of out-of-pocket expenditures relative to income. Research is needed to identify which specific components of uncovered expenditures in the elderly are most likely to result in reduced access to potentially useful health care interventions. Similarly, research is needed to identify which specific components of uncovered expenditures are associated with adverse health outcomes. Moreover, research is needed to examine the health impact of cost containment strategies that do not directly increase out-of-pocket expenditures, such as managed Medicare and medical savings accounts. Despite these research needs, our findings sup-

port policies to decrease out-of-pocket health care expenditures to reduce the risk for premature mortality in elderly Americans.

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### Clinical Pearl

#### Riboflavin in Migraine Prophylaxis

In a study of 55 patients, patients randomized to 400 mg of riboflavin per day had fewer migraines (about 2 per month) compared to the placebo group (about 4 per month), and the headaches were shorter in duration. (*Neurology*. 1998;50:466-470.)