Chronic Conditions: Results of the Medicare Health Outcomes Survey, 1998-2000

Beth Hartman Ellis, Ph.D., Erin Dowd Shannon, M.P.H., Jacquilyn Kay Cox, Ph.D., Leona Aiken, Ph.D., and Brenda M. Fowler, M.S.

This research examines the predictors of 2-year declines in physical and mental health for beneficiaries surveyed in the Medicare Health Outcomes Survey (HOS). Regression results indicate that age, arthritis of the hip/knee, sciatica, and pulmonary diseases, comorbidity at baseline, and increased comorbidity between baseline and followup were predictors of decline in physical health; however, these account for very small amounts of variance. The number of newly diagnosed chronic conditions and depression predicted decline in mental health. Beneficiaries deceased at followup were of lower socioeconomic status, and had lower physical and mental health scores than the analytic sample.

INTRODUCTION

This study is based on the Medicare HOS sponsored by CMS. This survey is the first health outcomes assessment for the Medicare population in managed care (MC) settings. Beginning in 1998 and continuing annually, a new baseline cohort is created from a randomly selected sample of Medicare members from each applicable Medicare contract market area. The HOS includes the SF-36®[1] health survey, which yields two distinct higher order measures of health status: the physical component summary (PCS) score and mental component summary (MCS) score. This research examines the changes in the PCS and MCS scores for beneficiaries from cohort I sampled in 1998 (baseline) and 2000 (followup), specifically addressing the impact of chronic conditions on health status for those age 65 or over.

As America's elderly population grows, improving and/or maintaining their physical and mental health status become an increasing challenge. The quality of life for elderly persons, as well as the costs associated with physical and mental health decline will be strongly impacted. A recent review of longitudinal research examined the association between risk factors and functional decline in the health of elderly persons. The top three risks for functional decline (rank ordered) were cognitive impairment, depression, and disease burden (Stuck, Walthert, Nikolaus et al., 1999). Though the Medicare HOS does not assess cognitive impairment, it does assess physical health status and risk for depression.

Physical decline in elderly persons is strongly associated with the presence of chronic conditions. The CDC indicate that more than 90 million Americans live with chronic conditions and that these conditions account for approximately 70 percent of all deaths in the United States (Centers for Disease Control and Prevention, 1998). Additionally, the National Center for Chronic Disease Prevention and Health Promotion (1999) estimates that 80 percent

[1] SF-36® is a registered trademark of the Medical Outcomes Trust.

Beth Hartman Ellis, Erin Dowd Shannon and Brenda M. Fowler are with the Health Services Advisory Group, Inc. Jacquilyn Kay Cox is with the Arizona Department of Health Services. Leona Aiken is with Arizona State University. The research in this article was funded under CMS Contract Number AZ0002. The views expressed in this article are those of the authors and do not necessarily reflect the views of the Health Services Advisory Group, Inc., Arizona Department of Health Services, Arizona State University, or the Centers for Medicare & Medicaid Services (CMS).

of all seniors have at least one chronic condition and 50 percent have at least two. Results from the National Heart Failure Project indicated that comorbidity was common in a nationwide sample of 34,587 Medicare patients (Havranek, Masoudi, Westfall et al., 2002).

Additionally, chronic diseases disproportionately affect elderly minorities. When adjusting for demographic, socioeconomic, behavioral, and clinical factors for patients with diabetic complications, racial/ethnic differences were found for increased incidence of ESRD for black persons, Asians, and Latinos (Karter, Ferrara, Liu et al., 2002). Treatment inequities also exist. For example, in an investigation of more than 169,000 Medicare beneficiaries who were treated for myocardial infarction, Rathore, Berger, Weinfurt et al. (2000) found that simple inexpensive medical therapies (e.g., aspirin on admission and beta-blockers on discharge) were underutilized in the treatment of black persons, females, and poor patients. Recent research indicates that black Medicare beneficiaries in MC received poorer quality of care than white beneficiaries (Schneider, Zaslavsky, and Epstein, 2002).

With the increasing population of elderly people in the United States there will be a concomitant increase in those who have declining mental health. Currently, approximately two million (6 percent) of the 34 million adults in the over 65 age group have a diagnosable depressive illness (major depressive disorder, bipolar disorder, or dysthymic disorders) (National Institute of Mental Health, 2003). The Surgeon General's Report on Mental Health indicates that approximately 20 percent of the over age 55 population in the United States experience specific mental disorders that are not part of normal aging, such as depressive disorder (U.S. Department of Health and Human Services, 1999). For example, the suicide rate is highest for elderly persons. According to the National Institute of Mental Health (2003), 20 percent of older adults who commit suicide have visited a primary care physician on the same day, 40 percent have visited within 1 week, and 70 percent within 1 month.

Currently, little is known about the health status of over age 65 Medicare beneficiaries in MC plans. MC has the potential to reduce many of the barriers to improve quality of care for Medicare beneficiaries by providing a single source of care, improved access, and reduced out-of-pocket costs, as well as disease management programs for chronically ill beneficiaries. However, if MC plans curtail access and services in an attempt to reduce costs, many of these benefits may fail to materialize.

Methods

Beginning in 1998, and continuing annually, a Medicare HOS baseline cohort is created from a random sample of 1,000 members from M+C plans (M+COs) in the United States. In plans with fewer than 1,000 Medicare members the sample consists of the entire enrolled Medicare population that meets the inclusion criteria. Medicare beneficiaries who are continuously enrolled in the health plan for at least 6 months are eligible for sampling. Beneficiaries are excluded from followup 2 years later if they disenrolled from their plan (voluntarily disenrolled), if their plan no longer has a contract in place at the time of followup (involuntarily disenrolled), or for reason of death. Scores on the outcome measures, which utilize the PCS score and the MCS score (Ware and Sherbourne, 1992) are also excluded at followup if there are insufficient data available from the baseline survey. The data collection protocol includes a combination of multiple mail-

ings and telephone followup (over a period of approximately 4 months). CMS contracts with the National Committee for Quality Assurance who, in turn, monitors the data collection activities of the HEDIS® certified vendors. The complete data collection protocol can be found in the HEDIS® specifications (National Committee for Quality Assurance, 2000).

Sample

Of the 279,135 beneficiaries sampled from 269 M+COs for cohort I baseline, either a PCS or MCS score, or both, could not be calculated for 106,821 (this figure may include disenrolled beneficiaries, surveys with less than 80 percent completion, or a PCS or MCS score that was unable to be calculated); 172,314 had a PCS and MCS score that could be calculated. Of the 172,314 beneficiaries who had scoring information, 41,805 were involuntarily removed from their plan or else their plan no longer existed at followup, and 130,509 beneficiaries were in a plan that did exist at followup. Of the 130,509 beneficiaries whose plans existed at followup, 10,746 were non-respondents at followup, 33,728 had voluntarily disenrolled from their plan, and 9,515 were deceased. Thus, the total sample of beneficiaries who completed both the baseline and followup surveys consisted of 76,520 beneficiaries from 188 plans.

Additional selection criteria were imposed on the respondent sample for this analysis in the following sequential order to eliminate inconsistencies in responses: (1) beneficiaries had to have both a PCS and MCS score at baseline and followup (7,318 excluded); (2) cases with proxy respondents were excluded (15,641)[2] (3) institutionalized beneficiaries were excluded (121); (4) cases in which the sex reported at baseline differed from the sex reported at followup were excluded (1,651); (5) cases with illogical reporting of age at baseline versus followup were excluded (1); (6) cases with illogical reporting of marital status between baseline and followup were excluded (83) (for example, married at baseline and never married at followup); (7) beneficiaries with disabilities under the age of 65 were excluded (2,488); and (8) beneficiaries who reported all 13 specific chronic conditions at baseline but did not report any of the 13 conditions at followup were excluded (562).[3] The resulting cohort I analytic sample consisted of 48,655 respondents age 65 or over from 188 plans.

Measures

The SF-36® is used in the Medicare HOS to assess physical and mental health functioning and has a long history of use in estimating relative disease burden for numerous conditions (Ware, 1993; Ware and Sherbourne, 1992; Ware et al., 1994). The SF-36® is a multipurpose, short-form health survey with 36 questions. The SF-36® asks respondents about their usual activities and how they would rate their health. It is a barometer of physical and mental health functional status. The PCS and MCS scores are calculated using the eight scales of the SF-36®: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The PCS, MCS, and individual scale scores range from 0 to 100, with higher scores indicating better functioning. The norm for the general population is 50 with a standard deviation of 10. The dependent measures for this study were the two summary

[2] Proxy responses have been found to substantially differ from self-reported responses to health care surveys (Yip et al., 2001; Ellis, Bannister, Cox et al., 2003). The data from the Ellis, Bannister, Cox et al. research were based on the first three cohorts of the Medicare HOS.

[3] The HOS asks respondents if a doctor has ever told them that they had the condition.

scores of the SF-36®: the normed[4] (1990) PCS and MCS scores. A change score for each respondent was calculated by subtracting the baseline score from the followup score (a positive result indicated an improvement over the 2-year period and a negative result indicated a decline).

Additional items in the Medicare HOS include demographic information, smoking status, ADLs, negative symptoms, the occurrence of 13 chronic conditions, and three depression-screening questions (Burnam et al., 1988).

Predictor Variables

Demographic information included sex, age, race, marital status, education, annual household income, homeowner status, and Medicaid status. The risk factors evaluated were 13 chronic medical conditions (listed in Table 2), the depression-screening questions, and smoking status.

Analyses

The following analyses were conducted to construct models for the prediction of the 2-year PCS and MCS change scores (using ordinary least squares [OLS] regression in SAS® version 8.2; SAS Institute, Inc., 1990; 2002). First, the change score (2000-1998 score) was predicted from demographic variables and the 1998 baseline score to control for the baseline level in the measurement of change. Second, risk factors (chronic conditions, smoking status, and risk for depression) were added to the regression equation to assess the impact of these variables over and above the baseline score and demographics. Each risk factor was added individually (with no other risk factors), and the effect size was determined by subtracting the R^2 of the model with only the baseline score and demographics from the R^2 of the model with the baseline score, demographics, and the risk factor. All risk factors that had an effect size of 0.005 (that is, added 0.5 percent or more of variance to the R^2 of the regression model of the baseline score and demographics [Menard, 1995]) as well as the baseline score and demographics were entered into the final model.[5]

Due to the large size of the sample and concomitant high statistical power, statistical significance was found for effects that accounted for exceptionally small amounts of variance. Therefore, effect sizes are used to establish conclusions. Effect size is defined as "...the degree to which the phenomenon is present in the population...or the degree to which the null hypothesis is false" (Cohen, 1988). In this study, the effect size was measured by how much additional variance was explained when a particular variable was added to the model. This was observed by examining the variable's partial R^2. A small effect size is one that accounts for 2 percent of the variance in the dependent variable, a medium effect size accounts for 13 percent, and a large effect size accounts for 26 percent.

Using the 48,655 sample of beneficiaries, three groups were created: the newly diagnosed group (beneficiaries who reported a specific chronic condition at followup only), the diagnosed before baseline group (chronic condition diagnosed prior to baseline), and the no disease group (the reference group). For the regression model, there were 38,760 beneficiaries who logically fit into one of the previously mentioned groups. This sample was used for the regression model.

[4] Normed to the 1990 general population, so that a score of 50 represents the national average for a given scale or summary score.

[5] Results for individual risk factors available from first author.

Fitting higher order polynomial regression models to the data and comparing the results with the linear model established linearity of the data. Regression analyses were performed to assess whether a higher order polynomial model of change in health status as a function of the baseline score might better fit the data than a linear model. With the PCS or MCS 2-year change score as the dependent variable, a linear model, with only the baseline PCS or MCS score as the predictor variable, was compared with both a quadratic and cubic model (Cohen et al., 2003). R^2 values were compared between these three models to determine if the higher order terms contributed significant prediction over the linear term. For the PCS 2-year change score regression, the R^2 value of the linear model was 0.1074, compared with an R^2 value of 0.1100 for the quadratic equation and 0.1103 for the cubic equation. Thus, the proportion of variance gained by adding the quadratic term to the model was 0.0026 (0.1100-0.1074), and the proportion gained by adding the cubic term was 0.0029 (0.1103-0.1074). For the MCS 2-year change score regression, the R^2 value of the linear model was 0.1751, compared with an R^2 value of 0.1754 for the quadratic equation, and 0.1763 for the cubic equation. The quadratic term accounted for only 0.0003 (0.1754-0.1751) of the variance and the proportion of variance gained by the cubic term was only 0.0012 (0.1763-0.1751). These results indicated that the addition of higher order polynomial terms to the linear regression equation added little or no predictive value to the model.

As stated previously, the sample in these analyses was comprised of beneficiaries from 188 different M+COs. The strength of clustering in data sets was measured by the intraclass correlation coefficient (ICC). This measure was used to determine whether PCS or MCS 2-year change scores from different M+COs were more discrepant from one another than PCS or MCS 2-year change scores within the same M+CO. Using the PROC MIXED procedure in SAS® (version 8.2), the ICCs were obtained for the PCS change score and the MCS change score. The ICC for the PCS change score was very small (1.28202×10^{-5}); 0.001282 percent of the variance was explained by M+CO membership. The ICC for the MCS change score was still negligible at 0.001768, with 0.1768 percent of the variance explained by M+CO membership. The ICCs were small enough that clustering did not appear to be a problem. Because clustering was not present in the data, OLS regression was used for both the PCS and MCS 2-year change score models.

A large number of records was omitted from OLS regression due to missing values for one or more predictor variables; approximately 17 percent of respondents did not report income, and approximately 3-5 percent of other predictor variables had missing values. Multiple imputation procedures were employed to handle missing data (Allison, 2001). Traditional approaches to handling missing data (casewise/listwise deletion) can lead to biased parameter estimates while new approaches to handling missing data such as multiple imputation (MI) take into account the uncertainty in the missing values (Rubin, 1987; West, 2001; Sinharay, Stern, and Russell, 2001). PROC MI and MIANALYZE procedures in SAS® (version 8.2) were used. PROC MI replaces each missing data point with a set of $m > 1$ plausible values to generate m complete data sets. These complete data sets are then analyzed by standard statistical software. Finally, PROC MIANALYZE combines the results of the analysis across the m complete data sets, and provides parameter estimates and standard errors that take into account the uncertainty due to the missing data values.

Results

Sample Comparisons

Due to the large number of beneficiaries who were excluded from the analytic sample, it was important to know if these beneficiaries differed systematically from those not excluded from the analytic sample. Table 1 provides demographic information for the beneficiaries who were involuntarily and voluntarily disenrolled between baseline and followup, deceased, nonrespondents at followup, beneficiaries who responded to both surveys but were excluded from the cohort I analytic sample (due to the criteria imposed on the analytic sample), and the cohort I analytic sample.

Cohen's effect size was used to compare differences between the groups (1988). Some small ($0.2 \leq d < 0.5$), medium ($0.5 \leq d < 0.8$) and large ($d \geq 0.8$) effect sizes were found between groups for demographics and health status. It is the deceased group, however, that differs most dramatically from the cohort I analytic sample as well as the respondents excluded from the cohort I analytic sample.

Table 2 presents the baseline prevalence and the 2-year incidence of each chronic condition for the cohort I analytic sample and beneficiaries excluded from this sample. Two small effect sizes were found between the two samples for stroke and six or more chronic conditions. Proportionally more respondents excluded from the cohort I analytic sample reported these conditions than the respondents in the cohort I analytic sample.

Table 2 also presents the prevalence of total comorbidity in 1998 and the incidence of comorbidities between 1998 and 2000. Approximately 85 percent of the cohort I analytic sample and 87 percent of the beneficiaries excluded from this sample had one or more of the 13 chronic conditions in 1998. Between baseline and followup, 45 percent of the cohort I analytic sample and 49 percent of the beneficiaries excluded from the analytic sample developed at least one new chronic condition. The number of all conditions diagnosed before baseline is the sum of all 13 conditions that were diagnosed before administration of the baseline survey. The number of all conditions newly diagnosed between baseline and followup is the sum of all 13 conditions that were reported for the first time on the followup survey.

Table 3 reports the regression model results predicting change in the PCS/MCS scores from the baseline PCS/MCS scores plus demographic variables. The PCS model accounted for 12.1 percent of the variance in the PCS change score. Over and above the PCS baseline predictor (parameter estimate = -0.272), the only demographic variable that contributed at least 0.5 percent to the variance in prediction was age (parameter estimate = -0.119). The MCS model accounted for 18.7 percent of the variance in MCS change scores. The MCS baseline score accounted for 18.4 percent (parameter estimate = -0.423) of the variance. No other single predictor contributed more than 0.2 percent to the variance in the overall equation.

Individual risk factors were added to the predictive model of PCS and MCS change scores, and this model was compared with a model that included only the baseline scores and demographics. The risk factors evaluated were: specific medical conditions (diagnosed before baseline and newly diagnosed [newly diagnosed refers to chronic conditions developed between baseline and followup]); smoking status (ex-smokers and current smokers with non-smokers as the reference group); the depression-screening questions; the total number of chronic conditions diagnosed before baseline; and the total number of newly diagnosed conditions.

Table 1
Demographics at Baseline

Category	Involuntarily Disenrolled[1] N=41,805		Effect Size	Voluntarily Disenrolled[1] N=33,728		Effect Size	Deceased at Followup N=9,515		Effect Size	Non-Respondents at Followup N=10,746		Effect Size	Respondents Excluded from Cohort I Analytic Sample[2] N=27,865		Effect Size	Cohort I Analytic Sample[2] N=48,655		Effect Size
	Percent[3]	N		Percent[3]	N		Percent[3]	N		Percent[3]	N		Percent[3]	N		Percent[3]	N	
Male	43.3	17,832	—	42.0	13,930	—	50.1	4,674	—	43.3	4,572	—	42.2	11,381	—	42.1	20,474	—
Non-White [4]	11.3	4,627	—	12.5	4,078	—	12.1	1,118	—	18.2	1,892	(5)	16.4	4,366	(5)	7.9	3,828	—
Hispanic/Spanish	3.2	1,302	—	6.3	2,045	—	4.6	416	—	7.9	816	—	7.9	2,081	—	3.6	1,709	—
Not Married	41.2	16,941	—	41.2	13,641	—	49.4	4,611	(5)	47.4	5,009	—	44.3	11,988	—	38.9	18,850	—
Less than High School	29.6	12,093	—	32.0	10,481	(5)	40.3	3,692	(5)	36.3	3,776	(5)	44.2	11,864	(5)	21.6	10,385	—
Annual Household Income Less than $10,000	16.5	5,512	—	19.4	5,130	(5)	25.8	1,889	(5)	24.3	1,914	(5)	25.0	5,256	(5)	12.3	4,932	—
Home Not Owned	24.8	9,995	—	26.3	8,508	—	35.0	3,121	(5)	30.5	3,128	(5)	30.1	7,914	(5)	19.0	9,056	—
Recipient of Medicaid	2.9	1,193	—	4.2	1,413	—	6.5	621	(5)	5.0	532	(5)	5.2	1,442	(5)	1.5	711	—
	Mean	SD		Mean	SD		Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Age in Years	72.8	7.9	—	72.4	8.1	—	77.6	8.9	(6)	72.7	9.2	—	72.8	10.2	—	73.0	5.6	—
Baseline PCS Score	40.7	12.1	(5)	40.8	12.1	—	32.5	12.0	(7)	40.2	12.2	—	37.9	12.2	(5)	43.2	11.2	—
Baseline MCS Score	52.1	10.4	(5)	51.7	10.7	(5)	47.3	12.4	(6)	50.9	11.0	—	49.8	11.5	(5)	54.1	8.8	—
Number Impaired ADLs	1.0	1.6	(5)	1.0	1.6	(5)	2.2	2.1	(7)	1.1	1.7	—	1.3	1.8	(6)	0.6	1.2	—
Number Chronic Conditions	2.5	2.0	—	2.5	2.0	—	3.4	2.3	(6)	2.5	2.0	—	2.7	2.0	(5)	2.3	1.8	—

[1] Involuntarily disenrolled includes beneficiaries whose plans were no longer a part of HOS in 2000; voluntarily disenrolled includes beneficiaries who left their health plan between baseline (1998) and followup (2000).

[2] Respondents were excluded from the cohort I analytic sample if the survey was completed by a proxy; a different sex was reported at baseline and follow up; there was an increase in age by more than 3 years or age decreased between baseline and follow up; marital status was reported as married, widowed, divorced, or separated at baseline, but was reported as never married at follow up; the beneficiary had ESRD; the beneficiary was under age 65; or if the beneficiary reported "Yes" to ever being told by a doctor that he/she had a specific chronic condition at baseline but reported "No" to the same question at followup.

[3] Based on the number of persons who responded to the question.

[4] Includes the categories American Indian or Alaskan Native, Asian or Pacific Islander, black person, and another race or multiracial.

[5] Small effect size for differences between that group and the cohort I analytic sample.

[6] Medium effect size for differences between that group and the cohort I analytic sample.

[7] Large effect size for differences between that group and the cohort I analytic sample.

NOTES: SD is standard deviation. PCS is physical component summary. MCS is mental component summary. ADLs is activities of daily living.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998.

Table 2

Prevalence and Incidence of Chronic Conditions in Cohort I Analytic Sample and Respondents Excluded from Cohort I Analytic Sample[1]

Condition	*Prevalence in 1998[2]					*Incidence Between 1998 and 2000[3]				
	Cohort I Analytic Sample (*N*=48,655)		Respondents Excluded from Cohort I Analytic Sample (*N*=27,865)			Cohort I Analytic Sample (*N*=48,655)		Respondents Excluded from Cohort I Analytic Sample (*N*=27,865)		
	Percent	*N*	Percent	*N*	Effect Size[4]	Percent	*N*	Percent	*N*	Effect Size[4]
Angina Pectoris or Coronary Artery Disease	14.1	6,879	16.8	4,455	0.07	4.2	2,048	5.6	1,574	0.07
Any Cancer (Other than Skin Cancer)	12.7	6,183	11.5	3,111	0.04	3.7	1,788	4.5	1,243	0.04
Arthritis of the Hand/Wrist	32.5	15,793	36.8	9,850	0.09	9.2	4,496	10.7	2,978	0.05
Arthritis of the Hip/Knee	35.5	17,289	42.0	11,250	0.13	9.9	4,808	11.0	3,059	0.04
Congestive Heart Failure	4.6	2,219	8.5	2,264	0.16	2.8	1,382	4.6	1,294	0.10
Crohn's Disease, Ulcerative Colitis, or Inflammatory Bowel Disease	4.8	2,309	6.4	1,702	0.07	2.2	1,066	3.0	836	0.05
Diabetes	13.7	6,676	19.1	5,119	0.14	3.4	1,655	4.9	1,363	0.08
Emphysema, Asthma, or COPD	11.2	5,441	13.5	3,590	0.07	3.6	1,733	4.6	1,268	0.05
Hypertension	50.6	24,593	54.9	14,808	0.08	7.2	3,484	8.3	2,323	0.04
Myocardial Infarction	8.8	4,265	11.3	2,990	0.08	2.7	1,327	3.9	1,077	0.06
Other Heart Conditions	19.3	9,381	21.8	5,793	0.06	6.9	3,335	8.2	2,282	0.05
Sciatica	21.0	10,223	25.0	6,639	0.09	7.9	3,855	9.4	2,611	0.05
Stroke	5.2	2,507	10.2	2,722	0.20	2.3	1,099	4.2	1,180	0.11
No Conditions	15.5	6,969	13.3	3,133	0.06	55.6	27,043	51.3	14,302	0.09
1 Condition	23.2	10,409	19.8	4,657	0.08	29.1	14,149	27.9	7,785	0.03
2 Conditions	22.0	9,892	19.8	4,642	0.05	10.9	5,304	12.5	3,473	0.05
3 Conditions	17.0	7,650	17.3	4,054	0.01	3.2	1,547	5.1	1,422	0.10
4 Conditions	10.7	4,792	12.1	2,847	0.04	0.9	446	1.9	531	0.09
5 Conditions	6.1	2,724	8.0	1,888	0.07	0.3	120	0.8	233	0.07
6 or More Conditions	5.6	2,533	9.7	2,279	0.20	0.1	46	0.4	119	0.06

*All comparisons statistically significant at $p<0.001$. *p* value from a chi-square test comparing the cohort I analytic sample and the respondents excluded from the cohort I analytic sample.

[1] Respondents were excluded from the cohort I analytic sample if the survey was completed by a proxy; a different sex was reported at baseline and followup; there was an increase in age of more than 3 years or a decrease in age between baseline and followup; marital status was reported as married, widowed, divorced, or separated at baseline, but was reported as never married at followup; the beneficiary had ESRD; the beneficiary was under age 65; or if the beneficiary reported "Yes" to ever being told by a doctor that he/she had a specific chronic condition at baseline but reported "No" to the same question at followup.

[2] Prevalence in 1998 is the percentage of respondents who reported "Yes" on the baseline survey to ever having been told by a doctor they had the condition.

[3] Incidence between 1998 and 2000 is the percentage of respondents who reported "No" on the baseline survey to ever having been told by a doctor they had the condition, but reported "Yes" on the followup survey.

[4] Effect size of differences between proportions. Small effect size: $0.20 \leq h < 0.50$; medium effect size: $0.50 \leq h < 0.80$; large effect size $h \geq 0.80$.

NOTE: COPD is chronic obstructive pulmonary disease.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

Table 3

Prediction of 2-Year Change Score from Baseline Score Plus Demographic Variables: 1998

			2-Year PCS Change Score Model						2-Year MCS Change Score Model					
Variable	Percent	N[1]	Parameter Estimate	SE	95% Confidence Interval		p Value	Effect Size[2]	Parameter Estimate	SE	95% Confidence Interval		p Value	Effect Size[2]
Intercept	—	—	17.125	0.671	15.81	18.441	<0.001	—	25.19	0.661	23.894,	26.486	<0.001	—
Baseline PCS Score	—	—	-0.272	0.004	-0.279	-0.265	<0.001	0.121	—	—	—	—	—	—
Baseline MCS Score	—	—	—	—	—	—	—	—	-0.423	0.005	-0.432,	-0.414	<0.001	0.184
Age in Years	—	—	-0.119	0.008	-0.134	-0.104	<0.001	0.005	-0.077	0.007	-0.092,	-0.063	<0.001	0.002
Educational Level	—	—	0.198	0.036	0.128	0.268	<0.001	0.001	0.314	0.035	0.245,	0.382	<0.001	0.002
Annual Household Income	—	—	0.291	0.029	0.234	0.348	<0.001	0.002	0.285	0.029	0.229,	0.341	<0.001	0.002
Female	55.2	21,397	-0.112	0.044	-0.197	-0.026	0.010	0.000	-0.083	0.043	-0.167,	0.001	0.052	0.000
Divorced/Separated	9.8	3,808	-0.005	0.072	-0.146	0.136	0.943	0.000	0.126	0.071	-0.012,	0.265	0.075	0.000
Never Married	2.8	1,064	0.149	0.125	-0.095	0.393	0.232	0.000	0.314	0.122	0.074,	0.554	0.010	0.000
Widowed	25.7	9,966	-0.027	0.054	-0.133	0.078	0.610	0.000	0.387	0.053	0.284,	0.491	<0.001	0.001
Black Person	3.7	1,442	-0.070	0.107	-0.279	0.139	0.513	0.000	-0.194	0.105	-0.399,	0.012	0.065	0.000
Asian/Pacific Islander	1.7	666	0.588	0.154	0.285	0.89	0.000	0.000	-0.165	0.152	-0.462,	0.133	0.278	0.000
American Indian/Other Race/Multiracial	1.8	715	-0.200	0.154	-0.502	0.102	0.194	0.000	-0.519	0.151	-0.816,	-0.223	0.001	0.000
Hispanic/Spanish	3.2	1,226	0.280	0.119	0.048	0.513	0.018	0.000	-0.043	0.117	-0.272,	0.185	0.711	0.000
Model R^2					0.121						0.187			

[1] Percent and number of respondents of modeled sample (*N*=38,760) in each category.

[2] Effect size is the squared semi-partial correlation coefficient of each variable in the model, with all variables in the model. The variable female was coded as 1 for females and -1 for males. Divorced/separated was coded as 1 and not divorced/separated was coded as -1. Never married was coded as 1 and not never married was coded as -1. Widowed was coded as 1 and not widowed was coded as -1 (reference group = married). Black person was coded as 1 and not black person was coded as –1; Asian/Pacific Islander was coded as 1 and not Asian/Pacific Islander was coded as –1; American Indian/Other Race/Multiracial was coded as 1 and not American Indian/Other Race/Multiracial was coded as -1; Hispanic/Spanish was coded as 1 and not Hispanic/Spanish was coded as -1; (reference group=white persons).

NOTES: *N*=48,655. SE is standard error. PCS is physical component summary. MCS is mental component summary.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

The following variables met the effect size criterion (0.5 percent, or 0.005) for the change in PCS scores: arthritis of the hip/knee diagnosed before baseline (0.012) and newly diagnosed (0.010); arthritis of the hand/wrist diagnosed before baseline (0.005); emphysema/asthma/chronic obstructive pulmonary disease (COPD) diagnosed before baseline (0.007); newly diagnosed sciatica (0.007); the number of conditions diagnosed before baseline (0.030); and the number of newly diagnosed conditions (0.036). All three depression-screening questions met the effect size criterion for the change in MCS scores (0.010, 0.007, and 0.010, respectively), as well as the number of conditions diagnosed before baseline (0.007), and the number of newly diagnosed conditions between baseline and followup (0.012). (Data not presented.)

Table 4 presents the results of the final regression model for the 2-year PCS change score. This model accounts for 19 percent of the variance in PCS change scores. PCS scores at baseline explained approximately 16 percent of the variance (parameter estimate = -0.378; effect size = 0.163) in 2-year PCS change scores, indicating that a beneficiary's score at baseline was a strong predictor of how much the PCS score would change over 2 years.

The only demographic variable that met the effect size criterion was age (0.7 percent of the variance in PCS change scores; parameter estimate = -0.136), indicating that older age was associated with a decrease in PCS change scores. Arthritis of the hip/knee that was diagnosed before baseline and newly diagnosed arthritis of the hip/knee each explained 1.4 percent of the variance in PCS change scores (parameter estimates of -2.691 and -3.386, respectively). Emphysema/asthma/COPD diagnosed before baseline explained approximately 0.8 percent of the variance (parameter estimate = -2.674). Newly diagnosed sciatica explained 0.6 percent of the variance with a parameter estimate of -2.304. The sum of the remaining nine conditions before baseline explained 0.9 percent of the variance in PCS change scores, and the number of other newly diagnosed conditions explained 1.5 percent of the variance. Both parameter estimates were negative (-0.715 and -1.547, respectively), indicating that increased numbers of conditions diagnosed before baseline, as well as newly diagnosed conditions, were associated with a decline in PCS change scores.

The final model was tested for robustness using the multiple imputation of missing data procedure (Table 4). Using the median value of five imputations, the R^2 was 0.197 (median values were also used for effect sizes), which is a very small difference (0.007) in the variance from the final model. These results indicated that observations with missing data did not differ substantially from observations without missing data.

Due to the lower PCS mean scores, a higher mean number of chronic conditions, and more impaired ADLs for the respondents excluded from the cohort I analytic sample, regression analyses were conducted on this sample to determine if the conclusions for the cohort I analytic sample showed the same pattern as beneficiaries excluded from this sample. Table 5 indicates that most of the same predictors emerged, indicating that the results are very robust.

The MCS change score model accounted for 21.8 percent of the variance in MCS change scores (Table 6). The largest contributor to the R^2 was the MCS score at baseline (17.6 percent of variance explained; parameter estimate = -0.518). There were two additional risk factors that met the

Table 4

Prediction of 2-Year PCS Change Score from Baseline PCS Plus Demographic Variables and Selected Risk Factor Variables Using the Cohort I Analytic Sample

	Final Regression Model (*N*=26,601)						Multiple Imputation of Missing Data (*N*=48,655)					
Variable	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]
Intercept	25.733	0.802	24.161	27.305	<0.001	—	26.382	0.592	25.222	27.542	<0.001	—
Baseline PCS Score	-0.378	0.005	-0.388	-0.368	<0.001	0.163	-0.385	0.004	-0.393	-0.377	<0.001	0.171
Demographics												
Age in Years	-0.136	0.009	-0.153	-0.118	<0.001	0.007	-0.131	0.007	-0.144	-0.119	<0.001	0.007
Educational Level	0.226	0.040	0.147	0.305	<0.001	0.001	0.183	0.031	0.122	0.244	<0.001	0.001
Annual Household Income	0.223	0.033	0.159	0.287	<0.001	0.001	0.263	0.026	0.212	0.315	<0.001	0.002
Female	-0.097	0.050	-0.196	0.001	0.052	0.000	-0.098	0.038	-0.172	-0.023	0.010	0.000
Divorced/Separated	-0.031	0.082	-0.191	0.129	0.701	0.000	0.083	0.063	-0.041	0.207	0.188	0.000
Never Married	-0.092	0.138	-0.363	0.180	0.508	0.000	0.029	0.107	-0.181	0.239	0.789	0.000
Widowed	-0.045	0.062	-0.166	0.076	0.466	0.000	0.032	0.046	-0.058	0.121	0.490	0.000
Black Person	-0.180	0.128	-0.431	0.070	0.158	0.000	0.052	0.087	-0.118	0.223	0.549	0.000
Asian/Pacific Islander	0.178	0.169	-0.153	0.510	0.292	0.000	0.227	0.133	-0.034	0.487	0.088	0.000
American Indian/Other Race/Multiracial	-0.279	0.181	-0.634	0.076	0.124	0.000	-0.041	0.129	-0.294	0.211	0.747	0.000
Hispanic/Spanish	0.150	0.137	-0.118	0.418	0.273	0.000	0.153	0.096	-0.036	0.342	0.113	0.000
Chronic Conditions[2]												
Arthritis of the Hip/Knee Diagnosed Before Baseline	-2.691	0.126	-2.938	-2.444	<0.001	0.014	-2.394	0.093	-2.576	-2.211	<0.001	0.011
Arthritis of the Hip/Knee Newly Diagnosed	-3.386	0.159	-3.697	-3.075	<0.001	0.014	-3.102	0.123	-3.343	-2.861	<0.001	0.011
Arthritis of the Hand/Wrist Diagnosed Before Baseline	-0.621	0.126	-0.868	-0.375	<0.001	0.001	-0.606	0.095	-0.793	-0.418	<0.001	0.001
Arthritis of the Hand/Wrist Newly Diagnosed	-1.020	0.161	-1.335	-0.705	<0.001	0.001	-0.945	0.132	-1.206	-0.684	<0.001	0.001
Emphysema/Asthma/COPD Diagnosed Before Baseline	-2.674	0.164	-2.996	-2.352	<0.001	0.008	-2.449	0.127	-2.700	-2.199	<0.001	0.007
Emphysema/Asthma/COPD Newly Diagnosed	-2.698	0.251	-3.189	-2.207	<0.001	0.004	-2.813	0.189	-3.183	-2.443	<0.001	0.004
Sciatica Diagnosed Before Baseline	-1.440	0.140	-1.715	-1.166	<0.001	0.003	-1.370	0.103	-1.572	-1.167	<0.001	0.003
Sciatica Newly Diagnosed	-2.304	0.167	-2.630	-1.977	<0.001	0.006	-2.340	0.137	-2.611	-2.070	<0.001	0.006
Number of All Other Conditions Diagnosed Before Baseline[3]	-0.715	0.042	-0.797	-0.632	<0.001	0.009	-0.730	0.037	-0.803	-0.656	<0.001	0.009
Number of All Other Conditions Newly Diagnosed Between Baseline and Followup[4]	-1.547	0.071	-1.686	-1.409	<0.001	0.015	-1.520	0.059	-1.637	-1.403	<0.001	0.014
Model R^2				0.19						0.197		

[1] Effect size is the squared semi-partial correlation coefficient of each variable in the model, with all of the variables in the model.

[2] Each chronic condition was divided into three groups: diagnosed before baseline, newly diagnosed, and no disease. To represent these three categories, two dummy coded variables were created, with the no disease group as the reference group (coded as 0). For consistency and to maintain the no disease group as the reference group for each disease, both dummy coded variables were included in the final model, even if only one of the two met the effect size selection criterion.

[3] The number of all other conditions diagnosed before baseline is the sum of the remaining nine conditions not included individually in the model.

[4] The number of all conditions newly diagnosed between baseline and followup is the sum of the remaining nine conditions not included individually in the model.

NOTES: SE is standard error. PCS is physical component summary. COPD is chronic obstructive pulmonary disease.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

effect size criterion for a decreased MCS score. The first was the depression-screening question, "Have you ever had 2 years or more in your life when you felt depressed or sad most days, even if you felt okay sometimes?" (0.5 percent variance explained; parameter estimate = -2.363) and the second was the number of newly diagnosed conditions an individual had (1.0 percent variance explained; parameter estimate = -0.959). To assess the impact of observations with missing data being omitted from the final model, missing values were imputed and the results were compared with the final model (Table 6). The predictors in the multiple imputation model are the same as those in the final model, indicating that the results are quite robust. The same pattern of results was found for respondents excluded from the cohort I analytic sample (Table 7).

DISCUSSION

Two conclusions can be drawn from these analyses. First, the results of the regression analyses provide evidence that the predictors of 2-year change scores are similar for respondents excluded from the cohort I analytic sample (strict exclusion criteria) and the analytic sample. Hence, findings are robust in spite of the strict exclusion criteria imposed on the study sample. The largest declines in PCS scores are associated with arthritis of the hip/knee, sciatica, and emphysema/asthma/COPD. This conclusion is consistent with other findings (Centers for Disease Control and Prevention, 2002). The current findings also indicate that newly diagnosed chronic conditions between baseline and followup are associated with PCS and MCS score declines; risk for depression is also associated with MCS score decline.

However, it is also important to note what was not found in these results. The baseline PCS and MCS scores explained most of the variance in the regression models (PCS baseline score explained 16.3 percent, total model R^2 is 19 percent; MCS baseline score explained 17.6 percent, total model R^2 is 21.8 percent). Chronic conditions, smoking status, impaired ADLs, and risk for depression account for very little variance; the majority of the variance is still unexplained. The literature indicates that social and psychological predictors may be very important to consider when assessing physical and mental health status. In a 6-year followup of 7,000 respondents in the Longitudinal Study of Aging, Seeman and Chen (2002) found that social interactions had independent positive effects on functional decline. Additionally, females who did not comply or adhere to screening guidelines for breast cancer also reported less social support (Katapodi, Facione, Miaskowski et al., 2002).

A second conclusion from these results involves the demographic and health status differences between the results for beneficiaries included in the final sample and the deceased group. There are small, medium, and large effects for demographics and health status between the deceased group and the respondents excluded from the cohort I analytic sample, which indicates that beneficiaries in the deceased group are different from both the cohort I analytic sample and the respondents excluded from the cohort I analytic sample. Based on the demographic results, it is evident that the deceased group is considerably less healthy, less educated, had a lower household income, were less likely to own their own home, were more likely to be on Medicaid; beneficiaries had a greater number of impaired ADLs, and had more chronic conditions than the other groups. Additionally, the deceased group was slightly older than the other groups (mean age of 77.6 versus mean ages ranging

Table 5

Prediction of 2-Year PCS Change Score from Baseline PCS Plus Demographic Variables and Selected Risk Factor Variables Using Respondents Excluded from Cohort I Analytic Sample

	Final Regression Model (*N*=8,227)						Multiple Imputation of Missing Data (*N*=27,865)					
Variable	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]
Intercept	17.629	0.882	15.900	19.358	<0.001	—	19.363	0.620	18.113	20.613	<0.001	—
Baseline PCS Score	-0.394	0.009	-0.412	-0.377	<0.001	0.185	-0.427	0.005	-0.438	-0.417	<0.001	0.206
Demographics												
Age in Years	-0.021	0.010	-0.040	-0.001	0.035	0.000	-0.025	0.007	-0.038	-0.012	<0.001	0.000
Educational Level	-0.032	0.077	-0.184	0.119	0.676	0.000	0.005	0.048	-0.090	0.100	0.922	0.000
Annual Household Income	0.134	0.067	0.003	0.266	0.046	0.000	0.158	0.055	0.042	0.275	0.011	0.000
Female	-0.122	0.101	-0.321	0.076	0.227	0.000	-0.030	0.090	-0.228	0.168	0.746	0.000
Divorced/Separated	-0.322	0.162	-0.641	-0.004	0.047	0.000	-0.348	0.096	-0.537	-0.160	<0.001	0.000
Never Married	-0.314	0.236	-0.777	0.149	0.184	0.000	-0.234	0.148	-0.526	0.058	0.116	0.000
Widowed	-0.126	0.127	-0.375	0.124	0.323	0.000	-0.300	0.103	-0.524	-0.076	0.013	0.000
Black	0.475	0.181	0.120	0.829	0.009	0.001	0.248	0.129	-0.027	0.522	0.074	0.000
Asian/Pacific Islander	0.673	0.266	0.152	1.195	0.011	0.001	0.480	0.192	0.095	0.866	0.016	0.000
American Indian/Other Race/Multiracial	-0.173	0.240	-0.644	0.299	0.473	0.000	0.207	0.152	-0.098	0.512	0.179	0.000
Hispanic/Spanish	0.250	0.200	-0.141	0.642	0.210	0.000	-0.011	0.132	-0.282	0.260	0.937	0.000
Chronic Conditions[2]												
Arthritis of the Hip/Knee Diagnosed Before Baseline	-1.983	0.265	-2.503	-1.463	<0.001	0.005	-1.910	0.152	-2.210	-1.609	<0.001	0.005
Arthritis of the Hip/Knee Newly Diagnosed	-3.132	0.300	-3.720	-2.544	<0.001	0.010	-2.852	0.180	-3.208	-2.496	<0.001	0.008
Arthritis of the Hand/Wrist Diagnosed Before Baseline	-0.714	0.263	-1.228	-0.199	0.007	0.001	-0.581	0.161	-0.905	-0.257	<0.001	0.000
Arthritis of the Hand/Wrist Newly Diagnosed	-0.991	0.305	-1.589	-0.393	0.001	0.001	-1.068	0.241	-1.587	-0.549	<0.001	0.001
Emphysema/ Asthma/COPD Diagnosed Before Baseline	-1.780	0.307	-2.383	-1.178	<0.001	0.003	-2.088	0.182	-2.445	-1.731	<0.001	0.004
Emphysema/ Asthma/COPD Newly Diagnosed	-2.407	0.433	-3.255	-1.559	<0.001	0.003	-2.183	0.256	-2.686	-1.679	<0.001	0.002
Sciatica Diagnosed Before Baseline	-1.209	0.279	-1.757	-0.661	<0.001	0.002	-1.445	0.164	-1.769	-1.121	<0.001	0.003
Sciatica Newly Diagnosed	-2.072	0.306	-2.671	-1.472	<0.001	0.004	-2.205	0.212	-2.642	-1.769	<0.001	0.005
Number of All Other Conditions Diagnosed Before Baseline[3]	-0.622	0.077	-0.772	-0.471	<0.001	0.006	-0.807	0.063	-0.942	-0.673	<0.001	0.009
Number of All Other Conditions Newly Diagnosed Between Baseline and Followup[4]	-1.665	0.111	-1.883	-1.446	<0.001	0.021	-1.498	0.082	-1.669	-1.328	<0.001	0.015
Model R^2			0.239						0.243			

[1] Effect size is the squared semi-partial correlation coefficient of each variable in the model, when all variables are entered into the model.

[2] Each chronic condition was divided into three groups: diagnosed before baseline, newly diagnosed, and no disease. To represent these three categories, two dummy coded variables were created, with the no disease group as the reference group (coded as 0).

[3] The number of all other conditions diagnosed before baseline is the sum of the remaining nine conditions not included individually in the model.

[4] The number of all conditions newly diagnosed between baseline and followup is the sum of the remaining nine conditions not included individually in the model.

NOTES: SE is standard error. PCS is physical component summary. COPD is chronic obstructive pulmonary disease.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

Table 6

Prediction of 2-Year MCS Change Score from Baseline MCS Plus Demographic Variables and Selected Risk Factor Variables Using the Cohort I Analytic Sample

	Final Regression Model (*N*=33,034)						Multiple Imputation of Missing Data (*N*=48,655)					
Variable	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]
Intercept	32.485	0.740	31.034	33.937	<0.001	—	32.846	0.615	31.641	34.051	<0.001	—
Baseline MCS Score	-0.518	0.006	-0.530	-0.507	<0.001	0.176	-0.525	0.005	-0.534	-0.515	<0.001	0.180
Demographics												
Age in Years	-0.074	0.008	-0.089	-0.058	<0.001	0.002	-0.075	0.006	-0.088	-0.063	<0.001	0.002
Educational Level	0.272	0.036	0.201	0.343	<0.001	0.001	0.283	0.031	0.222	0.344	<0.001	0.001
Annual Household Income	0.227	0.029	0.169	0.284	<0.001	0.001	0.224	0.027	0.170	0.278	<0.001	0.001
Female	-0.019	0.044	-0.106	0.067	0.606	0.000	-0.021	0.038	-0.095	0.053	0.576	0.000
Divorced/Separated	0.259	0.073	0.116	0.403	<0.001	0.000	0.162	0.064	0.036	0.287	0.012	0.000
Never Married	0.155	0.125	-0.091	0.400	0.217	0.000	0.278	0.107	0.069	0.488	0.009	0.000
Widowed	0.481	0.055	0.373	0.590	<0.001	0.002	0.485	0.046	0.394	0.576	<0.001	0.002
Black Person	-0.039	0.114	-0.263	0.184	0.730	0.000	-0.135	0.086	-0.304	0.034	0.118	0.000
Asian/Pacific Islander	-0.352	0.154	-0.653	-0.050	0.022	0.000	-0.311	0.133	-0.572	-0.050	0.020	0.000
American Indian/Other Race/Multiracial	-0.409	0.162	-0.726	-0.093	0.011	0.000	-0.421	0.129	-0.675	-0.168	0.001	0.000
Hispanic/Spanish	-0.076	0.122	-0.315	0.164	0.535	0.000	-0.099	0.097	-0.288	0.091	0.307	0.000
Depression-Screening Questions[2]												
Sad/Blue for 2 Weeks	-1.757	0.152	-2.054	-1.460	<0.001	0.003	-1.721	0.126	-1.968	-1.474	<0.001	0.003
Depressed in Past Year	-0.933	0.202	-1.329	-0.537	<0.001	0.001	-1.415	0.169	-1.747	-1.084	<0.001	0.001
Depressed 2 or More Years	-2.363	0.161	-2.679	-2.047	<0.001	0.005	-2.201	0.132	-2.460	-1.943	<0.001	0.005
Chronic Conditions												
Number of All Conditions Diagnosed Before Baseline	-0.322	0.026	-0.373	-0.270	<0.001	0.004	-0.351	0.027	-0.406	-0.296	<0.001	0.004
Number of All Conditions Newly Diagnosed Between Baseline and Followup	-0.959	0.046	-1.049	-0.870	<0.001	0.010	-0.978	0.042	-1.061	-0.894	<0.001	0.01
Model R^2			0.218						0.219			

[1] Effect size is the squared semi-partial correlation coefficient of each variable in the model, with all variables entered into model.

[2] Each depression-screening question was coded as 1 if the question was positively endorsed and as 0 if negatively endorsed. Smoking status was coded as non-smoker, current smoker, and ex-smoker; non-smoker = reference group.

NOTES: SE is standard error. MCS is mental component summary.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

Table 7

Prediction of 2-Year MCS Change Score from Baseline MCS Plus Demographic Variables and Selected Risk Factor Variables Using Respondents Excluded from the Cohort I Analytic Sample

	Final Regression Model (*N*=10,959)						Multiple Imputation of Missing Data (*N*=27,865)					
Variable	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]	Parameter Estimate	SE	95% Confidence Interval		*p* Value	Effect Size[1]
Intercept	29.566	1.018	27.571	31.561	<0.001	—	28.986	0.817	27.320	30.651	<0.001	—
Baseline MCS Score	-0.579	0.011	-0.600	-0.557	<0.001	0.192	-0.563	0.008	-0.580	-0.546	<0.001	0.187
Demographics												
Age in Years	-0.006	0.010	-0.025	0.013	0.532	0.000	-0.011	0.009	-0.028	0.007	0.221	0.000
Educational Level	0.155	0.077	0.005	0.306	0.043	0.000	0.164	0.052	0.061	0.266	0.002	0.000
Annual Household Income	0.229	0.067	0.098	0.360	<0.001	0.001	0.337	0.046	0.245	0.428	<0.001	0.002
Female	-0.047	0.098	-0.240	0.146	0.631	0.000	0.006	0.098	-0.207	0.219	0.952	0.000
Divorced/Separated	-0.306	0.164	-0.627	0.015	0.062	0.000	-0.100	0.124	-0.349	0.148	0.422	0.000
Never Married	-0.122	0.246	-0.603	0.360	0.621	0.000	-0.146	0.215	-0.602	0.311	0.508	0.000
Widowed	0.303	0.126	0.056	0.550	0.016	0.000	0.296	0.088	0.121	0.471	0.001	0.000
Black Person	0.060	0.180	-0.292	0.413	0.737	0.000	0.097	0.111	-0.121	0.316	0.380	0.000
Asian/Pacific Islander	-0.309	0.269	-0.835	0.218	0.251	0.000	0.122	0.228	-0.341	0.586	0.595	0.000
American Indian/Other Race/Multiracial	-0.104	0.234	-0.561	0.354	0.658	0.000	-0.110	0.160	-0.427	0.207	0.493	0.000
Hispanic/Spanish	0.162	0.196	-0.222	0.545	0.410	0.000	-0.068	0.141	-0.353	0.217	0.633	0.000
Depression-Screening Questions												
Sad/Blue for 2 Weeks	-1.950	0.293	-2.525	-1.375	<0.001	0.003	-1.971	0.215	-2.405	-1.537	<0.001	0.003
Depressed in Past Year	-2.180	0.345	-2.857	-1.504	<0.001	0.003	-1.646	0.346	-2.419	-0.874	<0.001	0.002
Depressed 2 or More Years	-2.373	0.292	-2.945	-1.801	<0.001	0.005	-1.925	0.280	-2.541	-1.310	<0.001	0.003
Chronic Conditions												
Number of All Conditions Diagnosed Before Baseline	-0.465	0.053	-0.568	-0.361	<0.001	0.005	-0.491	0.045	-0.584	-0.390	<0.001	0.006
Number of All Conditions Newly Diagnosed Between Baseline and Followup	-1.122	0.079	-1.276	-0.968	<0.001	0.014	-1.143	0.054	-1.248	-1.038	<0.001	0.013
Model R^2	0.250						0.237					

[1] Effect size is the squared semi-partial correlation coefficient of each variable in the model, with all variables entered into model.

NOTES: SE is standard error. MCS is mental component summary.

SOURCE: Medicare Health Outcomes Survey Cohort I Baseline, 1998 and Cohort I Followup, 2000.

from 72 to 73). There is a 4.6 mean age difference between the cohort I analytic sample and the deceased at followup group; however, there is a 10.7 PCS mean score difference between the deceased group (32.5) and the cohort I analytic sample (43.2). The substantially lower baseline PCS score for the deceased group, who are only 4.6 years older than the cohort I analytic sample, is worth noting. Had this group not been lost from the study due to death, the findings may have been different. This is an important caveat for the current study.

CONCLUSIONS

Predictors of 2-year physical and mental health decline for managed care beneficiaries are robust, but account for very small amounts of variance; PCS/MCS summary scores, risk factors, and demographic variables explained very little in health status decline. The chronic conditions that were associated with the greatest physical health decline however, were arthritis, sciatica, and pulmonary diseases. Beneficiaries with multiple chronic conditions and risk for depression show the most mental health decline. This study suggests that M+C plan administrators should target beneficiaries with these conditions for interventions designed to maintain the health status of their senior members. Wagner's (2001) chronic care model provides a framework for designing appropriate interventions. This model incorporates methods for improving health systems at the community, organization, practice, and patient levels. The current study identifies the beneficiary subgroups that are most likely to benefit from implementation of the chronic care model.

ACKNOWLEDGMENTS

The authors acknowledge Laura Giordano for acquisition of funding; David Drachman for critical review of this article; Susan Grace, Tim Laios, Fen Fen Li, and Rajesh Shrestha for generating the data; and Barbara Mayl for editing. We also thank Lawrence J. Shapiro, M.D., Herb S. Rigberg, M.D., Mary Fermazin, M.D., and Carter Marshall, M.D., for their comments on earlier drafts, and Robert Washam for programming.

REFERENCES

Allison, P.D.: *Missing Data: Quantitative Applications in the Social Sciences*. Sage Publications. Thousand Oaks, CA. 2001.

Burnam, M.A., Wells, K.B., Leake, B., and Landsverk, J.: Development of a Brief Screening Instrument for Detecting Depressive Disorders. *Medical Care* 26(8):775-789, August 1988.

Centers for Disease Control and Prevention: *Death Rates for Major Chronic Diseases, by Race and Ethnicity, United States*, 1998. Internet address: http://www.cdc.gov/nccdphp/upo/overview.htm. (Accessed 2004.)

Centers for Disease Control and Prevention: Prevalence of Self-Reported Arthritis or Chronic Joint Symptoms Among Adults--United States, 2001. *Morbidity and Mortality Weekly Report* 51(42):948. October 2002. Internet address: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5142a2.htm. (Accessed 2004.)

Cohen, J.: *Statistical Power Analysis for the Behavioral Sciences* (2nd ed). Lawrence Erlbaum. Hillsdale, NJ. 1988.

Cohen, J., Cohen, P., West, S.G., and Aiken, L.S.: *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (3rd ed). Lawrence Erlbaum Associates. Mahwah, NJ. 2003.

Ellis, B.H., Bannister, W., Cox, J.C., et al.: Utilization of the Propensity Scoring Method: An Exploratory Comparison of Proxy to Self-Respondents in the Medicare Health Outcomes Survey. *Health and Quality of Life Outcomes* 1(1) 47, September 2003.

Havranek, E.P., Masoudi, F.A., Westfall, K.A., et al.: Spectrum of Heart Failure in Older Patients: Results from the National Heart Failure Project. *American Heart Journal* 143(3):412-417, March 2002.

Karter, A.J., Ferrara, A., Liu, J.Y., et al.: Ethnic Disparities in Diabetic Complications in an Insured Population. *Journal of the American Medical Association* 287(19):2519-2527, May 2002.

Katapodi, M.C., Facione, N.C., Miaskowski, et al.: The Influence of Social Support on Breast Cancer Screening in a Multicultural Community Sample. *Oncology Nursing Forum* 29(5):845-852, June 2002.

Menard, S.: *Applied Logistic Regression Analysis. Sage Series: Quantitative Applications in the Social Sciences*. Sage Publications. Thousand Oaks, CA. 1995.

National Committee for Quality Assurance: *HEDIS® 2000, Volume 6. Specifications for the Medicare Health Outcomes Survey*. NCQA Publication. Washington, DC. 2000.

National Institute of Mental Health.: *Older Adults: Depression and Suicide Facts, 2003*. Internet address: http://www.nimh.nih.gov/publicat/elderlydepsuicide.cfm (Accessed 2003).

Rathore, S.S., Berger, A.K., Weinfurt, K.P., et al.: Race, Sex, Poverty, and the Medical Treatment of Acute Myocardial Infarction in the Elderly. *Circulation* 102(6):642-648, August 2000.

Rubin, D.B.: *Multiple Imputations for Nonresponse in Surveys*. John Wiley & Sons, Inc. New York. 1987.

SAS Institute Inc.: SAS® *Language Reference, Version 8. 2*. SAS Institute Inc. Cary, NC. 1990.

SAS Institute Inc.: *SAS® Version 8.2*. SAS Institute Inc. Cary, NC. 2002.

Schneider, E.C., Zaslavsky, A.M., and Epstein, A.M.: Racial Disparities in the Quality of Care for Enrollees in Medicare Managed Care. *Journal of the American Medical Association* 287(10):1288-1294, March 2002.

Seeman, T., and Chen, X.: Risk and Protective Factors for Physical Functioning in Older Adults with and without Chronic Conditions: MacArthur Studies of Successful Aging. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 57(3):135-144, May 2002.

Sinharay, S., Stern, H.S., and Russell, D.: The Use of Multiple Imputation for the Analysis of Missing Data. *Psychological Methods* 6(4):317-329, December 2001.

Stuck, A.E., Walthert, J.M., Nikolaus, T., et al.: Risk Factors for Functional Status Decline in Community Living Elderly People: A Systematic Literature Review. *Social Science and Medicine* 48(4):445-469, February 1999.

U.S. Department of Health and Human Services: Mental Health: *A Report of the Surgeon General*. Washington, DC, 1999.

Wagner, E.H., Glasgow, R.E., Davis, C., et al.: Quality Improvement in Chronic Illness Care: A Collaborative Approach. *Joint Commission Journal on Quality Improvement* 27(2):63-80, February 2001.

Ware, J.E.: *SF-36® Health Survey: Manual and Interpretation Guide*. The Health Institute. Boston, MA. 1993.

Ware, J.E., and Sherbourne, C.D.: The MOS 36-Item Short-Form Health Survey (SF-36®). *Medical Care* 30(6):473-483, June 1992.

Ware, J.E., Snow, K.K., Kosinski, M., and Gandek B.: *SF-36 Physical and Mental Health Summary Scales: A User's Manual*. The Health Institute, New England Medical Center. Boston, MA. 1994.

West, S.G.: Approaches to Missing Data in Psychological Research: Introduction to the Special Section. *Psychological Methods* 6(4):315-316, December 2001.

Yip, J.Y., Wilber, K.H., Myrtle, R.C., and Grazman, D.N.: Comparison of Older Adult Subject and Proxy Responses on the SF-36 Health-Related Quality of Life Instrument. *Aging and Mental Health* 5(2):136-142, May 2001.

Reprint Requests: Beth Hartman Ellis, Ph.D., Health Services Advisory Group, Inc., 1600 E. Northern Avenue, Phoenix, AZ 85020. E-mail: bellis@azqio.sdps.org