



# **MEDICARE HEALTH OUTCOMES SURVEY**

## **TASK 5.40A**

### **REPORT ON A LONGITUDINAL ASSESSMENT OF CHANGE IN HEALTH STATUS AND THE PREDICTION OF HEALTH UTILIZATION, HEALTH EXPENDITURES, AND EXPERIENCES WITH CARE FOR BENEFICIARIES IN MEDICARE MANAGED CARE**

## **FINAL REPORT**

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## EXECUTIVE SUMMARY

Since the elderly population in America is increasing rapidly, it is important to understand how changes in beneficiary health status impact health care utilization, expenditures, and patient experiences with care. This report explores longitudinal change in beneficiary physical and mental health, bodily pain, and impaired Activities of Daily Living (ADLs) in 2002, and relates these health measures to health care usage and expenditures in 2003. Additionally, the report examines whether changes in health status from 2000-2002 relate to patient experience with care ratings in 2002.

One of the original goals of this study was to link managed care beneficiaries who participated in the Medicare Health Outcomes Survey (HOS) and the Medicare Current Beneficiary Survey (MCBS), so that health status, as measured by the longitudinal Medicare HOS, could be linked to expenditures and utilization from the MCBS. However, due to the very low number of beneficiaries who could be matched between surveys, an alternative analytic approach was utilized. The alternative analytic plan included two steps. First, we developed a predictive model to estimate changes in physical and mental health, bodily pain, and impaired ADLs that would have been observed among MCBS beneficiaries from their responses to two health questions as well as other health and demographic characteristics that are also in the Medicare HOS. The two health questions that are common to the HOS and MCBS are:

- Compared to one year ago, how would you rate your health in general now?  
Response options: Much better than one year ago, somewhat better now than one year ago, about the same as one year ago, somewhat worse now than one year ago, or much worse now than one year ago
- In general, compared to other people your age, would you say that your health is:  
Response options: Excellent, very good, good, fair, or poor

Second, we used the resulting coefficients to predict changes in physical and mental health, bodily pain, and impaired ADLs for 714 managed care respondents who were matched from the MCBS 2002 and 2003 files. Multivariate generalized linear models were used to examine the relationship between predicted changes in health status and total health expenditures, pharmacy expenditures, hospital inpatient visits, hospital outpatient visits, and medical provider visits. Significant relationships were found for predicted physical health change and total expenditures, pharmacy expenditures, hospital inpatient visits, hospital outpatient visits, and medical provider visits. After adjusting for covariates, a one-point increase in physical health, as measured by the physical component summary (PCS) score was associated with a:

- 6 percent lower total health care expenditures
- 5 percent lower pharmacy expenditures
- 9 percent lower rate of hospital inpatient visits
- 5 percent lower rate of hospital outpatient visits
- 4 percent lower rate of medical provider visits

Changes in mental health status are significantly associated with total health care expenditures, pharmacy expenditures, rates of hospital inpatient visits, and medical provider visits after adjusting for other covariates. A one-point increase in mental health status, as measured by the mental component summary (MCS) score, was associated with a:

- 7 percent lower total health care expenditures
- 4 percent lower pharmacy expenditures
- 15 percent lower rate of hospital inpatient visits
- 4 percent lower rate of medical provider visits

Decreased bodily pain, as measured by a bodily pain subscale (a one-point decrease) was associated with a 5 percent lower total expenditures, and an 8 percent lower rate of hospital inpatient visits. Predicted changes in ADL limitations are marginally related to total health care expenditures and pharmacy expenditures, and significantly related to the rate of medical provider visits. An improvement in any one of the ADLs was associated with a:

- 12 percent lower total health care expenditures
- 11 percent lower pharmacy expenditures
- 14 percent lower rate of medical provider visits

To assess the impact of longitudinal change in physical and mental health status, bodily pain, and impaired ADLs on experience of care ratings, respondents from the Medicare HOS 2000-2002 Cohort 3 and respondents from the 2002 Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys were linked by health information numbers. The resulting 3,603 respondents were utilized in multivariate logistic regression models that assessed the impact of changes in the health status measures on experiences with care ratings for doctor/nurse, health care, and health plans. Separate multivariate logistic regression models were fit for each of the global ratings of care. Additionally, separate analyses were conducted to determine whether the effect of change in health status on member experiences with care differed depending upon whether baseline or follow-up health status was controlled for in the analysis.

When controlling for health status at baseline (2000) and other covariates, changes in health status between 2000 and 2002 were significantly and positively associated with beneficiaries' experiences with care ratings on a 0-10 scale in 2002. For example, a 1-point increase in PCS scores from 2000 to 2002 was associated with a 1 percent and a 2 percent increase in the odds of beneficiaries providing high (9-10) ratings, relative to low (0-8) ratings for doctor/nurse and overall health care, respectively. However, when controlling for follow-up health status (2002) and other covariates, changes in health status were no longer related significantly to 2002 ratings of doctor/nurse or overall health care. The results indicated that beneficiaries with a given level of health status during the follow-up period tend to provide similar ratings of doctor/nurse or overall health care regardless of whether that level of follow-up health status represents an improvement or decline in health status from the baseline period.

In sum, longitudinal changes in health status were found to significantly relate to future health care costs and utilizations. However, given these preliminary findings, the Centers for Medicare & Medicaid Services should validate these results using a large sample of beneficiaries who are exactly matched between the Medicare HOS and the MCBS.

# 1

## INTRODUCTION

This report examines the longitudinal relationship between changes in health status, health expenditures, utilization of services, and experiences of care for beneficiaries in Medicare managed care (Medicare Advantage [MA]). Data are derived from the Medicare Health Outcomes Survey (HOS), the Medicare Consumer Assessment of Healthcare Providers and Systems (CAHPS<sup>® 1</sup>) Managed Care (MA) Survey, and the Medicare Current Beneficiary Survey (MCBS). These surveys provide a unique opportunity for the Centers for Medicare & Medicaid Services (CMS) to understand beneficiaries' reports of health care experiences, as well as health care usage and expenditures over time based on changes in health status. We analyzed health status for managed care beneficiaries by examining changes in physical and mental component summary (PCS, MCS) scores, impaired activities of daily living (ADLs), and bodily pain. The following section of the Introduction briefly summarizes the literature regarding these conceptualizations of health status as they relate to health care expenditures, usage, and experiences of care.

### EXPENDITURES, UTILIZATION, AND HEALTH STATUS

Approximately 40 cents of every health care dollar is spent on people who are 65 years of age or older (RAND, 2006). According to the Agency for Healthcare Research and Quality (AHRQ), the hospital bill for Medicare was approximately \$327 billion in 2003 (2005). Since the elderly population in America is increasing rapidly and costs will be rising, it is important to understand how changes in beneficiary health status impact health care utilization and expenditures.

In a national study of Medicare beneficiaries, higher spending geographic regions had more health care utilization, which was explained by increased physician visits, more frequent tests and procedures, and the increased use of specialists and hospitals (Fisher et al., 2003a). However, more health care does not necessarily mean better health. Fisher et al. (2003b) examined the five-year mortality rate, health outcomes, and experiences of care as they related to costs for a cohort of Medicare Fee-For-Service (FFS) enrollees. Based on different average levels of spending, patients were assigned to a "natural randomized" group. The results indicated that residents of high-spending regions received 60 percent more care, but did not have better health outcomes, higher ratings for experiences of care, or lower mortality (Fisher et al., 2003b). Additionally, a high concentration of specialists was positively associated with higher spending and lower quality of care; states that spent \$1,000 more per beneficiary had beta-blocker usage rates at discharge that were 3.5 percentage points lower and mammography rates that were 2.1 percentage points lower than average use in 2000 (Balcker & Chandra, 2004). Using Health Plan

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Employer Data and Information Set (HEDIS<sup>®</sup>)<sup>2</sup> quality indicators, other research has demonstrated that health care quality was positively associated with access to outpatient care, but negatively associated with inpatient days (Scholle et al., 2005). In an early study, Evashwick et al. (1984) examined predictors of health services usage by the elderly. This research indicated that the factor of beneficiary need was the best single predictor for use of physician services, hospitalizations, ambulatory care, and home care. In an assessment of a single health question in the prediction of expenditures, Bierman et al. (1999) found in age and sex adjusted data, expenditures for beneficiaries in poor health were five times higher than enrollees in excellent health.

Few research studies have examined changes in PCS and MCS scores as they relate to utilization and cost. However, one study did analyze SF-36 change scores in relationship to mortality and hospitalizations. The research, which was based at several veteran medical centers, found a 5-point decrease in baseline PCS scores increased the odds for death and hospitalizations. Though MCS scores were less predictive of outcomes, significant odds ratios were found for each 5-point decrease in these scores for mortality and hospitalizations (Fan et al., 2004).

Functional status as measured by the number of impaired ADLs has been used by CMS to assess expenditures, and is currently used as a frailty adjuster for Programs of All-Inclusive Care for the Elderly (PACE) managed care organizations (Kautter & Pope, 2005). These authors argue that the number of impaired ADLs is "...the most promising functional status measure..." and that diagnosis-based risk adjustment alone does not explain expenditures for the frail elderly. In their analysis of the frailty adjustment model, Kautter and Pope provide evidence that impaired ADLs (in addition to specific diagnoses for each beneficiary) are valid measures of providing payment to MA organizations. Confirmation of increased impairment with higher health care utilization provides more evidence of impaired ADLs serving as a reliable measure for reimbursement.

The majority of the literature on pain targets specific types of pain and the relationship to various outcomes. For example, in a study of utilization and expenditures for osteoporosis related fractures, patients with a fracture had twice the expenditures of the group without fractures (Orsini et al., 2005). Recent research examined the presence of comorbid pain and depression. Using 1996 data from the Health and Retirement Survey, depression and comorbid pain were associated with increased medical expenditures, government insurance, and disability outcomes compared to depression alone (Tian et al., 2005). Almost a decade ago Galiese & Melzack (1997) indicated that there is "...compelling evidence that a significant majority of the elderly experience pain that may interfere with normal functioning. Nonetheless, a significant proportion of these individuals do not receive adequate pain management." These authors also stated that in 1997 chronic pain had only begun to receive serious empirical attention. Hence, the focus in the current study on overall bodily pain is needed. Empirical analysis that provides a longitudinal assessment of overall bodily pain and the relationship to health expenditures and usage is warranted.

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## **EXPERIENCES WITH CARE**

The CAHPS program has produced a wealth of literature on experiences with care for Medicare beneficiaries (e.g., Zaslavsky & Cleary, 2002; Elliott et al., 2001; Zaslavsky et al., 2001; Landon et al., 2001). Generally, this literature on experiences of care has employed cross-sectional designs, because longitudinal data are not available. However, change in health status over time may differentially impact experience of care ratings. For example, in a longitudinal study of factors associated with changes in care experiences, non-elderly patients with improved health status and those with declines in health status were more likely to report an increase in care ratings, compared to respondents who reported no health status change (Newsome et al., 1999). Interesting results were found in a study of health status at hospital admission, health status at discharge, health status change at discharge, and care experiences for elderly patients. This research indicates that patients with similar discharge health status had similar care experience ratings independent of whether the discharge health status was an improvement, a decline, or remained stable based on admission status (Covinsky et al., 1998). These conclusions are also supported in a study on non-elderly patient experiences of care and cholecystectomy; patients were more likely to focus on their present health state than to consider the extent of their improvement (Kane et al., 1997). The current study provides the opportunity to examine CAHPS ratings longitudinally, and should contribute substantive knowledge to understanding how health status affects patients' ratings of care

With the expected increase in Medicare growth as the baby boomer generation ages, this study provides a unique and important opportunity to examine longitudinal changes in health status as these changes relate to health care utilization, expenditures, and experiences with care.

## 2

## METHODOLOGY

### DATA SOURCES

The data utilized in the study were obtained from CMS. The data consisted of self-reported health status measures, self-reported and claims-based health care utilization, and ratings of care, which were derived from three national surveys of Medicare beneficiaries. These surveys were conducted during the years from 2000 to 2003. These three national surveys are:

- Medicare HOS 2000-2002 Cohort 3
- Managed Care CAHPS 2002 Enrollee Survey
- MCBS 2002 and 2003 Cost and Use Data

The following section describes the data sources in more detail.

### MEDICARE HEALTH OUTCOMES SURVEY

Beginning in 1998 and continuing annually, an HOS baseline cohort is created from a random sample of 1,000 members per plan from MA plans 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. The HOS has a longitudinal design, with each cohort having a two-year follow-up remeasurement. Medicare beneficiaries who are continuously enrolled in a given health plan for at least six months are eligible for sampling. Beneficiaries who are institutionalized, nursing home residents, or disabled under age 65 are eligible for inclusion, but those with end stage renal disease (ESRD) are excluded. Beneficiaries are excluded from follow up two years later if they disenrolled from their plan (voluntarily disenrolled), if their plan no longer has a contract in place at the time of follow up (involuntarily disenrolled), or for reason of death. The data collection protocol includes a combination of multiple mailings and telephone follow up over a period of approximately four months. CMS contracts with the National Committee for Quality Assurance (NCQA) to oversee the data collection activities for the Medicare HOS survey.

The 2000-2002 HOS instruments consist of a 36-item health survey, as well as additional demographic and health-related questions. Physical and mental functioning and well-being are measured with the PCS and MCS scores. These scores are calculated using the following scales: general health, mental health, physical functioning, role-emotional, social functioning, role-physical, bodily pain, and vitality. A higher PCS or MCS score reflects better health status. The HOS instrument also contains a general health question, a health transition question, a comparative health question, and questions related to limitations for the ADLs of bathing,

dressings, eating, getting in or out of chairs, walking, and using the toilet. Demographic and other background information in the HOS includes gender, age, race, marital status, education, annual household income, homeowner status, Medicaid enrollment, smoking status, the presence or absence of selected chronic conditions, and other negative health symptoms. The complete data collection protocol can be found in the *HEDIS<sup>®</sup> Volume 6: Specifications for the Medicare Health Outcomes Survey* (NCQA, 2000-2002).

## **CAHPS MANAGED CARE**

The purpose of the CAHPS surveys is to provide a standardized system for the measurement and reporting of health plan enrollees' experiences with the care they receive. In 1995, the AHRQ funded the development of the original CAHPS survey by a consortium of researchers at Harvard Medical School, the Research Triangle Institute International (RTI), RAND, and Westat. In 1997, CMS began collecting CAHPS survey data from managed care enrollees.

The Medicare CAHPS survey instrument produces scores for four global ratings (of health plan, personal physician or nurse, specialists, and care received overall) and six composite measures. The composite measures are sets of questions grouped together to address a single aspect of care (e.g., getting needed care or getting care quickly). The ability of the MA CAHPS to detect plan differences has been supported (Zaslavsky et al., 2003).

The CAHPS questionnaires are cross-sectional and are administered by mail, followed by telephone interviews of beneficiaries who do not respond to the mail questionnaires. For CAHPS managed care, the reporting unit is comprised of the managed care contract. For a contract that covers a wide geographic area with more than 20,000 enrollees, the plan enrollments are further sub-divided by counties, resulting in more than one reporting unit per contract. Within a given reporting unit, a simple random sample of 600 enrollees who had continuous coverage for at least six months and who were not institutionalized at the time of the data collection were selected to participate in the survey.

## **MEDICARE CURRENT BENEFICIARY SURVEY**

The MCBS is a continuous, multi-purpose panel survey of a representative sample of the Medicare population, including both aged and disabled enrollees. Sampling includes groups of counties chosen to represent the entire nation. Beneficiaries are randomly sampled in age strata with an overrepresentation of the disabled and oldest old. Panels are retained for four years of data collection before being retired from the study. The study is sponsored by the CMS. Survey operations are performed through a contract with Westat, Inc.

The MCBS primarily focuses on economic and beneficiary issues; in particular, health care use, expenditures and factors that affect use of care and the beneficiary's ability to pay. As a part of this focus the MCBS collects a variety of information about demographic characteristics, health

status and functioning, access to care, insurance coverage, financial resources and potential family support. The longitudinal design of the MCBS allows analysis of the effects of changes in these factors on patterns of use over time.

Fieldwork for Round 1 began in September 1991 and was completed in December 1991. Subsequent rounds, involving the re-interviewing of the same sample persons or appropriate proxy respondents, begin every four months. Interviews are conducted regardless of whether the sample person resides at home or in a long-term care facility, using the questionnaire version, appropriate to the setting. The community response rate for the first interview is close to 80 percent, with subsequent interviews having a conditional response rate of approximately 95 percent. The response rate for facility interviews is 100 percent (CMS, 2006).

## **ANALYTIC STRATEGY**

The goals of the current study are two-fold. First, the study determines the extent to which longitudinal changes in health status, as defined by changes in the PCS, changes in the MCS, changes in the bodily pain subscale, and changes in the number of ADLs that respondents can perform without limitations from 2000 to 2002, affect 2003 health care costs and utilizations. Health care utilization and costs are defined in the MCBS 2003 Cost and Use documentation as follows:

- Inpatient visits = Inpatient hospital, including emergency room visits that result in an inpatient admission
- Outpatient visits = Outpatient hospital, including emergency room visits that do not result in an inpatient admission
- Medical provider visits = Medical doctor and practitioner visits, diagnostic laboratory and radiology, medical and surgical service, durable medical equipment, and non-durable supplies
- Total health care expenditures = Sum of 11 payer types (Medicare, Medicaid, Medicare HMO, private HMO, Veterans Administration, private health insurance plan that is employer sponsored, private health insurance plan individually purchased, private health insurance plan whose source is unknown, respondent out-of-pocket, other public health plans, uncollected liabilities)
- Pharmacy expenditures = Sum of prescribed medicine expenditures across 11 payer types (as listed above)

Secondly, the study examines whether changes in health status from 2000 to 2002 relate to 2002 enrollees' experience of care as measured by the rating of doctor/nurse, rating of health care, and rating of health plan.

## RELATIONSHIP BETWEEN CHANGES IN HEALTH STATUS AND HEALTH CARE COSTS AND UTILIZATION

The 2002 MCBS survey with 12,697 Medicare respondents was joined to the 2003 MCBS survey with 12,486 respondents by unique member identification number. The study included the respondents who participated in both the 2002 and 2003 surveys, and were continuously enrolled in Medicare managed care plans for at least 11 out of 12 months in each of the two years; age 65 or older without ESRD as of December 31, 2002; lived in the community settings in 2003; did not have a skilled nursing facility (SNF) stay during 2003; were enrolled in Medicare for the entire year of 2003; and were still alive as of December 31, 2003. As a result, there were 718 Medicare *managed care* respondents who met the study criteria. Four of the 718 respondents were excluded due to missing data on selected study variables. As a result, 714 *managed care* respondents from the MCBS surveys were included in the analysis.

The data on 2003 total health care expenditures, pharmacy expenditures, rates of inpatient visits, outpatient visits, and medical provider visits were obtained from the MCBS survey. Changes in PCS, MCS, the bodily pain subscale scores, and limitations in ADLs from 2000 to 2002 were not available directly as part of the MCBS survey. However, the 2002 MCBS and 2002 HOS surveys contain a number of similarly worded questions and response categories related to a transitional and a comparative health status question, limitations in ADLs, the presence or absence of selected comorbid conditions, census region of residence, Medicaid eligibility status, smoking status, marital status, age, gender, race, and educational level. These measures correlated significantly with health status and were regularly used as covariates in the risk-adjustment of health outcomes in the literature (Iezzoni, 2003). As a result, a predictive model was developed to estimate changes in scores for PCS, MCS, the bodily pain subscale, and limitations in ADLs that would have been observed among MCBS respondents from their responses to a set of these predictor variables found in both the MCBS and HOS surveys. Changes in PCS, MCS, and the bodily pain subscale were defined as the differences between the 2002 follow-up standardized score and the 2000 baseline standardized score. A change in ADLs was defined as the difference in the number of ADLs without limitations between the follow up and the baseline year. The predictor variables included in the model were 2002 responses to:

- Transitional and comparative health questions
- Limitations in the six ADLs of bathing, dressing, eating, getting in or out of chairs, walking, and using the toilet
- The presence or absence of selected comorbid conditions; hypertension, myocardial infarction, angina pectoris or coronary artery disease (CAD), stroke, non-skin cancer, diabetes, emphysema/asthma/chronic obstructive pulmonary disease (COPD)
- Census region of residence
- Medicaid eligibility status
- Smoking status
- Marital status
- Age

- Gender
- Race
- Educational level

The main effects along with all possible two-way interaction effects between the predictor variables were included in the model. Backward stepwise multiple regression was used to exclude from the model the two-way interaction variables that did not contribute significantly to the model at  $p=0.1$  level. Separate models were fitted for each of the four study outcomes. The models were found to explain 9.0 percent, 4.9 percent, 5.2 percent, and 33.0 percent of variances in changes in scores for PCS, MCS, bodily pain, and limitations in ADLs, respectively. The beta coefficients derived from the predictive model based on 51,921 HOS respondents were applied to 714 MCBS managed care respondents to estimate the scores reflecting changes in scores for PCS, MCS, bodily pain, and limitation in ADLs from 2000 to 2002, respectively.

Multivariate generalized linear models were used to examine the relationship between the predicted change scores in health status and 2003 total expenditures, pharmacy expenditures, rates of utilization of hospital inpatient visits, hospital outpatient visits, and medical provider visits among the MCBS managed care respondents who participated in the 2002 and 2003 MCBS surveys, after controlling for differences in age group, gender, race, educational level, marital status, census region of residence, smoking status, Medicaid dual eligibility status, and the presence or absence of selected comorbid conditions. Separate models were fitted for each of the study outcomes and for each of the changes in PCS, MCS, bodily pain, and limitation in ADLs, respectively. Due to the skewed distribution of health care costs, a generalized linear model based on a gamma distribution and a log link function was used to model total health care expenditures and pharmacy expenditures (Blough et al., 1999). A generalized linear model with a negative binomial distribution and a log link function was used to model rates of utilization of inpatient visits, outpatient visits, and medical provider visits (Pedan, 2001). The exponentiation of the generalized linear model parameter associated with predicted changes in PCS, MCS, bodily pain, or limitation of ADLs yielded an adjusted cost ratio or adjusted rate ratio indicating the magnitude of changes in the study outcome variables associated with one-unit change in the predicted PCS, MCS, bodily pain, or limitation in ADLs, after accounting for differences in other covariates. The adjusted cost ratio or adjusted rate ratio for a change in some amount greater than 1 unit e.g. 5 units, is derived by raising the power of the adjusted cost ratio or adjusted rate ratio for a unit change to the power of 5 for  $c=5$  units.

#### **RELATIONSHIP BETWEEN CHANGE IN HEALTH STATUS AND EXPERIENCES WITH CARE**

The 2000 to 2002 HOS surveys contained data on 60,255 respondents who provided sufficient responses to allow the calculation of PCS and MCS scores for 2000 and 2002. The 2002 CAHPS survey contained data on 184,782 managed care beneficiaries. The HOS respondents were joined to the 2002 managed care CAHPS respondents using health identification numbers. The merge resulted in 4,154 records that were matched between the two surveys; 551 records were excluded due to missing data on 2002 follow-up responses for smoking status, gender, education, marital status, limitations in ADLs, and the presence or absence of the following selected comorbid

conditions: hypertension, myocardial infarction, angina pectoris/CAD, stroke, non-skin cancer, diabetes, and emphysema/asthma/COPD. As a result, 3,603 respondents were included in the analysis.

The three global rating questions of personal doctor/nurse, health care, and health plan served as the dependent variables. The rating of specialists was not examined in the study because more than 50 percent of the respondents did not provide responses to this question, primarily due to the skip logic in the survey for this question (Elliott, 2006). The global rating questions of doctor/nurse, health care, and health plan were measured on a 0-10 scale where 0 represents the worst possible and 10 represents the best possible. The response categories of 9-10 and 0-8 were combined to form a binary category of high and low ratings, respectively.

Multivariate logistic regression models were used to examine the relationship between changes in health status as defined by changes in PCS, MCS, the bodily pain subscale scores, and limitation in ADLs, and each of the three experience of care ratings, after controlling for differences in age group, gender, race, educational level, marital status, smoking status, census region of residence, and the presence or absence of selected comorbid conditions observed in 2002. Separate models were fitted for each of the three dependent variables and for each of the changes in PCS, MCS, bodily pain, and limitation in ADLs, respectively. In addition, two separate sets of data analysis were conducted to determine whether the effect of change in health status on member experience of care differed depending upon whether the baseline health status or follow-up health status was controlled for in the analysis. The exponentiation of the logistic regression model parameter associated with predicted changes in PCS, MCS, bodily pain, or limitation of ADLs yielded adjusted odd ratios indicating the magnitude of changes in the odds of having 9-10 experiences with care ratings associated with a one-unit change in the predicted PCS, MCS, bodily pain, or limitation of ADLs, after accounting for differences in other covariates. The adjusted odds ratio for a change in some amount greater than one unit e.g. 5 units, is derived by raising the power of the adjusted odd ratio for a unit change to the power of 5 for  $c=5$  units.



# 3

## RESULTS

### SAMPLE CHARACTERISTICS OF THE 2000-2002 MEDICARE HOS RESPONDENTS

Table 1 presents the distribution of 51,921 respondents who participated in both the 2002 and 2004 HOS surveys by demographic and other study characteristics and their associated mean changes in scores for PCS, MCS, the bodily pain subscale, and limitations in ADLs from 2000 to 2002. The demographic and study characteristics shown in Table 1 are those that were found in the 2002 HOS and MCBS surveys. These characteristics were used as the predictors in developing the models to estimate changes in scores for PCS, MCS, the bodily pain subscale, and limitations in ADLs that would have been observed among the MCBS respondents. These characteristics include:

- Age group
- Gender
- Race
- Educational level
- Marital status
- Smoking status
- Medicaid eligibility status
- Census region of residence
- Responses to a comparative health question (health compared to others of the same age)
- Responses to a transitional health question (health compared to one year ago)
- Limitation in ADLs of bathing, dressing, eating, getting in or out of chairs, walking, and using the toilet
- Presence and absence of; hypertension, myocardial infarction/heart attack, angina pectoris/CAD, stroke, any non-skin cancer, diabetes, and emphysema/asthma/COPD

About one-third (32.5 percent) of the respondents are between 70-74 years of age, 58 percent are female, 90.7 percent are white, 37.2 percent are high school graduates, 57.4 percent are married, and 90.3 percent are non-smokers. Approximately, one-quarter (23.5 percent) of the respondents resided in the Pacific region at the time of the 2002 survey. About 23 percent of the respondents perceive their health as “fair” or “poor” compared to their peers and 22.3 percent perceive their health as ‘somewhat worse’ or ‘much worse’ than a year ago. More than one-third (35.7 percent) of the respondents report having difficulty or inability walking, 28 percent, 13.7 percent, 11.4 percent, 7.8 percent, and 5.3 percent reported having limitations in getting in or out of chairs, bathing, dressing, using the toilet, and eating, respectively. More than half (58.2 percent) of the respondents have hypertension, 18.1 percent, 16.0 percent, 15.6 percent, 13.4 percent, 11.2 percent, and 8.9 percent have diabetes, angina pectoris/CAD, non-skin cancer, emphysema/asthma/COPD, myocardial infarction/heart attack, and stroke, respectively.

Changes in scores for PCS, MCS, the bodily pain subscale, and number of ADL impairments varied by age group, educational level, smoking status, and beneficiaries' responses to the comparative and transitional health questions, limitation in ADLs, and the presence or absence of selected comorbid conditions (Table 1). Beneficiaries with advanced age or a lower level of education, smokers, beneficiaries who indicate their health as "fair" or "poor" compared to others of the same age, or who indicate their health as "somewhat worse" or "much worse" compared to a year ago; beneficiaries who have difficulties in performing any of the six ADLs of bathing, dressing, eating, getting in or out of chairs, walking, and using the toilet; or beneficiaries with hypertension, myocardial infarction/heart attack, angina pectoris/CAD, stroke, any non-skin cancer, diabetes, or emphysema/asthma/COPD have a greater decline in scores for PCS, MCS, the bodily pain subscale, and limitation in ADLs from 2000 to 2002 when compared to younger beneficiaries or those with a higher level of education, non-smokers, beneficiaries who indicate their health was "excellent," "very good," or "good" compared to their peers or who indicate their health was "much better," "somewhat better," or "about the same" compared to one year ago; beneficiaries without limitation in any of the six ADLs, or those without the selected comorbid conditions.

Changes in scores for the PCS, the bodily pain subscale, and number of ADL impairments are similar for males and females. By contrast, males have a greater decrease in MCS scores than do females. Changes in scores for PCS, MCS, and the bodily pain subscale are similar across racial groups and across beneficiaries with or without Medicaid dual eligibility status. However, African Americans report a greater decline in ADL functions when compared to beneficiaries of an unknown race or other racial groups. Beneficiaries with Medicaid dual eligibility also report a greater decline in ADL functions relative to beneficiaries without Medicaid eligibility. Beneficiaries who differ in marital status are not different in scores for PCS change, the bodily pain subscale, or limitations in ADLs. However, beneficiaries who were never married report a smaller decline in MCS scores than do beneficiaries who are married, divorced, separated, or widowed. Lastly, beneficiaries in various census regions are not different in the changes for scores in PCS, MCS, bodily pain, or limitations in ADLs.

### **PREDICTING CHANGES IN PCS, MCS, BODILY PAIN, AND ADLS**

The data from 51,921 HOS respondents on demographic characteristics and the selected study variables shown in Table 1 were incorporated into the predictive models to estimate changes in PCS, MCS, bodily pain, and the number of ADL impairments that would have been observed among the MCBS respondents. Multiple regression analyses were used to model changes in PCS, MCS, bodily pain, or number of ADL impairments as a function of the demographic and study characteristics. Each of the predictor variables and their response categories along with all possible two-way interaction effects between the variables were entered into the model as dummy indicator variables. A backward selection multiple regression method was used to exclude the two-way interaction variables that did not contribute significantly to the model at the  $p=0.1$  level. Separate models were developed for each of the four measures of changes in health status.

Significant relationships were found between changes in health status and a set of the predictor variables. The models explained 9.0 percent, 4.9 percent, 5.2 percent, and 33.0 percent of variances in changes in scores for PCS, MCS, bodily pain, and limitation in ADLs, respectively. The beta coefficients derived from the model were applied to 714 MCBS managed care respondents to estimate the scores reflecting changes in PCS, MCS, bodily pain, and limitation in ADLs from 2000 to 2002, respectively, based on their responses to the predictor variables obtained from the MCBS survey.

### **SAMPLE CHARACTERISTICS OF THE MCBS MANAGED CARE RESPONDENTS**

Table 2 presents the demographic and study characteristics of 714 MCBS managed care respondents and associated health care costs and utilization for 2003. About one-quarter (24.2 percent) of the respondents are between 75-79 years of age, 57.9 percent are female, 84.3 percent are white, 31.4 percent are high school graduates, 55.2 percent are married, and 90.5 percent are non-smokers. Approximately, one-third (30.5 percent) of the respondents reside in the Pacific region. More than half (57.2 percent) of the respondents have hypertension; 21.4 percent, 18.6 percent, 12.6 percent, 12.3 percent, 12.0 percent, and 9.8 percent have non-skin cancer, diabetes, myocardial infarction/heart attack, emphysema/asthma/COPD, angina pectoris/CAD, and stroke, respectively.

Total health expenditures in 2003 varied by age group and the presence or absence of hypertension, myocardial infarction/heart attack, angina pectoris/CAD, stroke, any non-skin cancer, and diabetes. Older beneficiaries or beneficiaries with specified chronic conditions have a higher level of total health expenditures than younger beneficiaries or beneficiaries without specified chronic conditions. Average total health expenditures are not significantly different between females and males. However, females have a higher level of pharmacy expenditures than males. Race, educational level, marital status, smoking status, or Medicaid eligibility does not significantly affect total health expenditures, pharmacy expenditures, or rates of hospital inpatient visits, hospital outpatient visits, or medical provider visits. However, beneficiaries' rates of hospital outpatient and medical provider visits varied by census region of residence. Beneficiaries living in the West South Central region have a higher rate of hospital outpatient visits than beneficiaries living in other regions. Beneficiaries living in the East South Central region have a lower rate of medical provider visits than beneficiaries living in other regions.

### **PREDICTED CHANGES IN HEALTH STATUS AND HEALTH CARE COSTS AND UTILIZATIONS**

Table 3 shows unadjusted analyses of predicted changes in scores for PCS, MCS, the bodily pain subscale, and limitation in ADLs by quintiles and associated health care costs and utilizations. Analysis of variance and Duncan's pairwise multiple comparison test were used to test for significant differences in unadjusted mean health care costs and rates of utilization overall and between beneficiaries in each of the five quintiles of changes in health status. Overall,

beneficiaries in each of the five quintiles of predicted changes in scores for PCS, MCS, the bodily pain subscale, and limitation in ADLs are significantly different in their unadjusted total health care and pharmacy expenditures. Those in the lower quintiles with the predicted decline in the scores for PCS, MCS, or bodily pain have significantly higher total health care expenditures and pharmacy expenditures than did beneficiaries in other quintiles with the predicted improvement in scores for PCS, MCS, or the bodily pain subscale. In addition, beneficiaries with a higher amount of decline in PCS, MCS, or the bodily pain subscale scores have higher rates of hospital inpatient, hospital outpatient, and medical provider visits than those with a lower amount of decline or those with predicted improvement in PCS, MCS, or the bodily pain subscale scores. The direction of the differences in health care costs and utilizations are less clear among beneficiaries in different quintiles of change in ADL limitations (Figures 1- 20).

Multivariate analysis and generalized linear models were used to examine the extent to which the predicted changes in PCS, MCS, the bodily pain subscale, and ADL limitations impacted health care costs and utilizations after controlling for differences in:

- Age group
- Gender
- Race
- Educational level
- Marital status
- Census region of residence
- Smoking status
- Medicaid dual eligibility
- The presence or absence of hypertension, myocardial infarction, angina pectoris/CAD, non-skin cancer, diabetes, and emphysema/asthma/COPD

The results of the multivariate analyses are shown in Table 4. We found significant relationships between predicted changes in PCS scores and total expenditures, pharmacy expenditures, rates of hospital inpatient visits, hospital outpatient visits, and medical provider visits. Exponentiation of the model parameters associated with predicted change in PCS yielded the adjusted cost ratio or adjusted rate ratio indicating the magnitude of change in the study outcomes for a unit change in the predicted PCS score. Raising the power of the adjusted cost ratio or adjusted rate ratio for a unit change in the predicted PCS score by a power of  $c$  units indicates the amount of change in the study outcome associated with  $c$  units change in predicted PCS scores. After adjusting for covariates, a one-point increase in PCS scores is associated with a:

- 6 percent lower total health care expenditures (adjusted cost ratio=0.94,  $p<0.001$ )
- 5 percent lower pharmacy expenditures (adjusted cost ratio=0.95,  $p<0.01$ )
- 9 percent lower rate of hospital inpatient visits (adjusted rate ratio=0.91,  $p<0.05$ )
- 5 percent lower rate of hospital outpatient visits (adjusted rate ratio=0.95,  $p<0.01$ )
- 4 percent lower rate of medical provider visits (adjusted rate ratio=0.96,  $p<0.001$ )

Predicted changes in MCS scores are significantly associated with total health care expenditures, pharmacy expenditures, rates of hospital inpatient visits, and rates of medical provider visits, after adjusting for other covariates. A one-point increase in MCS scores is associated with a:

- 7 percent lower total health care expenditures (adjusted cost ratio=0.93,  $p<0.001$ )
- 4 percent lower pharmacy expenditures (adjusted cost ratio=0.96,  $p<0.05$ )
- 15 percent lower rate of hospital inpatient visits (adjusted rate ratio=0.85,  $p<0.01$ )
- 4 percent lower rate of medical provider visits (adjusted rate ratio=0.96,  $p<0.01$ )

Predicted changes in the bodily pain subscale are significantly associated with total health care expenditures and the rate of hospital inpatient visits. After controlling for covariates, a one-point increase in the bodily pain subscale is associated with 5 percent lower total health care expenditures (adjusted cost ratio=0.95,  $p<0.01$ ) and an 8 percent lower rate of hospital inpatient visits (adjusted rate ratio=0.92,  $p<0.05$ ). Predicted changes in the bodily pain subscale are not significantly associated with pharmacy expenditures, the rate of hospital outpatient visits, or the rate of medical provider visits.

Lastly, predicted changes in ADL limitations are marginally related to total health care expenditures and pharmacy expenditures, and significantly related to the rate of medical provider visits. Predicted changes in ADL limitations are not significantly related to rates of hospital inpatient and hospital outpatient visits. An improvement in limitation in any one of the six ADLs is associated with:

- 12 percent lower total health care expenditures (adjusted cost ratio=0.88,  $p=0.058$ )
- 11 percent lower pharmacy expenditures (adjusted rate ratio=0.89,  $p=0.071$ )
- 14 percent lower rate of medical provider visits (adjusted rate ratio=0.86,  $p<0.01$ )

## **SAMPLE CHARACTERISTICS OF THE RESPONDENTS IN THE 2000-2002 HOS AND 2002 CAHPS SURVEYS**

Table 5 presents the demographic and study characteristics of 3,603 managed care respondents who participated in both the 2000-2002 HOS and 2002 CAHPS surveys and associated percentage of respondents within each of the study characteristics who provided 9-10 ratings for doctor/nurse, overall health care, or health plan, respectively. More than one-third (35.03 percent) of the respondents are between 70-74 years of age, 58.1 percent are female, 93.1 percent are white, 38.4 percent are high school graduates, 58.3 percent are married, and 89.8 percent are non-smokers. Approximately, one-fifth (21.3 percent) of the respondents reside in the East North Central region. More than half (57.6 percent) of the respondents have hypertension; 16.9 percent, 15.5 percent, 15 percent, 13.4 percent, 10.3 percent, and 8.2 percent have diabetes, non-skin

cancer, angina pectoris/CAD, emphysema/asthma/COPD, myocardial infarction/heart attack, and stroke, respectively.

The percentage of respondents who rate their doctor/nurse 9-10 on a 0-10 scale vary by gender, educational level, and census region of residence. A higher percentage of females (69 percent) rate their doctor/nurse 9-10 when compared to male respondents (64.9 percent). A higher educational level is associated with a lower rating of doctor/nurse. A lower percentage of respondents who have college degrees (60.4 percent) or more than 4-year college degree (59 percent) rate their doctor/nurse 9-10 when compared to respondents with a lower level of education (66.2 percent - 72.5 percent). A lower percentage of respondents (53.7 percent) who live in the Mountain region rate their doctor/nurse 9-10 relative to other census regions (66.9 percent - 77.2 percent). The percentage of respondents rating their doctor/nurse 9-10 is not different by age group; race; marital status; smoking status; Medicaid dual eligibility; or presence or absence of hypertension, myocardial infarction, angina pectoris/CAD, non-skin cancer, diabetes, and emphysema/asthma/COPD.

The percentage of respondents who rate their health care 9-10 vary by gender and educational level. A higher percentage of females (75.9 percent) rate their health care 9-10 when compared to male respondents (68.9 percent). A higher educational level is associated with a lower rating of health care. A lower percentage of respondents who have a college degree (67.3 percent) or more than a 4-year college degree (64.9 percent) rate their health care 9-10 when compared to respondents with a lower level of education (71.2 percent - 75.6 percent). The percentage of respondents rating their health care 9-10 is not different by age group; race; marital status; smoking status; Medicaid dual eligibility; census region of residence; or presence or absence of hypertension, myocardial infarction, angina pectoris/CAD, non-skin cancer, diabetes, and emphysema/asthma/COPD.

The percentage of respondents who rate their health plan 9-10 vary by age group, gender, and census region of residence. Higher age is associated with a higher likelihood of providing 9-10 rating for health plan; 73.7 percent of respondents aged 85 or older rate their health plan as 9-10 compared to younger respondents (61.1 percent - 71.6 percent). A higher percentage of females (69.6 percent) rate their health plan 9-10 when compared to male respondents (65.0 percent). A lower percentage of respondents (57.3 percent) who live in the Middle Atlantic region rate their health plan 9-10 relative to other census regions (63.2 percent to 73.9 percent). The percentage of respondents who rate their health plan 9-10 is not different by race; educational level; marital status; smoking status; Medicaid dual eligibility; or presence or absence of hypertension, myocardial infarction, angina pectoris/CAD, non-skin cancer, diabetes, and emphysema/asthma/COPD.

## **HEALTH STATUS AND EXPERIENCES WITH CARE**

Standardized scores for PCS, MCS, the bodily pain subscale, and the number of limitations in ADLs at baseline and at follow up were divided into three equal groups (tertiles) reflecting the

health status scores of “low,” “medium,” and “high” for the three groups, respectively. Within each of the tertiles, the percentage of respondents who rated their doctor/nurse, health care, and health plan as “9-10” were determined. The chi-square statistic was used to determine whether there was a significant association between tertiles of health status at baseline or at follow up and the proportion of respondents rating their doctor/nurse, health care, or health plan at 9-10.

Table 6 shows the relationship between health status at baseline and the percentage of respondents rating their doctor/nurse, health care, or health plan a 9-10 on a 0-10 scale. Ratings of doctor/nurse, health care, and health plan are significantly associated with the scores on the bodily pain subscale and number of ADLs without limitations at baseline. Respondents who have a higher score on the bodily pain subscale have a higher likelihood of providing a 9-10 rating for doctor/nurse, health care, or health plan when compared to respondents who have a lower score on the bodily pain subscale. Respondents who do not have limitations in any of the six ADLs have a higher likelihood of providing a 9-10 rating for doctor/nurse, health care, or health plan relative to respondents who have limitations in any of the ADLs. Ratings of health care and health plan are related significantly to MCS scores at baseline. Respondents who have a higher MCS score at baseline have a higher likelihood of providing 9-10 ratings on health care or health plan when compared to respondents with a lower MCS score at baseline. PCS scores at baseline are marginally related to rating of health care but are not significantly related to ratings of doctor/nurse or health plan.

Table 7 presents the relationship between health status at follow up and ratings of doctor/nurse, health care, and health plan. Ratings of doctor/nurse, health care, and health plan are significantly associated with the scores for MCS and the bodily pain subscale at follow up. Respondents who have a higher score for MCS or the bodily pain subscale at follow up have a higher likelihood of providing 9-10 rating for doctor/nurse, health care, or health plan when compared to respondents who have a lower score on MCS or the bodily pain subscale. Ratings of health care and health plan are significantly related to the number of ADLs without limitations at follow up. Respondents who have no limitations on five to six ADLs have a higher likelihood of providing 9-10 ratings on health care or health plan when compared to respondents who have no limitation on zero to four ADLs. PCS scores at follow up are significantly related to ratings of health care but are not significantly related to ratings of doctor/nurse or health plan.

## **CHANGES IN HEALTH STATUS AND EXPERIENCES WITH CARE**

Multivariate logistic regression analysis was conducted to examine the extent to which changes in health status affect the three ratings of doctor/nurse, health care, and health plan, after controlling for differences in age group, gender, race, educational level, marital status, smoking status, census region of residence, and the presence or absence of selected comorbid conditions. Exponentiation of the model parameters associated with changes in health status yielded the adjusted odds ratio indicating the magnitude of change in the odds of providing a 9-10 rating relative to a 0-8 rating per 1 unit change in PCS, MCS, and the bodily pain subscale score, after controlling for the study covariates. Raising the power of the adjusted odds ratio for a unit change in health status by a power of  $c$  units indicated the amount of changes in the odds of

providing high rating relative to low rating per  $c$  units change in health status. Two separate sets of data analyses were conducted to determine whether the effect of change in health status on members' ratings differed depending upon whether the study controlled for baseline health status or follow up health status along with other study covariates.

The results of the multivariate analysis are shown in Table 8. After controlling for health status at baseline and other covariates, changes in health status were found to significantly and positively affect the three global ratings of doctor/nurse, health care, and health plan. A one-point increase in PCS scores from 2000 to 2002 is associated with a one percent (adjusted odds ratio=1.01,  $p<0.05$ ) and a 2 percent (adjusted odds ratio=1.02,  $p<0.05$ ) increase in the odds of providing a 9-10 rating relative to a 0-8 rating for doctor/nurse and health care, respectively. A one-point increase in MCS scores is associated with a one percent (adjusted odds ratio=1.01,  $p<0.05$ ), a 2 percent (adjusted odds ratio=1.02,  $p<0.001$ ), and a one percent (adjusted odds ratio=1.01,  $p<0.01$ ) increase in the odds of providing 9-10 ratings for doctor/nurse, health care, and health plan, respectively. A one-point increase in the bodily pain subscale score is associated with a one percent (adjusted odds ratio=1.01,  $p<0.05$ ), a 2 percent (adjusted odds ratio=1.02,  $p<0.001$ ), and a one percent (adjusted odds ratio=1.01,  $p<0.05$ ) increase in the odds of providing 9-10 ratings for doctor/nurse, health care, and health plan, respectively. A one-unit increase in the number of ADLs without limitations from 2000 to 2002 is associated with a 9 percent (adjusted odds ratio=1.09,  $p<0.05$ ) and a 10 percent (adjusted odds ratio=1.10,  $p<0.01$ ) increase in the odds of providing a 9-10 rating relative to a 0-8 rating for health care and health plan, respectively, after controlling for the number of ADLs without limitations at baseline and other study covariates.

The second set of analyses examined the impact of changes in health status on the three global ratings after adjusting for differences in health status at follow up along with other study covariates. Contrary to the earlier findings, changes in health status were no longer significantly related to ratings of doctor/nurse or health care. The odds of providing high ratings (9-10) for doctor/nurse and health care are not significantly related to changes in PCS, MCS, and the bodily pain subscale, after controlling for differences in health status at follow up and other covariates. Furthermore, for the rating of health plan, the direction of the relationship after adjusting for health status at follow up is opposite to those observed when adjusting for health status at baseline. A one-point increase in scores for the MCS and the bodily pain subscale is associated with a 2 percent (adjusted odds ratio=0.98,  $p<0.001$ ), and a one percent (adjusted odds ratio=0.99,  $p<0.01$ ) *decrease* in the odds of providing a 9-10 rating relative to a 0-8 rating for health plan. Additionally, a one-point increase in number of ADLs without limitations is associated with an 8 percent (adjusted odds ratio=0.92,  $p<0.05$ ) and a 9 percent (adjusted odds ratio=0.91,  $p<0.05$ ) *decrease* in the odds of providing 9-10 ratings relative to 0-8 ratings for doctor/nurse and health plan.



## **ANALYSIS OF THE REPRESENTATIVENESS OF A LINKED HOS AND CAHPS MANAGED CARE SAMPLE**

As indicated earlier, to examine the relationship between changes in health status and experiences with care rating, the 2000 to 2002 HOS surveys were linked to 2002 CAHPS survey by unique health identification number. The analytic file used in the study included 3,603 respondents who participated in both HOS and CAHPS surveys in 2002. A large percentage of sample enrollees participated in only one of the two surveys. The following analyses examined whether the analytic sample differed systematically from the overall 2000-2002 HOS survey sample or from the 2002 CAHPS sample on demographic and other characteristics.

Due to the large sample size involved, effect size was used to determine whether the two samples differed systematically on demographic and other characteristics. Effect size is “A measure of the magnitude of a relationship, either in the units of the original measure...or in standardized units” (Cohen et al., 2003, p. 673). A small effect size is defined as greater than, or equal to, 0.20, but less than 0.50. A medium effect size is greater than, or equal to, 0.50, but less than 0.80, and a large effect size is greater than, or equal to, 0.80 (Cohen, 1988). In the analyses, a difference in the mean or proportion between the two samples that is less than 0.20 standard deviation (small effect size) is not considered to be meaningfully different from each other.

The analytic sample of 3,603 respondents was compared to 52,404 overall 2000-2002 HOS respondents who provided completed responses on the studied variables. The two samples were found to be comparable in age group, gender, race, education, marital status, smoking status, proxy status, Medicaid dual eligibility status, and presence or absence of selected chronic conditions. The differences between the two samples on the aforementioned variables did not approach the small effect size (Table 9). Moreover, the two samples were not statistically or meaningfully different in their mean PCS at baseline, mean PCS at follow-up, changes in PCS, mean MCS at baseline, mean MCS at follow-up, and changes in MCS. However, the differences between the two samples that met the criterion for a small effect size were the percentage of respondents residing in Middle Atlantic and West North Central regions. A disproportionately lower percentage of the analytic sample (8.35 percent) resided in the Middle Atlantic region compared to 15.01 percent of the total 2000-2002 HOS sample (effect size=0.209). In contrast, a disproportionately higher percentage of the analytic sample (16.65 percent) of respondents lived in the West North Central region compared to 8.95 percent of the total 2000-2002 HOS sample. The results indicated that the analytic sample reflects the composition of the overall 2000-2002 HOS sample on demographic and health status characteristics. However, the distribution of analytic sample members differed from the HOS sample by census region. The results indicate that the overlap between HOS and CAHPS samples was not evenly distributed across the country and was concentrated more or less in certain regions than others.

The analytic sample of 3,603 respondents was also compared to 172,679 overall CAHPS sample aged 65 or older. It should be noted that 172,679 enrollees in the total CAHPS sample represents all 2002 cross-sectional eligible sample members aged 65 or older (CAHPS respondents and CAHPS non-respondents). In contrast, the analytic sample of 3,603 respondents represents the

longitudinal HOS respondents who responded to both of the 2000 baseline and 2002 follow-up HOS surveys with completed responses on selected study variables and who participated in the 2002 CAHPS survey. As a result, missing data were much more prevalent among the CAHPS sample relative to the analytic sample on demographic and other variables measured from the CAHPS survey. Approximately, one-quarter of the CAHPS sample as opposed to one-eighth of the analytic sample had unknown or missing responses on self-reported race, education, and smoking status. Moreover, a higher percentage of the CAHPS sample was between aged 65-69 (21.01 percent) relative to 13.04 percent in the analytic sample. The small effect size was also found for White and Hispanic races, non-smoking status, self-respondent or proxy status, census regions of Middle Atlantic and West North Central. However, the two samples were found to be comparable in gender, educational level, smoking status, the use of proxy, Medicaid dual eligibility, ratings of doctor/nurse, rating of health care, rating of health plan, responses on a single item on general health status, mental health status, and health status compared to one year ago. The results indicated that the analytic sample was not systematically different from the total CAHPS sample in health status as defined by single-item measures; experiences with care ratings, and selected demographic variables. However, the analytic sample tends to be older, has less missing data, and disproportionately resided in the Middle Atlantic and West North Central region when compared to total CAHPS sample.

# 4

## DISCUSSION

The results of the current analyses provide a unique assessment of longitudinal changes in beneficiary health status and the relationship to health care expenditures, utilization, and experiences of care, and have research and policy implications.

### CHANGE IN HEALTH STATUS: HEALTH EXPENDITURES AND UTILIZATION

According to the Congressional Budget Office's analysis of Medicare expenditures, in 2001 the most expensive five percent of Fee-For-Service (FFS) beneficiaries accounted for 43 percent of the total spending (Congressional Budget Office [CBO], 2005). It is well known that chronic conditions are strongly related to high expenditures and medical resources; more than 75 percent of high cost beneficiaries diagnosed with one or more of seven major chronic conditions (CBO, 2005). What has generally not been considered in the research literature is the implication of small overall health status increments or decrements and the relationship to health costs and resource use.

According to the results of the current study, a single point increase in PCS scores is associated with 6 percent lower total health care expenditures. A single point increase in PCS scores is also predictive of a 9 percent lower rate of hospital inpatient visits. These findings indicate that small changes in PCS scores have a relatively strong impact on costs and utilization. A modest improvement in physical and mental health status can have a substantial effect on reducing health care costs and resource use. Educational efforts including health care prevention and effective patient-provider communication are examples that may spur small improvements to PCS scores (e.g., RAND, 2006), and significantly impact total expenditures and utilization. Improvements in the management of geriatric syndromes such as falls, incontinence, and pain management should also lead to increases in overall health, and hence decreased costs. Clinical, as well as community and organizational efforts can accomplish these types of improvements.

Prevention is less costly than treatments and may provide the opportunity to make small, but significant impacts on beneficiary health status. However, a research study by RAND indicates that physicians adhere to treatment recommendations more often than they adhere to prevention recommendations (2006). Successful strategies to impact provider prevention behavior with the elderly may improve health care and be much less costly than treatment options. The reduction in costs of small increases to elderly physical health status should have a profound effect on costs and utilization at the aggregate level. CMS may want to consider demonstrations that would identify community and clinical (at the primary provider level) strategies to prevent functional decline in the elderly. These strategies may incorporate efforts to prevent institutionalization and avoid hospitalizations. The effects of such efforts may need to be assessed over the course of several years to accurately determine cost savings and health status improvement.

It is noteworthy that the results for MCS scores, expenditures, and utilization are substantial. A one-point increase in MCS scores is predictive of a 15 percent lower rate of hospital inpatient visits and seven percent lower total health care expenditures. Similar to modest changes in PCS scores, a modest change in MCS scores has substantial effects on reducing costs and utilization. These findings underscore the body of literature on the high costs of depression in the elderly (e.g., Tian et al., 2005). Additionally, poor mental health is strongly associated with physical symptoms, which are generally manifest in somatic complaints (Mental Health: Report of the Surgeon General, 1999). Given the high prevalence of depressed mood in Medicare managed care elderly beneficiaries (Health Services Advisory Group, 2006), it is important that depression screening is conducted on all Medicare beneficiaries so that prevention and treatment options are available. Additionally, quality improvement programs for depression in the elderly have been shown to be effective and should be implemented after screening by primary care providers (Wells et al., 2005).

Similar to the findings for physical and mental health, bodily pain has a significant impact on expenditures and utilization. A one-point increase in the bodily pain subscale is predictive of five percent lower total health care expenditures, and an eight percent lower rate of hospital inpatient visits. Pain is underdiagnosed and frequent in a significant majority of elderly people (Gagliese & Melzack, 1997; Wary & Villard, 2006). Generally, most elderly pain patients do not have access to pain management, which is due to a lack of proper pain assessment, risks of pharmacotherapy, and misconceptions about the efficacy of nonpharmacological pain management treatments, as well as elderly attitudes about these treatments (Gagliese & Melzack, 1997). Similar to needed depression screening for the Medicare elderly, pain assessment should be standard for beneficiary primary care visits. The National Institutes of Health (NIH) Pain Consortium indicates that low cost treatments such as acupuncture for pain that occurs in the elderly (e.g., osteoarthritis and fibromyalgia) are effective (NIH Pain Consortium, 2006). Medications can also be effective; however, not until pain symptom severity is assessed by a medical provider and treatment provided could a better quality of life, and hence costs savings be achieved for the elderly.

### **CHANGE IN HEALTH STATUS: EXPERIENCES WITH CARE**

When baseline health status is controlled for, there are significant and positive associations between health status and beneficiary experiences of care. Not surprisingly, 10-point increases in PCS and MCS scores are predictive of a 10 to 22 percent increase in experiences of care ratings for doctor/nurse, health care, and health plan. These results generally support the cross-sectional experience of care literature. The contribution of the present study adds to the small number of longitudinal research studies on health status and experiences of care. Interestingly, the current results indicate that when controlling for follow-up health status, the probability of high ratings for doctor/nurse and health care are not significantly related to changes in PCS, MCS, and bodily pain. Additionally, when controlling for health status at follow up, a 10-point increase in the MCS score and the bodily pain subscales *decreased* the odds of providing high experience of care ratings for health plans. A similar pattern was found for the number of impaired ADLs and

the relationship to doctor/nurse and health plan experience of care ratings. Clearly, conclusions drawn from cross-sectional research designs on health status and ratings of experiences of care differ from longitudinal research designs. Changes in health status and the global ratings of care may tap different domains of patient expectations and experience. Recent research indicates that patient expectations may be part of the equation in measuring experiences of care (e.g., Jackson et al., 2001; Noble et al., 2006). Additionally, patients may focus on their present health state when answering questions regarding their experiences of care. For example, enrollees with poor health may provide lower ratings of experiences with care, due a mismatch between models of care and needs of patients with serious illnesses and/or disabilities. Demographic characteristics also affect experience of care ratings; less satisfied patients tend to be those who are in higher socioeconomic levels and also tend to be younger (e.g. Landon et al., 2001). Intraindividual longitudinal research on health status change and experiences of care in the Medicare elderly is needed to unpack the relationships between changes in health status and experiences of care.

## **POLICY IMPLICATIONS**

Policy implications based on the findings in the current report regarding health status change, expenditures, and utilization should target education. CMS may want to consider a national effort to educate providers and health plans about the significant impact that small increases in health status have on expenditures and utilization. A second implication for CMS policy involves the self-reported assessment of health services by managed care beneficiaries. Since there were not enough matched beneficiaries between the HOS and MCBS surveys, future versions of the HOS survey should incorporate enrollees' use of medical services (this point was also mentioned in the Medicare HOS Evaluation Report, 2004). The ability to assess intraindividual health status change, health service utilization, and expenditures is essential to understanding managed care health plans' performance. Third, the results from the current study may have implications for how managed care health plans are assessed. Plans could be rewarded based on their ability to provide small health status improvements for their beneficiaries that are well below the mean PCS and/or MCS scores.

The counter-intuitive findings for changes in health status and experiences with care also have policy implications. These findings provide important evidence for a longitudinal assessment of experiences with care, either through an integrated MA CAHPS/HOS survey based on the current HOS baseline and follow-up research design, or a longitudinal research design for the CAHPS surveys. If CMS did integrate the MA CAHPS and the HOS, or revised the MA CAHPS to be longitudinal, additional items that measure patient expectations and social support may be warranted. In a non-elderly sample, using multivariate analyses Noble et al. (2006) found that satisfaction with a total knee arthroplasty was primarily determined by patients' expectations, and not their absolute level of function. Additionally, other research in a non-elderly sample indicates that social support is as important as health status and more important than clinical status variables in understanding patient experiences with care (Da Costa et al., 1999).

## 5

### LIMITATIONS

The primary limitation to the results found in this report is the lack of intraindividual change data over time. Although the results found for changes in health status, expenditures, and utilization have strong face validity, the current results need to be confirmed with an analysis of matched beneficiaries from the Medicare HOS and the MCBS, or other databases. We recommend that the conclusions be validated on the same individuals over time. This recommendation is particularly noteworthy for the findings regarding health status and experiences of care. The very different conclusions found for care experiences depending on whether health status is controlled for at baseline or follow up make validation on these findings important.

Additionally, because the focus of the current study is on beneficiaries who were alive at follow up, it is likely that enrollees who were deceased or nonrespondents at follow up had decreased health status and therefore would have incurred more costs and utilized more health services (e.g., Garber et al., 1998). It is noteworthy that the models for HOS respondents for PCS, MCS, and bodily pain had limited predictive power and the majority of variances in the variables are not accounted for. Furthermore, there are estimation errors associated with predicting the changes in PCS, MCS, bodily pain, and limitations in ADLs for the MCBS respondents, due to a number of factors. For example, there may be misclassifications of self-reported chronic disease. These estimation errors may bias the findings. Additionally, the study did not take into account proxy responses. Proxies may not be a reliable source of information for health status or ratings of care. In addition, individual with poor health are more likely to have proxy respondents. Not adjusting for proxy may bias the study findings. Furthermore, the analytic sample of linked HOS and CAHPS samples differ from the overall HOS and CAHPS samples in the distribution of enrollees by census region. The analytic sample had disproportionately higher percentage of respondents in the West North Central and lower percentage of respondents in the Middle Atlantic when compared to the HOS or CAHPS overall sample. This tendency may not affect the internal validity of the findings since the census region of residence was accounted for in the multivariate models. However, it may affect the ability to generalize the findings to Medicare managed care as a whole. Finally, we did not use survey weights; consequently, results are limited to the study population and may not be generalizable to the overall Medicare population or to specific health plans.

## 5

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# APPENDIX

MEDICARE HEALTH OUTCOMES SURVEY  
FINAL REPORT, TASK 5.40A

**Table 1**  
**Characteristics of 2000 - 2002 Medicare HOS Sample and Associated Changes in Health Status**  
**n=51,921**

2002 Characteristics	Number of Enrollees	Percent of Sample	Change in PCS <sup>1</sup>		Change in MCS <sup>1</sup>		Change in Bodily Pain <sup>1</sup>		Change in ADLs <sup>2</sup>	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Age Group</b>										
65-69	6,750	13.00%	-1.01	8.23	-0.23	8.91	-0.61	9.20	-0.06	1.19
70-74	16,864	32.48%	-1.40	8.32	-0.30	8.91	-0.77	9.33	-0.13	1.16
75-79	13,898	26.77%	-1.72	8.58	-0.82	9.26	-1.04	9.63	-0.19	1.27
80-84	8,959	17.26%	-1.87	8.81	-0.88	9.98	-1.10	9.90	-0.25	1.39
85+	5,450	10.50%	-2.08	9.18	-1.45	10.70	-1.08	10.53	-0.38	1.59
<b>Gender</b>										
Female	30,147	58.06%	-1.57	8.57	-0.54	9.56	-0.90	9.59	-0.18	1.27
Male	21,774	41.94%	-1.61	8.55	-0.79	9.18	-0.92	9.68	-0.20	1.31
<b>Race</b>										
African American	2,734	5.27%	-1.59	9.03	-0.52	10.23	-0.86	10.43	-0.22	1.43
Hispanic	698	1.34%	-1.22	9.29	-0.92	10.57	-0.72	10.04	-0.17	1.58
White	47,075	90.67%	-1.59	8.53	-0.65	9.33	-0.92	9.56	-0.19	1.27
Other/Unknown	1,414	2.72%	-1.51	8.55	-0.76	9.59	-0.74	9.85	-0.10	1.30
<b>Education</b>										
8th Grade or less	5,734	11.04%	-1.97	9.38	-1.08	10.87	-1.24	10.53	-0.29	1.62
Some High School	8,206	15.80%	-1.70	8.74	-0.67	9.96	-1.11	9.92	-0.23	1.37
High School	19,287	37.15%	-1.49	8.47	-0.66	9.38	-0.87	9.37	-0.17	1.25
Some College	11,179	21.53%	-1.56	8.44	-0.51	9.00	-0.80	9.57	-0.15	1.21
College	3,634	7.00%	-1.71	8.25	-0.46	8.30	-0.77	9.41	-0.15	1.12
> 4 year College	3,881	7.47%	-1.23	8.01	-0.46	7.95	-0.67	9.14	-0.15	1.10
<b>Marital Status</b>										
Married	29,775	57.35%	-1.53	8.49	-0.75	9.02	-0.94	9.55	-0.16	1.25
Never Married	1,395	2.69%	-1.66	7.86	-0.25	8.56	-0.87	9.24	-0.22	1.22
Divorced/Separated/Widowed	20,751	39.97%	-1.67	8.71	-0.53	9.98	-0.88	9.75	-0.22	1.35
<b>Smoking Status</b>										
Non-smoker	46,893	90.32%	-1.55	8.57	-0.60	9.35	-0.86	9.62	-0.18	1.29
Smoker	5,028	9.68%	-1.97	8.49	-1.09	9.89	-1.37	9.66	-0.24	1.28
<b>Medicaid Dual Eligibility</b>										
No	50,152	96.59%	-1.59	8.55	-0.66	9.32	-0.92	9.59	-0.18	1.27
Yes	1,769	3.41%	-1.51	9.06	-0.42	11.55	-0.66	10.62	-0.28	1.62
<b>Census Region</b>										
East North Central	8,105	15.61%	-1.58	8.45	-0.61	9.31	-0.90	9.43	-0.17	1.31
East South Central	2,001	3.85%	-1.56	9.13	-0.64	10.47	-1.06	10.02	-0.14	1.43
Middle Atlantic	7,807	15.04%	-1.53	8.45	-0.45	9.23	-0.91	9.67	-0.16	1.25
Mountain	5,752	11.08%	-1.68	8.67	-0.74	9.62	-0.84	9.77	-0.21	1.30
New England	2,653	5.11%	-1.51	8.56	-0.56	9.25	-0.78	9.92	-0.17	1.22
Pacific	12,200	23.50%	-1.64	8.51	-0.79	9.35	-0.93	9.51	-0.18	1.27
South Atlantic	5,561	10.71%	-1.56	8.72	-0.57	9.48	-0.88	9.80	-0.20	1.29
West North Central	4,656	8.97%	-1.56	8.41	-0.36	8.93	-0.85	9.47	-0.22	1.26
West South Central	3,186	6.14%	-1.58	8.77	-1.17	9.82	-1.14	9.63	-0.23	1.38
<b>Health Compared to Peers</b>										
Excellent	5,994	11.54%	0.43	7.04	0.60	7.13	0.80	8.77	-0.01	0.84
Very Good	15,710	30.26%	-0.42	8.05	0.20	8.07	-0.05	9.42	-0.03	1.02
Good	18,081	34.82%	-1.91	8.78	-0.54	9.41	-1.12	9.63	-0.15	1.26
Fair	9,947	19.16%	-3.54	9.02	-1.91	11.03	-2.29	9.79	-0.44	1.61
Poor	2,189	4.22%	-3.95	9.44	-5.33	12.95	-3.75	10.86	-1.07	1.93
<b>Health Compared to One Year Ago</b>										
Much Better	1,715	3.30%	1.64	8.97	1.59	9.06	2.36	10.69	0.07	1.20
Somewhat Better	4,658	8.97%	0.38	8.63	0.28	9.39	0.97	9.77	-0.01	1.27
About the Same	33,958	65.40%	-0.80	7.94	-0.03	8.57	-0.28	9.16	-0.06	1.12
Somewhat Worse	10,093	19.44%	-4.90	8.94	-2.55	10.76	-3.69	9.80	-0.56	1.52
Much Worse	1,497	2.88%	-7.01	10.54	-7.29	12.89	-6.19	11.06	-1.42	2.02
<b>Limitation in Bathing</b>										
No	44,790	86.27%	-1.26	8.39	-0.28	8.86	-0.63	9.47	0.02	0.99
Yes	7,131	13.73%	-3.67	9.32	-2.96	12.03	-2.68	10.38	-1.53	1.98
<b>Limitation in Dressing</b>										
No	46,010	88.62%	-1.29	8.40	-0.32	8.95	-0.66	9.48	0.01	1.01
Yes	5,911	11.38%	-3.89	9.47	-3.18	12.09	-2.89	10.51	-1.72	2.01
<b>Limitation in Eating</b>										
No	49,173	94.71%	-1.49	8.50	-0.45	9.18	-0.79	9.56	-0.08	1.13
Yes	2,748	5.29%	-3.39	9.54	-4.17	12.30	-3.00	10.56	-2.08	2.18
<b>Limitation in Getting In or Out of Chairs</b>										
No	37,344	71.92%	-0.90	8.27	-0.16	8.64	-0.31	9.49	0.13	0.90
Yes	14,577	28.08%	-3.34	9.06	-1.90	11.03	-2.44	9.80	-1.01	1.71

MEDICARE HEALTH OUTCOMES SURVEY  
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Table 1, continued  
Characteristics of 2000 - 2002 Medicare HOS Sample and Associated Changes in Health Status  
n=51,921

2002 Characteristics	Number of Enrollees	Percent of Sample	Change in PCS <sup>1</sup>		Change in MCS <sup>1</sup>		Change in Bodily Pain <sup>1</sup>		Change in ADLs <sup>2</sup>	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Limitation in Walking</b>										
No	33,404	64.34%	-0.52	8.02	-0.09	8.30	-0.07	9.32	0.17	0.85
Yes	18,517	35.66%	-3.51	9.16	-1.65	11.05	-2.43	9.97	-0.83	1.66
<b>Limitation in Using the Toilet</b>										
No	47,850	92.16%	-1.42	8.47	-0.41	9.10	-0.75	9.55	-0.04	1.08
Yes	4,071	7.84%	-3.54	9.42	-3.42	12.12	-2.78	10.35	-1.94	2.05
<b>Hypertension</b>										
No	21,684	41.76%	-1.32	8.46	-0.57	9.07	-0.75	9.57	-0.14	1.24
Yes	30,237	58.24%	-1.78	8.64	-0.70	9.64	-1.03	9.67	-0.22	1.32
<b>Myocardial Infarction/Heart Attack</b>										
No	46,124	88.83%	-1.54	8.48	-0.58	9.28	-0.88	9.54	-0.17	1.27
Yes	5,797	11.17%	-1.97	9.19	-1.19	10.35	-1.13	10.28	-0.30	1.44
<b>Angina Pectoris or CAD</b>										
No	43,614	84.00%	-1.48	8.49	-0.57	9.21	-0.83	9.56	-0.16	1.25
Yes	8,307	16.00%	-2.14	8.92	-1.05	10.38	-1.35	9.93	-0.31	1.44
<b>Stroke</b>										
No	47,325	91.15%	-1.51	8.49	-0.58	9.19	-0.88	9.53	-0.16	1.25
Yes	4,596	8.85%	-2.40	9.27	-1.40	11.31	-1.28	10.51	-0.43	1.63
<b>Any Non-Skin Cancer</b>										
No	43,839	84.43%	-1.47	8.50	-0.57	9.29	-0.83	9.57	-0.17	1.27
Yes	8,082	15.57%	-2.23	8.90	-1.08	9.97	-1.35	9.92	-0.25	1.39
<b>Diabetes</b>										
No	42,520	81.89%	-1.53	8.50	-0.58	9.22	-0.87	9.52	-0.17	1.25
Yes	9,401	18.11%	-1.83	8.86	-0.96	10.21	-1.12	10.10	-0.25	1.44
<b>Emphysema/Asthma/COPD</b>										
No	44,949	86.57%	-1.51	8.54	-0.58	9.25	-0.86	9.58	-0.17	1.26
Yes	6,972	13.43%	-2.09	8.73	-1.11	10.31	-1.27	9.94	-0.30	1.47

<sup>1</sup> Change = standardized norm-based score at remeasurement period - standardized norm-based score at the baseline period.

Norm-based score was calculated based on 1998 US General Population

<sup>2</sup> Change = number of ADL activities with no limitation in the remeasurement period - number of ADL activities with no limitations in the baseline period

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Table 2 Characteristics of 2002 - 2003 MCBS Sample and Associated Health Care Costs and Utilization n=714												
2002 Characteristics	Number of Enrollees	Percent of Sample	Total Health Expenditures		Pharmacy Expenditures		Inpatient Visits		Outpatient Visits		Medical Provider Visits	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Age Group</b>												
65-69	165	23.11%	\$3,622	\$4,294	\$1,093	\$1,293	0.09	0.36	2.07	3.20	9.70	10.66
70-74	151	21.15%	\$4,160	\$5,179	\$1,170	\$1,356	0.15	0.44	2.71	5.74	9.60	8.81
75-79	173	24.23%	\$4,587	\$6,414	\$1,260	\$1,112	0.18	0.49	2.23	3.18	11.30	10.99
80-84	129	18.07%	\$6,581	\$10,436	\$1,469	\$1,769	0.23	0.54	2.39	3.70	10.81	10.51
85+	96	13.45%	\$5,875	\$9,021	\$1,165	\$1,279	0.20	0.52	2.44	3.68	11.30	10.41
<b>Gender</b>												
Female	414	57.98%	\$5,021	\$7,543	\$1,375	\$1,529	0.15	0.44	2.18	3.27	10.82	10.58
Male	300	42.02%	\$4,513	\$6,612	\$1,024	\$1,071	0.18	0.51	2.59	4.84	10.02	9.95
<b>Race</b>												
African American	60	8.40%	\$4,516	\$6,084	\$1,441	\$1,676	0.17	0.46	1.72	2.36	6.85	6.02
Hispanic	33	4.62%	\$3,960	\$5,123	\$1,173	\$916	0.27	0.57	3.39	8.92	7.39	5.02
White	602	84.31%	\$4,915	\$7,428	\$1,220	\$1,364	0.16	0.47	2.39	3.75	10.99	10.74
Other/Unknown	19	2.66%	\$3,769	\$4,540	\$867	\$871	0.11	0.32	1.32	1.42	11.37	11.51
<b>Education</b>												
8th Grade or less	103	14.43%	\$3,666	\$5,226	\$1,180	\$1,087	0.15	0.47	1.81	3.33	8.69	9.35
Some High School	107	14.99%	\$5,100	\$7,219	\$1,372	\$1,127	0.20	0.46	2.61	5.25	10.17	8.77
High School	224	31.37%	\$4,871	\$7,846	\$1,222	\$1,286	0.14	0.45	2.47	3.79	10.91	10.80
Some College	174	24.37%	\$5,006	\$7,485	\$1,169	\$1,549	0.17	0.50	2.40	4.04	10.32	10.54
College	58	8.12%	\$4,947	\$7,158	\$1,243	\$1,944	0.16	0.45	2.38	4.40	12.67	11.94
> 4 year College	48	6.72%	\$5,414	\$6,176	\$1,225	\$1,243	0.23	0.47	2.17	2.04	11.02	10.14
<b>Marital Status</b>												
Married	394	55.18%	\$4,764	\$6,941	\$1,156	\$1,302	0.18	0.51	2.41	3.84	10.73	11.05
Never Married	12	1.68%	\$4,758	\$6,169	\$1,481	\$1,722	0.17	0.39	1.00	1.13	8.42	7.23
Divorced/Separated/Widowed	308	43.14%	\$4,864	\$7,498	\$1,309	\$1,428	0.14	0.41	2.33	4.27	10.25	9.43
<b>Smoking Status</b>												
Non-smoker	646	90.48%	\$4,833	\$7,279	\$1,237	\$1,390	0.16	0.46	2.28	3.83	10.63	10.47
Smoker	68	9.52%	\$4,558	\$6,032	\$1,141	\$1,116	0.21	0.53	3.07	5.40	9.07	8.71
<b>Medicaid Dual Eligibility</b>												
No	676	94.68%	\$4,802	\$7,235	\$1,205	\$1,360	0.16	0.47	2.37	3.99	10.54	10.34
Yes	38	5.32%	\$4,900	\$5,882	\$1,634	\$1,418	0.18	0.39	2.03	4.35	9.50	10.04
<b>Census Region</b>												
East North Central	49	6.86%	\$4,639	\$5,124	\$1,396	\$1,369	0.16	0.47	2.20	2.23	11.51	11.62
East South Central	15	2.10%	\$3,680	\$3,358	\$1,491	\$1,299	0.07	0.26	1.47	1.60	5.87	4.16
Middle Atlantic	133	18.63%	\$5,118	\$8,802	\$1,123	\$1,220	0.21	0.59	2.53	3.81	9.98	10.30
Mountain	122	17.09%	\$4,810	\$7,918	\$1,079	\$1,576	0.15	0.48	2.59	4.59	10.87	11.98
New England	18	2.52%	\$6,116	\$5,255	\$1,657	\$2,184	0.17	0.38	3.50	2.81	13.22	11.26
Pacific	218	30.53%	\$4,847	\$7,458	\$1,228	\$1,443	0.14	0.40	1.98	4.09	10.47	10.09
South Atlantic	101	14.15%	\$4,063	\$5,058	\$1,436	\$1,159	0.18	0.43	1.90	3.25	9.26	7.15
West North Central	37	5.18%	\$5,641	\$7,016	\$1,097	\$767	0.24	0.60	2.51	2.83	13.68	11.99
West South Central	21	2.94%	\$4,599	\$4,277	\$1,021	\$876	0.14	0.36	5.52	7.94	10.43	10.53
<b>Hypertension</b>												
No	304	42.58%	\$3,887	\$5,823	\$849	\$1,066	0.15	0.46	1.88	3.65	9.40	9.99
Yes	410	57.42%	\$5,489	\$7,957	\$1,508	\$1,492	0.18	0.48	2.70	4.21	11.29	10.49
<b>Myocardial Infarction/HeartAttack</b>												
No	624	87.39%	\$4,319	\$5,922	\$1,155	\$1,361	0.14	0.43	2.25	4.01	10.03	10.08
Yes	90	12.61%	\$8,192	\$12,357	\$1,728	\$1,302	0.32	0.67	3.06	3.90	13.67	11.38
<b>Angina Pectoris or CAD</b>												
No	628	87.96%	\$4,513	\$6,490	\$1,169	\$1,356	0.16	0.46	2.22	3.82	9.87	9.78
Yes	86	12.04%	\$6,956	\$10,712	\$1,653	\$1,371	0.23	0.55	3.28	5.08	14.98	12.84
<b>Stroke</b>												
No	644	90.20%	\$4,593	\$6,719	\$1,179	\$1,302	0.16	0.47	2.30	3.97	10.05	9.77
Yes	70	9.80%	\$6,782	\$10,276	\$1,675	\$1,806	0.17	0.45	2.79	4.29	14.53	13.85
<b>Any Non-Skin Cancer</b>												
No	561	78.57%	\$4,348	\$6,939	\$1,155	\$1,310	0.14	0.44	2.00	3.34	9.55	9.57
Yes	153	21.43%	\$6,490	\$7,737	\$1,494	\$1,528	0.25	0.56	3.63	5.66	13.91	12.11
<b>Diabetes</b>												
No	581	81.37%	\$4,392	\$6,691	\$1,063	\$1,218	0.15	0.44	2.28	3.81	9.60	9.40
Yes	133	18.63%	\$6,623	\$8,753	\$1,946	\$1,710	0.22	0.58	2.66	4.74	14.36	12.99
<b>Emphysema/Asthma/COPD</b>												
No	626	87.68%	\$4,669	\$7,202	\$1,168	\$1,355	0.15	0.46	2.25	3.87	10.22	10.06
Yes	88	12.32%	\$5,791	\$6,866	\$1,649	\$1,373	0.24	0.53	3.09	4.82	12.34	11.91

Table 3 Unadjusted Mean Comparison of 2003 Costs and Health Care Utilization between Quintiles of Predicted Changes in Health Status for 2000 - 2002 Among Medicare Managed Care Sample Respondents to the MCBS Survey n=714												
Quintile of Predicted Changes in Health Status Measure between 2000 and 2002	Number of Enrollees	Percent of Sample	2003 Total Expenditures		2003 Pharmacy Expenditures		2003 Inpatient Visits		2003 Outpatient Visits		2003 Medical Provider Visits	
			Mean <sup>3</sup>	SD	Mean <sup>3</sup>	SD	Mean <sup>3</sup>	SD	Mean <sup>3</sup>	SD	Mean <sup>3</sup>	SD
<b>Predicted Changes in PCS<sup>1</sup></b>												
-12.26 to -2.89	142	19.89%	\$6,773 <sup>a</sup>	\$9,253	\$1,578 <sup>a</sup>	\$1,707	0.24 <sup>a</sup>	0.52	3.13 <sup>a</sup>	5.94	12.77 <sup>a</sup>	11.59
-2.88 to -0.90	143	20.03%	\$5,387 <sup>a,b</sup>	\$7,340	\$1,576 <sup>a</sup>	\$1,464	0.18 <sup>a,b</sup>	0.45	2.52 <sup>a</sup>	3.68	12.50 <sup>a</sup>	11.37
-0.89 to -0.12	143	20.03%	\$4,074 <sup>b,c</sup>	\$5,848	\$1,289 <sup>a</sup>	\$1,442	0.14 <sup>a,b</sup>	0.44	2.17 <sup>a,b</sup>	3.54	9.91 <sup>b</sup>	9.12
-0.12 to 0.48	143	20.03%	\$4,563 <sup>b,c</sup>	\$7,602	\$922 <sup>b</sup>	\$1,016	0.17 <sup>a,b</sup>	0.53	2.45 <sup>a,b</sup>	3.46	9.36 <sup>b</sup>	9.85
0.48 to 5.12	143	20.03%	\$3,253 <sup>c</sup>	\$4,442	\$774 <sup>b</sup>	\$817	0.10 <sup>b</sup>	0.38	1.49 <sup>b</sup>	2.43	7.90 <sup>b</sup>	8.62
Overall F-test (df, p-value) <sup>2</sup>			5.12 (4, p=0.0005)		11.06 (4, p<0.0001)		1.79 (4, p=0.1295)		3.21 (4, p=0.0125)		6.03 (4, p<0.0001)	
<b>Predicted Changes in MCS<sup>1</sup></b>												
-15.21 to -1.05	142	19.89%	\$7,462 <sup>a</sup>	\$10,521	\$1,702 <sup>a</sup>	\$1,809	0.29 <sup>a</sup>	0.60	2.91 <sup>a</sup>	5.29	12.75 <sup>a</sup>	12.00
-1.05 to -0.21	143	20.03%	\$4,463 <sup>b</sup>	\$6,634	\$929 <sup>b</sup>	\$936	0.20 <sup>a,b</sup>	0.52	1.83 <sup>b</sup>	3.16	9.68 <sup>b</sup>	9.09
-0.20 to 0.31	143	20.03%	\$4,024 <sup>b</sup>	\$6,159	\$1,039 <sup>b</sup>	\$995	0.13 <sup>b</sup>	0.43	2.23 <sup>a,b</sup>	3.44	10.15 <sup>b</sup>	10.87
0.32 to 0.87	143	20.03%	\$4,309 <sup>b</sup>	\$6,168	\$1,230 <sup>b</sup>	\$1,507	0.11 <sup>b</sup>	0.38	2.68 <sup>a,b</sup>	4.15	9.43 <sup>b</sup>	7.72
0.88 to 15.38	143	20.03%	\$3,798 <sup>b</sup>	\$4,345	\$1,241 <sup>b</sup>	\$1,278	0.10 <sup>b</sup>	0.35	2.11 <sup>a,b</sup>	3.58	10.44 <sup>a,b</sup>	11.14
Overall F-test (df, p-value) <sup>2</sup>			6.46 (4, p<0.0001)		6.90 (4, p<0.0001)		3.99 (4, p=0.0033)		1.69 (4, p=0.1495)		2.36 (4, p=0.0524)	
<b>Predicted Changes in Bodily Pain<sup>1</sup></b>												
-16.41 to -2.10	142	19.89%	\$6,962 <sup>a</sup>	\$10,287	\$1,379 <sup>a,b</sup>	\$1,330	0.26 <sup>a</sup>	0.53	3.20 <sup>a</sup>	5.98	12.15 <sup>a</sup>	11.13
-2.08 to -0.42	143	20.03%	\$5,098 <sup>b</sup>	\$6,768	\$1,549 <sup>a</sup>	\$1,575	0.18 <sup>a,b</sup>	0.53	2.04 <sup>b</sup>	2.73	11.81 <sup>a,b</sup>	10.92
-0.42 to 0.28	143	20.03%	\$4,065 <sup>b</sup>	\$4,997	\$1,167 <sup>b,c</sup>	\$1,293	0.13 <sup>b</sup>	0.40	1.99 <sup>b</sup>	3.05	9.19 <sup>c</sup>	8.53
0.28 to 0.97	143	20.03%	\$3,733 <sup>b</sup>	\$5,582	\$1,086 <sup>b,c</sup>	\$1,561	0.12 <sup>b</sup>	0.38	2.15 <sup>b</sup>	3.03	9.97 <sup>b,c</sup>	10.83
0.97 to 8.50	143	20.03%	\$4,193 <sup>b</sup>	\$6,635	\$957 <sup>c</sup>	\$892	0.13 <sup>b</sup>	0.48	2.38 <sup>a,b</sup>	4.25	9.31 <sup>b,c</sup>	9.73
Overall F-test (df, p-value) <sup>2</sup>			4.82 (4, p=0.0008)		4.36 (4, p=0.0017)		2.22 (4, p=0.0652)		2.23 (4, p=0.0639)		2.66 (4, p=0.0318)	
<b>Predicted Changes in ADLs Function<sup>1</sup></b>												
-3.58 to -0.15	142	19.89%	\$6,118 <sup>a</sup>	\$8,237	\$1,554 <sup>a</sup>	\$1,795	0.22 <sup>a</sup>	0.49	2.49 <sup>a,b</sup>	4.45	12.86 <sup>a</sup>	11.17
-0.15 to 0.09	143	20.03%	\$4,976 <sup>a,b</sup>	\$7,291	\$978 <sup>b</sup>	\$1,196	0.17 <sup>a</sup>	0.52	2.87 <sup>a</sup>	4.99	11.65 <sup>a</sup>	13.02
0.09 to 0.20	143	20.03%	\$3,315 <sup>b</sup>	\$4,430	\$911 <sup>b</sup>	\$946	0.11 <sup>a</sup>	0.40	1.70 <sup>b</sup>	2.83	8.08 <sup>c</sup>	7.32
0.21 to 0.34	143	20.03%	\$4,379 <sup>a,b</sup>	\$6,844	\$1,239 <sup>a,b</sup>	\$1,373	0.15 <sup>a</sup>	0.43	1.95 <sup>a,b</sup>	2.73	8.84 <sup>b,c</sup>	7.85
0.34 to 0.95	143	20.03%	\$5,438 <sup>a</sup>	\$8,143	\$1,458 <sup>a</sup>	\$1,279	0.18 <sup>a</sup>	0.50	2.75 <sup>a</sup>	4.41	11.01 <sup>a,b</sup>	10.51
Overall F-test (df, p-value) <sup>2</sup>			3.18 (4, p=0.0133)		6.35 (4, p<0.0001)		1.02 (4, p=0.3960)		2.32 (4, p=0.0552)		5.40 (4, p=0.0003)	

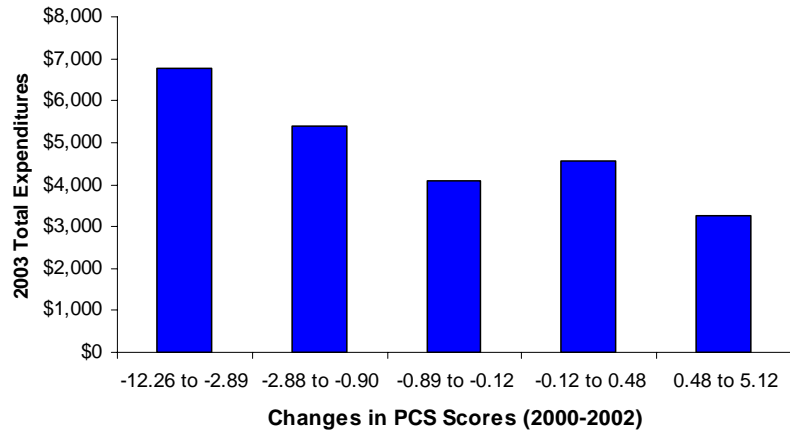
<sup>1</sup> Predicted change scores in MCBS managed care respondents based on the observed relationship between changes in health status scores and a set of predictor variables from the HOS survey.

Predictor variables of change in health status measures included responses to transitional health and comparative health questions, limitation in activity of daily living of bathing, dressing, eating, getting in or out of chairs, walking, and using the toilet, presence or absence of hypertension, myocardial infarction, angina pectoris or CAD, stroke, any non-skin cancer, diabetes, and emphysema/asthma/COPD, age group, gender, race, census region of residence, smoking status, marital status, Medicaid eligibility, educational level, and selected 2-way interactions between the predictor variables.

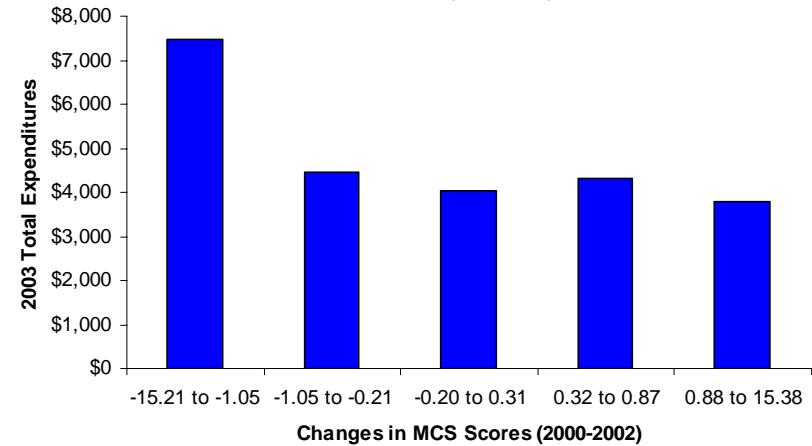
<sup>2</sup> F-test statistics for testing overall differences between groups; df represents degree of freedom.

<sup>3</sup> Means with the same letter are not significantly different at 0.05 level based on Duncan's multiple comparison test.

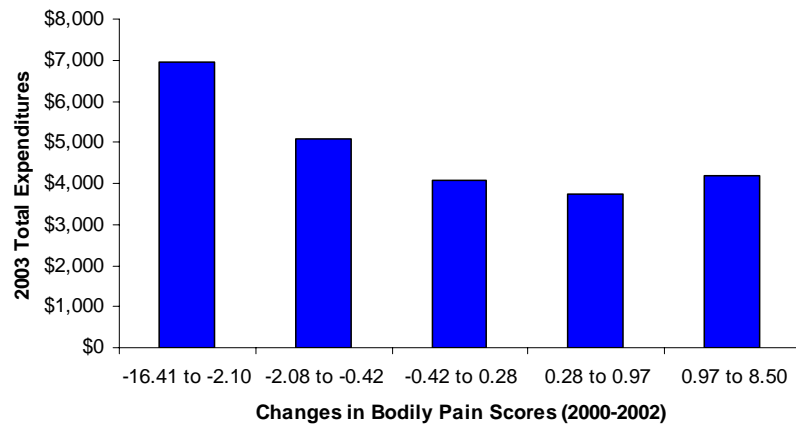
**Figure 1: Total Expenditures (2003) by Quintile of Predicted Changes in PCS Scores (2000-2002)**



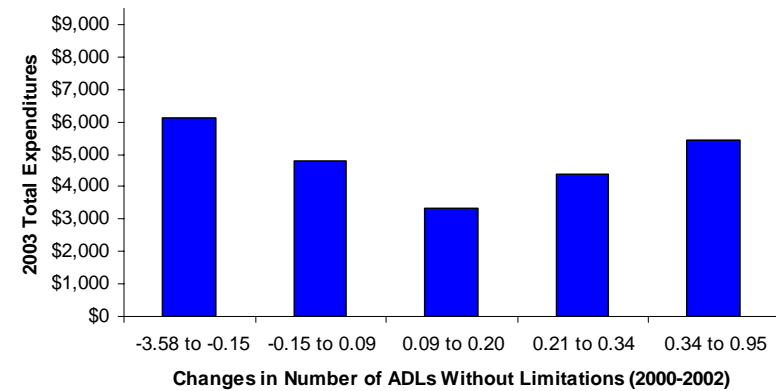
**Figure 2: Total Expenditures (2003) by Quintile of Predicted Changes in MCS Scores (2000-2002)**



**Figure 3: Total Expenditures (2003) by Quintile of Predicted Changes in Bodily Pain Scores (2000-2002)**

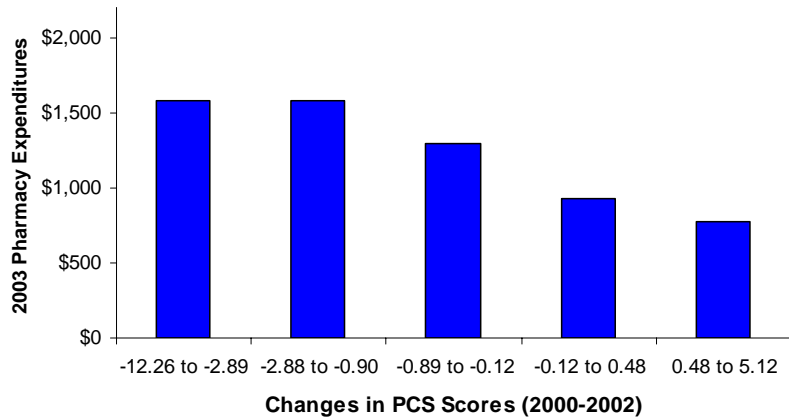


**Figure 4: Total Expenditures (2003) by Predicted Changes in Number of ADLs Without Limitations (2000-2002)**

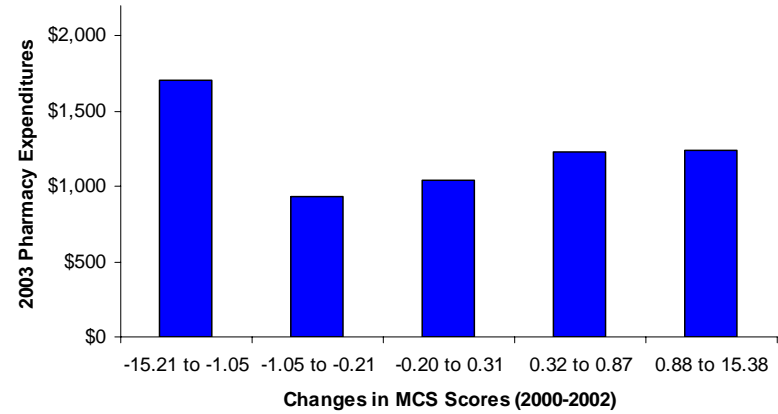




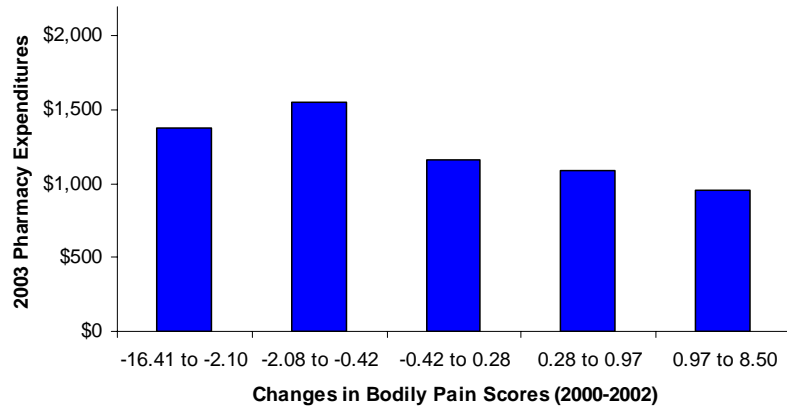
**Figure 5: Pharmacy Expenditures (2003) by Quintile of Predicted Changes in PCS Scores (2000-2002)**



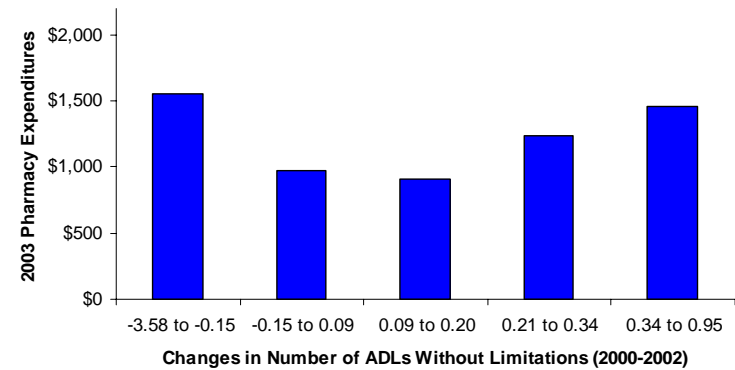
**Figure 6: Pharmacy Expenditures (2003) by Quintile of Predicted Changes in MCS Scores (2000-2002)**



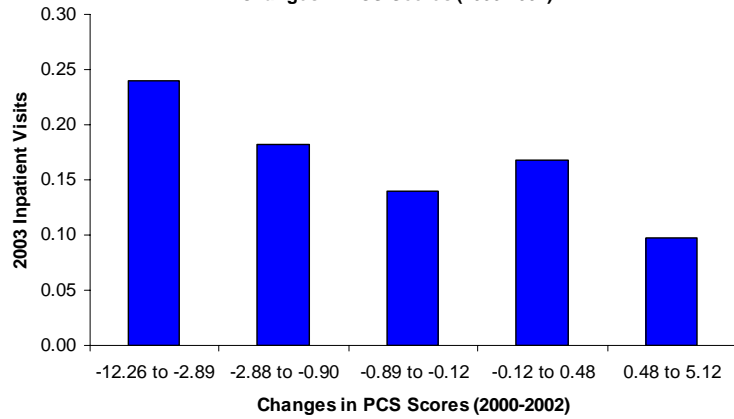
**Figure 7: Pharmacy Expenditures (2003) by Quintile of Predicted Changes in Bodily Pain Scores (2000-2002)**



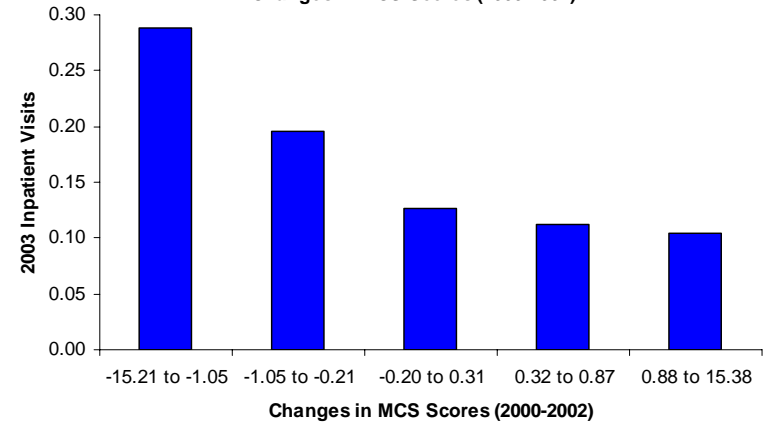
**Figure 8: Pharmacy Expenditures (2003) by Predicted Changes in Number of ADLs Without Limitations (2000-2002)**



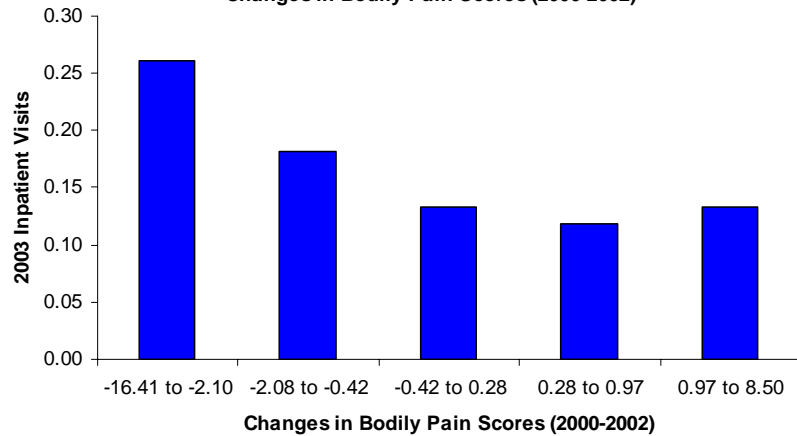
**Figure 9: Average Inpatient Visits (2003) by Quintile of Predicted Changes in PCS Scores (2000-2002)**



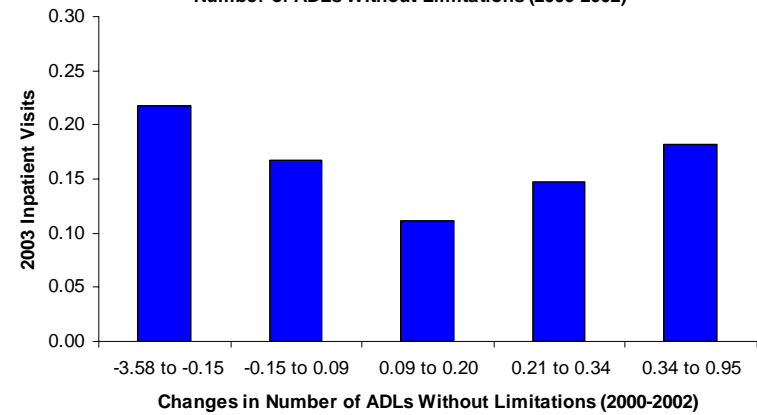
**Figure 10: Average Inpatient Visits (2003) by Quintile of Predicted Changes in MCS Scores (2000-2002)**



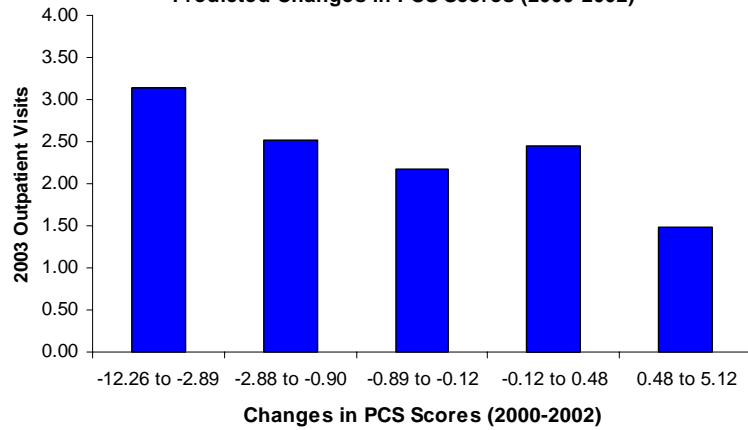
**Figure 11: Average Inpatient Visits (2003) by Quintile of Predicted Changes in Bodily Pain Scores (2000-2002)**



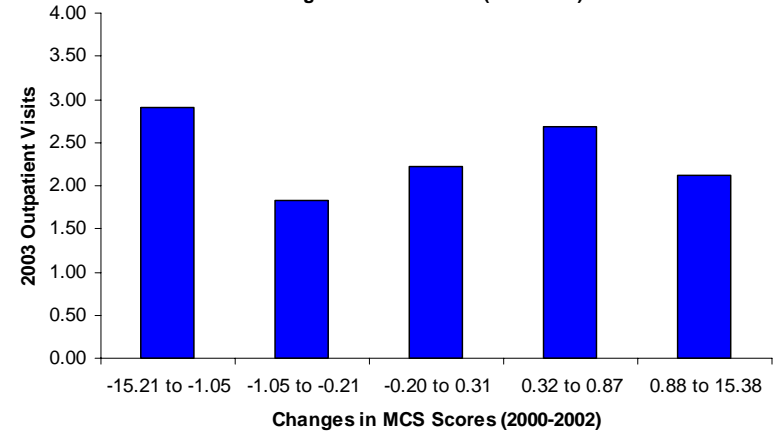
**Figure 12: Average Inpatient Visits (2003) by Predicted Changes in Number of ADLs Without Limitations (2000-2002)**



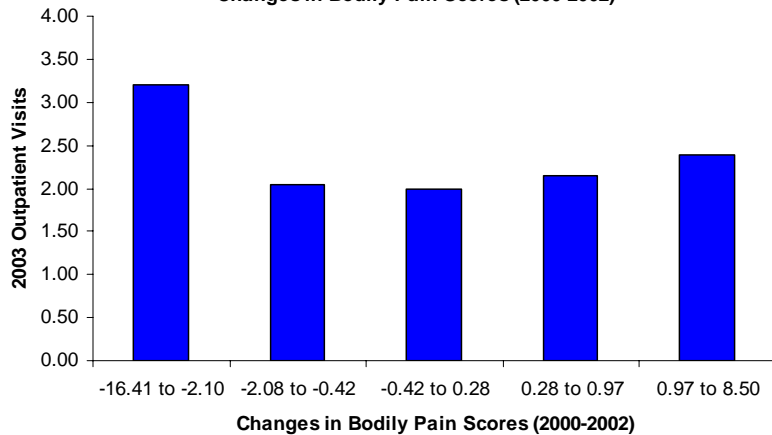
**Figure 13: Average Outpatient Visits (2003) by Quintile of Predicted Changes in PCS Scores (2000-2002)**



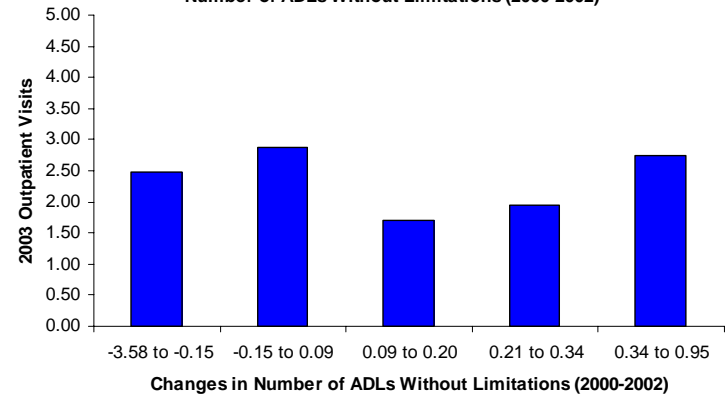
**Figure 14: Average Outpatient Visits (2003) by Quintile of Predicted Changes in MCS Scores (2000-2002)**



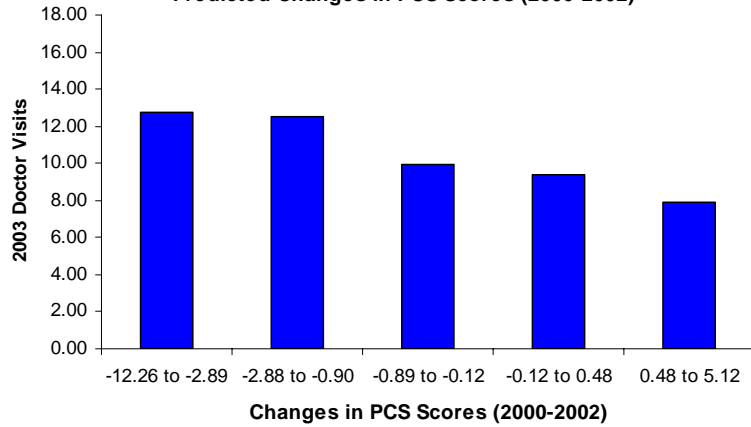
**Figure 15: Average Outpatient Visits (2003) by Quintile of Predicted Changes in Bodily Pain Scores (2000-2002)**



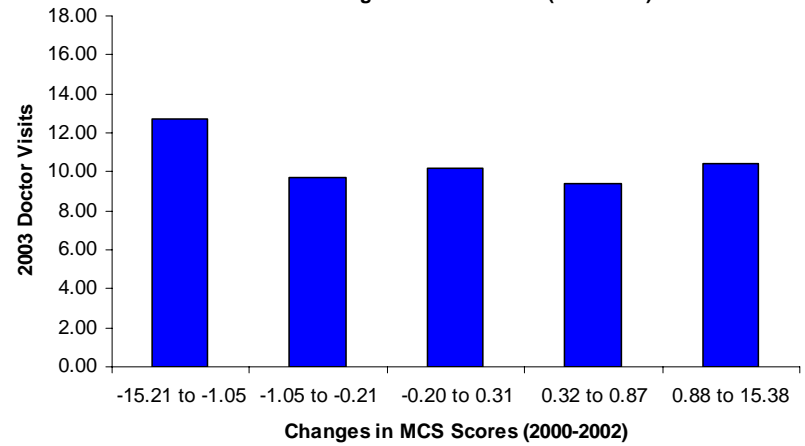
**Figure 16: Average Outpatient Visits (2003) by Predicted Changes in Number of ADLs Without Limitations (2000-2002)**



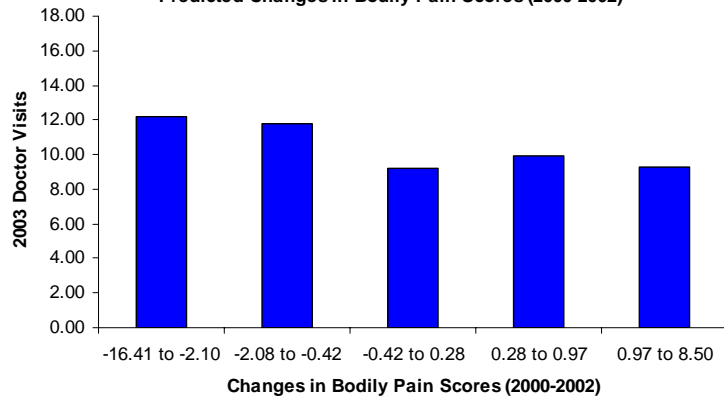
**Figure 17: Average Medical Provider Visits (2003) by Quintile of Predicted Changes in PCS Scores (2000-2002)**



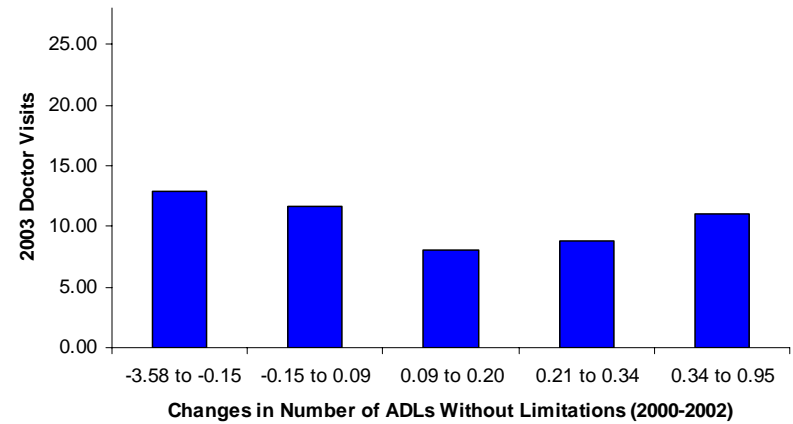
**Figure 18: Average Medical Provider Visits (2003) by Quintile of Predicted Changes in MCS Scores (2000-2002)**



**Figure 19: Average Medical Provider Visits (2003) by Quintile of Predicted Changes in Bodily Pain Scores (2000-2002)**



**Figure 20: Average Medical Provider Visits (2003) by Predicted Changes in Number of ADLs Without Limitations (2000-2002)**



**Table 4**  
**Multivariate Generalized Linear Models of the Relationship between Predicted Changes in Health Status (2000 - 2002) and 2003 Costs and Health Care Utilization**

Health Status Measure <sup>a</sup>	2003 Total Expenditures (n=704)		2003 Pharmacy Expenditures (n=665)		2003 Inpatient Visits (n=714)		2003 Outpatient Visits (n=714)		2003 Medical Provider Visits (n=714)	
	Adjusted Cost Ratio <sup>c,e</sup>	95% Confidence Interval	Adjusted Cost Ratio <sup>c,e</sup>	95% Confidence Interval	Adjusted Rate Ratio <sup>d,e</sup>	95% Confidence Interval	Adjusted Rate Ratio <sup>d,e</sup>	95% Confidence Interval	Adjusted Rate Ratio <sup>d,e</sup>	95% Confidence Interval
Predicted Changes in PCS <sup>b</sup>	0.94	(0.91,0.97)***	0.95	(0.92,0.98)**	0.91	(0.85, 0.99)*	0.95	(0.91,0.99)**	0.96	(0.93,0.98)***
Predicted Changes in MCS <sup>b</sup>	0.93	(0.90,0.96)***	0.96	(0.93,0.99)*	0.85	(0.77,0.94)*	0.97	(0.94,1.02)	0.96	(0.94,0.99)**
Predicted Changes in Bodily Pain <sup>b</sup>	0.95	(0.92,0.98)**	0.98	(0.95,1.01)	0.92	(0.85,1.00)*	1.00	(0.96,1.04)	0.98	(0.95,1.01)
Predicted Changes in ADLs Function <sup>b</sup>	0.88	(0.77,1.00)	0.89	(0.78,1.01)	0.84	(0.60,1.18)	1.02	(0.86,1.21)	0.86	(0.77,0.95)**

<sup>a</sup> All models control for age group, gender, race, educational level, marital status, smoking status, census region of residence, Medicaid dual eligibility, and presence or absence of hypertension, myocardial infarction, angina pectoris or coronary artery disease, stroke, non-skin cancer, diabetes, and emphysema/asthma/COPD.

<sup>b</sup> Predicted change scores in MCBS managed care respondents based on the observed relationship between changes in health status scores and a set of predictor variables from the HOS survey.

Predictor variables of change in health status measures included responses to transitional health and comparative health questions, limitation in activity of daily living of bathing, dressing, eating, getting in or out of chairs, walking, and using the toilet, presence or absence of hypertension, myocardial infarction, angina pectoris or CAD, stroke, any non-skin cancer, diabetes, and emphysema/asthma/COPD, age group, gender, race, census region of residence, smoking status, marital status, Medicaid eligibility, educational level, and selected 2-way interactions between the predictor variables.

<sup>c</sup> Adjusted cost ratios minus one reflect percent change in total expenditures per person per year per 1-point change in PCS, MCS, bodily pain subscale, or ADLs, holding other covariates constant.

<sup>d</sup> Adjusted rate ratios minus one reflect percent change in rate of utilization per person per year per 1-point change in PCS, MCS, bodily pain subscale, or ADLs, holding other covariates constant.

<sup>e</sup> The adjusted cost ratio or adjusted rate ratio associated with changes in PCS, MCS, bodily pain, or number of limitation in ADLs function for some amount of changes greater than 1 point or 1 unit (e.g. c=5 units), is derived by raising the adjusted cost ratio or the adjusted rate ratio associated with a unit change to the power of 5 if c=5 units.

\*  $p < 0.05$ ; \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

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Table 5  
Characteristics of the Respondents Who Participated in the 2000 and 2002 Medicare HOS Surveys and 2002 CAHPS Survey  
and Associated Experience of Care Ratings (n = 3,603)

2002 Characteristics	Number of Enrollees	Percent of Sample	Rating of Doctor/Nurse <sup>1</sup>			Rating of Health Care <sup>1</sup>			Rating of Health Plan <sup>1</sup>		
			Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent
<b>Age Group</b>											
65-69	470	13.04%	253	399	63.41%	229	323	70.90%	262	429	61.07%
70-74	1,262	35.03%	681	1,036	65.73%	645	875	73.71%	729	1,127	64.69%
75-79	939	26.06%	552	808	68.32%	482	659	73.14%	602	856	70.33%
80-84	567	15.74%	334	478	69.87%	285	398	71.61%	361	504	71.63%
85+	365	10.13%	205	287	71.43%	165	220	75.00%	224	304	73.68%
<b>Gender</b>											
Female	2,092	58.06%	1,202	1,741	69.04%	1,100	1,450	75.86%	1,290	1,854	69.58%
Male	1,511	41.94%	823	1,267	64.96%	706	1,025	68.88%	888	1,366	65.01%
<b>Race</b>											
Black	146	4.05%	75	107	70.09%	70	90	77.78%	87	125	69.60%
Hispanic	40	1.11%	29	33	87.88%	27	32	84.38%	29	37	78.38%
White	3,355	93.12%	1,887	2,816	67.01%	1,680	2,313	72.63%	2,025	3,001	67.48%
Other/Unknown	62	1.72%	34	52	65.38%	29	40	72.50%	37	57	64.91%
<b>Education</b>											
8th Grade or less	468	12.99%	229	346	66.18%	200	281	71.17%	267	394	67.77%
Some High School	532	14.77%	314	433	72.52%	263	348	75.57%	348	476	73.11%
High School	1,383	38.38%	799	1,176	67.94%	704	949	74.18%	850	1,258	67.57%
Some College	766	21.26%	447	658	67.93%	415	558	74.37%	447	686	65.16%
College	222	6.16%	116	192	60.42%	111	165	67.27%	130	199	65.33%
> 4 year College	232	6.44%	120	203	59.11%	113	174	64.94%	136	207	65.70%
<b>Marital Status</b>											
Married	2,102	58.34%	1,201	1,793	66.98%	1,080	1,483	72.83%	1,279	1,917	66.72%
Never Married	104	2.89%	52	84	61.90%	47	67	70.15%	63	90	70.00%
Divorced/Separated/Widowed	1,397	38.77%	772	1,131	68.26%	679	925	73.41%	836	1,213	68.92%
<b>Smoking Status</b>											
Non-smoker	3,235	89.79%	1,829	2,705	67.62%	1,640	2,246	73.02%	1,958	2,892	67.70%
Smoker	368	10.21%	196	303	64.69%	166	229	72.49%	220	328	67.07%
<b>Medicaid Dual Eligibility</b>											
No	3,459	96.00%	1,949	2,897	67.28%	1,728	2,377	72.70%	2,086	3,093	67.44%
Yes	144	4.00%	76	111	68.47%	78	98	79.59%	92	127	72.44%
<b>Census Region</b>											
East North Central	766	21.26%	470	665	70.68%	408	545	74.86%	499	694	71.90%
East South Central	85	2.36%	61	79	77.22%	39	54	72.22%	58	79	73.42%
Middle Atlantic	301	8.35%	181	251	72.11%	155	213	72.77%	149	260	57.31%
Mountain	449	12.46%	188	350	53.71%	190	280	67.86%	247	391	63.17%
New England	254	7.05%	144	214	67.29%	126	168	75.00%	147	222	66.22%
Pacific	595	16.51%	328	490	66.94%	301	416	72.36%	350	528	66.29%
South Atlantic	454	12.60%	257	382	67.28%	231	331	69.79%	263	412	63.83%
West North Central	600	16.65%	339	495	68.48%	303	395	76.71%	402	544	73.90%
West South Central	99	2.75%	57	82	69.51%	53	73	72.60%	63	90	70.00%
<b>Hypertension</b>											
No	1,528	42.41%	820	1,237	66.29%	704	978	71.98%	926	1,354	68.39%
Yes	2,075	57.59%	1,205	1,771	68.04%	1,102	1,497	73.61%	1,252	1,866	67.10%
<b>Myocardial Infarction/HeartAttack</b>											
No	3,233	89.73%	1,809	2,693	67.17%	1,613	2,213	72.89%	1,951	2,893	67.44%
Yes	370	10.27%	216	315	68.57%	193	262	73.66%	227	327	69.42%
<b>Angina Pectoris or CAD</b>											
No	3,061	84.96%	1,710	2,544	67.22%	1,494	2,057	72.63%	1,843	2,725	67.63%
Yes	542	15.04%	315	464	67.89%	312	418	74.64%	335	495	67.68%

Table 5, continued Characteristics of the Respondents Who Participated in the 2000 and 2002 Medicare HOS Surveys and 2002 CAHPS Survey and Associated Experience of Care Ratings (n = 3,603)											
2002 Characteristics	Number of Enrollees	Percent of Sample	Rating of Doctor/Nurse <sup>1</sup>			Rating of Health Care <sup>1</sup>			Rating of Health Plan <sup>1</sup>		
			Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent
<b>Stroke</b>											
No	3,308	91.81%	1,853	2,770	66.90%	1,666	2,280	73.07%	2,004	2,972	67.43%
Yes	295	8.19%	172	238	72.27%	140	195	71.79%	174	248	70.16%
<b>Any Non-Skin Cancer</b>											
No	3,046	84.54%	1,702	2,520	67.54%	1,482	2,039	72.68%	1,841	2,709	67.96%
Yes	557	15.46%	323	488	66.19%	324	436	74.31%	337	511	65.95%
<b>Diabetes</b>											
No	2,991	83.01%	1,670	2,496	66.91%	1,478	2,024	73.02%	1,814	2,674	67.84%
Yes	612	16.99%	355	512	69.34%	328	451	72.73%	364	546	66.67%
<b>Emphysema/Asthma/COPD*</b>											
No	3,120	86.59%	1,752	2,606	67.23%	1,547	2,116	73.11%	1,902	2,799	67.95%
Yes	483	13.41%	273	402	67.91%	259	359	72.14%	276	421	65.56%

<sup>1</sup> Each of the three global ratings was defined as a binary variable representing ratings of 9-10 or 0-8

<sup>2</sup> Number of respondents who gave a rating of 9 or 10 on a 0-10 scale measure ranging from 0=worst possible to 10=best possible

<sup>3</sup> Number of respondents who provided responses on the rating question

595, 1,128 and 383 respondents had missing data on ratings of doctor/nurse, rating of health care, and rating of health plan, respectively.

\* chronic obstructive pulmonary disease

**Table 6**  
**Relationship between Tertiles of PCS, MCS, Bodily Pain, and Limitations in ADLs at Baseline and Associated Experience of Care Ratings**

Tertiles of Health Status at Baseline	Number of Enrollees	Percent of Sample	Rating of Doctor/Nurse <sup>1</sup>			Rating of Health Care <sup>1</sup>			Rating of Health Plan <sup>1</sup>		
			Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent
<b>PCS</b>											
11.51 to 38.56	1,201	33.33%	656	992	66.13%	618	873	70.79%	697	1,063	65.57%
38.57 to 50.82	1,201	33.33%	680	1,007	67.53%	600	828	72.46%	740	1,078	68.65%
50.82 to 67.62	1,201	33.33%	689	1,009	68.29%	588	774	75.97%	741	1,079	68.67%
Chi-square statistic (df, p)			1.09 (df=2, p=0.581)			5.74 (df=2, p=0.057)			3.11 (df=2, p=0.211)		
<b>MCS</b>											
0.46 to 51.41	1,201	33.33%	643	973	66.08%	580	838	69.21%	636	1,048	60.69%
51.42 to 58.38	1,201	33.33%	667	1,011	65.97%	620	833	74.43%	762	1,088	70.04%
58.38 to 72.25	1,201	33.33%	715	1,024	69.82%	606	804	75.37%	780	1,084	71.96%
Chi-square statistic (df, p)			4.43 (df=2, p=0.109)			9.25 (df=2, p=0.0098)			35.23 (df=2, p<0.0001)		
<b>Bodily Pain Subscale</b>											
19.93 to 41.77	1,297	36.00%	711	1,071	66.39%	688	958	71.82%	745	1,153	64.61%
42.19 to 51.61	1,129	31.33%	627	961	65.24%	538	776	69.33%	668	1,019	65.55%
52.04 to 62.75	1,177	32.67%	687	976	70.39%	580	741	78.27%	765	1,048	73.00%
Chi-square statistic (df, p)			6.49 (df=2, p=0.039)			16.43 (df=2, p=0.0003)			20.584 (df=4, p<0.0001)		
<b>Number of ADLs without limitations</b>											
0 to 5	1,330	37.08%	717	1,107	64.77%	670	968	69.21%	748	1,168	64.04%
6	2,257	62.92%	1,299	1,888	68.80%	1,129	1,498	75.37%	1,418	2,037	69.61%
Chi-square statistic (df, p)			5.16 (df=1, p=0.023)			11.28 (df=1, p=0.0008)			10.52 (df=1, p=0.0012)		

<sup>1</sup> Each of the three global ratings was defined as a binary variable representing ratings of 9-10 or 0-8

<sup>2</sup> Number of respondents who gave a rating of 9 or 10 on a 0-10 scale measure ranging from 0=worst possible to 10=best possible

<sup>3</sup> Number of respondents who provided the responses on the rating question

595, 1,128 and 383 respondents had missing data on rating of doctor/nurse, rating of health care, and rating of health plan, respectively



**Table 7**  
**Relationship between Tertiles of PCS, MCS, Bodily Pain, and Limitations in ADLs at Follow Up and Associated Experience of Care Ratings**

Tertiles of Health Status at Follow-Up	Number of Enrollees	Percent of Sample	Rating of Doctor/Nurse <sup>1</sup>			Rating of Health Care <sup>1</sup>			Rating of Health Plan <sup>1</sup>		
			Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent	Numerator <sup>2</sup>	Denominator <sup>3</sup>	Percent
<u>PCS</u>											
8.43 to 35.70	1,201	33.33%	660	1,009	65.41%	629	891	70.59%	697	1,060	65.75%
35.73 to 49.34	1,202	33.36%	678	993	68.28%	604	831	72.68%	738	1,077	68.52%
49.34 to 65.97	1,200	33.31%	687	1,006	68.29%	573	753	76.10%	743	1,083	68.61%
Chi-square statistic (df, p)			2.52 (df=2,p=0.284)			6.31 (df=2, p=0.043)			2.57 (df=2, p=0.277)		
<u>MCS</u>											
12.93 to 50.64	1,201	33.33%	634	961	65.97%	543	810	67.04%	665	1,045	63.64%
50.65 to 58.34	1,201	33.33%	662	1,022	64.77%	626	862	72.62%	729	1,096	66.51%
58.34 to 72.81	1,201	33.33%	729	1,025	71.12%	637	803	79.33%	784	1,079	72.66%
Chi-square statistic (df, p)			10.54 (df=2,p=0.005)			30.96 (df=2, p<0.0001)			20.71 (df=2, p<0.0001)		
<u>Bodily Pain Subscale</u>											
19.93 to 37.91	1,205	33.44%	659	1,009	65.31%	615	885	69.49%	683	1,070	63.83%
41.34 to 51.61	1,315	36.50%	716	1,089	65.75%	665	910	73.08%	812	1,180	68.81%
52.04 to 62.75	1,083	30.06%	650	910	71.43%	526	680	77.35%	683	970	70.41%
Chi-square statistic (df, p)			10.05 (df=2,p=0.007)			12.06 (df=2, p=0.002)			11.24 (df=2, p=0.004)		
<u>Number of ADLs without limitations</u>											
0 - 4	953	26.45%	499	770	64.81%	465	671	69.30%	506	815	62.09%
5	553	15.35%	329	477	68.97%	285	390	73.08%	348	502	69.32%
6	2,097	58.20%	1,197	1,761	67.97%	1,056	1,414	74.68%	1,324	1,903	69.57%
Chi-square statistic (df, p)			3.15 (df=2,p=0.207)			6.69 (df=2, p=0.035)			15.39 (df=2, p=0.0005)		

<sup>1</sup> Each of the three global ratings was defined as a binary variable representing ratings of 9-10 or 0-8

<sup>2</sup> Number of respondents who gave a rating of 9 or 10 on a 0-10 scale measure ranging from 0=worst possible to 10=best possible

<sup>3</sup> Number of respondents who provided the responses on the rating question

595, 1,128 and 383 respondents had missing data on rating of doctor/nurse, rating of health care, and rating of health plan, respectively

**Table 8**  
**Multivariate Logistic Regression Models of the Relationship between Changes in Health Status (2000 - 2002)**  
**and Experience of Care Ratings**

Health Status Measure <sup>a</sup>	2002 Rating of Doctor/Nurse <sup>d</sup> (n=3,008)		2002 Rating of Health Care <sup>d</sup> (n=2,475)		2002 Rating of Health Plan <sup>d</sup> (n=3,220)	
	Adjusted Odds Ratio <sup>e,f</sup> (95% Confidence Interval)		Adjusted Odds Ratio <sup>e,f</sup> (95% Confidence Interval)		Adjusted Odds Ratio <sup>e,f</sup> (95% Confidence Interval)	
	Models controlling for health status at baseline	Models controlling for health status at follow up	Models controlling for health status at baseline	Models controlling for health status at follow up	Models controlling for health status at baseline	Models controlling for health status at follow up
Changes in PCS <sup>b</sup>	1.01 (1.00,1.02)*	1.00 (0.99,1.01)	1.02 (1.00,1.03)*	1.00 (0.99,1.01)	1.01 (1.00,1.02)	0.99 (0.98,1.00)
Changes in MCS <sup>b</sup>	1.01 (1.00,1.02)*	0.99 (0.98,1.00)	1.02 (1.01,1.03)***	0.99 (0.98,1.00)	1.01 (1.00,1.02)**	0.98 (0.97,0.99)***
Changes in Bodily Pain <sup>b</sup>	1.01 (1.00,1.02)*	1.00 (0.99,1.00)	1.02 (1.01,1.03)***	1.00 (0.98,1.01)	1.01 (1.00,1.02)*	0.99 (0.98,0.99)**
Changes in ADLs Function <sup>c</sup>	1.03 (0.96,1.10)	0.92 (0.85,0.99)*	1.09 (1.01,1.18)*	0.96 (0.88,1.04)	1.10 (1.03,1.17)**	0.91 (0.84,0.97)**

<sup>a</sup> All models control for age group, gender, race, educational level, marital status, smoking status, Medicaid dual eligibility, census region of residence, and presence of hypertension, myocardial infarction, angina pectoris or coronary artery disease, stroke, non-skin cancer, diabetes, and emphysema/asthma/COPD

<sup>b</sup> Change = standardized norm-based score at remeasurement period - standardized norm-based score at the baseline period  
 Norm-based score was calculated based on the 1998 US General Population

For the measure of changes in ADL function, the sample size for ratings of doctor/nurse, health care, and health plan are 2951, 2428, and 3158, respectively

<sup>c</sup> Change = number of ADL activities with no limitation in the remeasurement period - number of ADL activities with no limitations in the baseline period

<sup>d</sup> Each of the three global ratings was defined as a binary variable representing ratings of 9-10 or 0-8

<sup>e</sup> Adjusted odds ratios reflect the change in the odds of having high (9-10) ratings relative to low (0-8) ratings with a 1-point change in PCS, MCS,

the bodily pain subscale, or 1-unit change in number of ADLs with no limitations, holding other covariates constant

<sup>f</sup> The adjusted odds ratio associated with changes in PCS, MCS, bodily pain, or number of limitation in ADLs function for some amount of changes greater than 1 point or 1 unit (e.g. c=5 units), is derived by raising the adjusted odd ratio associated with a unit change to the power of 5 if c=5 units

\* p < 0.05; \*\* p < 0.01, \*\*\* p < 0.001

<b>Table 9</b>					
<b>Comparison of Demographic and Selected Studied Characteristics Between Medicare Managed Care HOS 2000-2002 Survey Sample and the Managed Care Analytic Sample</b>					
<b>2002 Characteristics<sup>a</sup></b>	<b>HOS 2000-2002 Managed Care Respondents (n=52,424)</b>		<b>CAHPS +HOS Managed Care Analytic Sample (n=3,603)</b>		<b>Effect Size</b>
	<b>Number of Enrollees</b>	<b>Percent of Samples</b>	<b>Number of Enrollees</b>	<b>Percent of Samples</b>	
<u>Age Group<sup>b</sup></u>					
65-69	6,810	12.99%	470	13.04%	0.002
70-74	17,004	32.44%	1,262	35.03%	0.055
75-79	14,036	26.77%	939	26.06%	0.016
80-84	9,059	17.28%	567	15.74%	0.042
85+	5,515	10.52%	365	10.13%	0.013
<u>Gender<sup>b</sup></u>					
Female	30,459	58.10%	2,092	58.06%	0.001
Male	21,965	41.90%	1,511	41.94%	0.001
<u>Race<sup>b</sup></u>					
Black	2,782	5.31%	146	4.05%	0.060
Hispanic	712	1.36%	40	1.11%	0.022
White	47,505	90.62%	3,355	93.12%	0.092
Other/Unknown	1,425	2.72%	62	1.72%	0.068
<u>Education</u>					
8th Grade or less	5,794	11.05%	468	12.99%	0.060
Some High School	8,302	15.84%	532	14.77%	0.030
High School	19,465	37.13%	1,383	38.38%	0.026
Some College	11,282	21.52%	766	21.26%	0.006
College	3,670	7.00%	222	6.16%	0.034
> 4 year College	3,911	7.46%	232	6.44%	0.040
<u>Marital Status</u>					
Married	30,040	57.30%	2,102	58.34%	0.021
Never Married	1,407	2.68%	104	2.89%	0.012
Divorced/Separated/Widowed	20,977	40.01%	1,397	38.77%	0.025
<u>Smoking Status</u>					
Non-smoker	47,318	90.26%	3,235	89.79%	0.016
Smoker	5,106	9.74%	368	10.21%	0.016
<u>Proxy Responses</u>					
No	43,220	82.44%	3,011	83.57%	0.030
Yes	5,778	11.02%	356	9.88%	0.037
Unknown	3,426	6.54%	236	6.55%	0.001
<u>Medical Dual Eligibility<sup>b</sup></u>					
No	50,632	96.58%	3,459	96.00%	0.031
Yes	1,792	3.42%	144	4.00%	0.031
<u>Census Region<sup>b</sup></u>					
East North Central	8,178	15.60%	766	21.26%	0.146
East South Central	2,021	3.86%	85	2.36%	0.087
Middle Atlantic	7,867	15.01%	301	8.35%	0.209
Mountain	5,809	11.08%	449	12.46%	0.043
New England	2,675	5.10%	254	7.05%	0.082
Pacific	12,318	23.50%	595	16.51%	0.175
South Atlantic	5,631	10.74%	454	12.60%	0.058
West North Central	4,693	8.95%	600	16.65%	0.233
West South Central	3,232	6.17%	99	2.75%	0.169

**Table 9, continued**  
**Comparison of Demographic and Selected Studied Characteristics Between Medicare Managed Care HOS 2000-2002 Survey Sample and the Managed Care Analytic Sample**

	HOS 2000-2002 Managed Care Respondents (n=52,424)		CAHPS +HOS Managed Care Analytic Sample (n=3,603)		Effect Size
	Number of Enrollees	Percent of Samples	Number of Enrollees	Percent of Samples	
<u>Presence of Selected Comorbid Conditions</u>					
Hypertension	30,553	58.28%	2,075	57.59%	0.014
Myocardial Infarction/HeartAttack	5,852	11.16%	370	10.27%	0.029
Angina Pectoris or CAD	8,394	16.01%	542	15.04%	0.027
Stroke	4,652	8.87%	295	8.19%	0.025
Any Non-Skin Cancer	8,176	15.60%	557	15.46%	0.004
Diabetes	9,518	18.16%	612	16.99%	0.031
Emphysema/Asthma/COPD	7,038	13.43%	483	13.41%	0.001
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Effect Size</b>
Mean PCS at Baseline	43.35	11.22	43.45	11.27	0.008
Mean PCS at Follow-up	41.76	11.50	41.77	11.54	0.001
Mean Change in PCS	-1.59	8.57	-1.67	8.48	-0.009
Mean MCS at Baseline	52.72	9.75	52.72	9.61	0.000
Mean MCS at Follow-up	52.06	10.25	52.29	10.00	0.022
Mean Change in MCS	-0.66	9.40	-0.43	9.32	0.024

<sup>a</sup> Demographic and other characteristics were derived from the HOS survey

<sup>b</sup> Information was derived from the Medicare Enrollment Database

<sup>\*</sup> Denotes small effect size (0.20 - 0.49) for differences between HOS sample and analytic sample

<b>Table 10 Comparison of Demographic and Selected Studied Characteristics Between Medicare Managed Care CAHPS 2002 Survey Sample and the Managed Care Analytic Sample</b>					
<b>2002 Characteristics<sup>a</sup></b>	<b>CAHPS 2002 Managed Care Sample (n=172,769)</b>		<b>CAHPS +HOS Managed Care Analytic Sample (n=3,603)</b>		<b>Effect Size</b>
	<b>Number of Enrollees</b>	<b>Percent of Sample</b>	<b>Number of Enrollees</b>	<b>Percent of Sample</b>	
<u>Age Group<sup>b</sup></u>					
65-69	36,302	21.01%	470	13.04%	0.213 *
70-74	48,980	28.35%	1,262	35.03%	0.144
75-79	39,933	23.11%	939	26.06%	0.068
80-84	27,123	15.70%	567	15.74%	0.001
85+	20,431	11.83%	365	10.13%	0.054
<u>Gender<sup>b</sup></u>					
Female	101,569	58.79%	2,092	58.06%	0.015
Male	71,200	41.21%	1,511	41.94%	0.015
<u>Race</u>					
Black	10,089	5.84%	114	3.16%	0.130
White	120,716	69.87%	3,063	85.01%	0.367 *
Other/Unknown	41,964	24.29%	426	11.82%	0.329 *
<u>Hispanic Origin</u>					
No	120,558	69.78%	2,971	82.46%	0.300 *
Yes	9,213	5.33%	141	3.91%	0.068
Unknown	42,998	24.89%	491	13.63%	0.288 *
<u>Education</u>					
8th Grade or less	16,532	9.57%	383	10.63%	0.035
Some High School	23,418	13.55%	496	13.77%	0.006
High School	49,165	28.46%	1,256	34.86%	0.138
Some College	26,609	15.40%	661	18.35%	0.079
College	8,997	5.21%	198	5.50%	0.013
> 4 year College	9,435	5.46%	214	5.94%	0.021
Unknown	38,613	22.35%	395	10.96%	0.310 *
<u>Smoking Status</u>					
Non-smoker	119,303	69.05%	2,859	79.35%	0.236 *
Smoker	13,257	7.67%	310	8.60%	0.034
Unknown	40,209	23.27%	434	12.05%	0.298 *
<u>Proxy Responses</u>					
No	96,472	55.84%	2,642	73.33%	0.368 *
Yes	15,815	9.15%	298	8.27%	0.031
Unknown	60,482	35.01%	663	18.40%	0.380 *
<u>Medical Dual Eligibility<sup>b</sup></u>					
No	164,137	95.00%	3,454	95.86%	0.041
Yes	8,632	5.00%	149	4.14%	0.041
<u>Census Region<sup>b</sup></u>					
East North Central	23,963	13.87%	766	21.26%	0.195
East South Central	5,394	3.12%	85	2.36%	0.047
Middle Atlantic	31,117	18.01%	301	8.35%	0.290 *
Mountain	14,479	8.38%	449	12.46%	0.134
New England	9,825	5.69%	254	7.05%	0.056
Pacific	41,072	23.77%	595	16.51%	0.182
South Atlantic	25,005	14.47%	454	12.60%	0.055
West North Central	12,698	7.35%	600	16.65%	0.292 *
West South Central	9,216	5.33%	99	2.75%	0.133

<b>Table 10, continued</b>					
<b>Comparison of Demographic and Selected Studied Characteristics Between Medicare Managed Care CAHPS 2002 Survey Sample and the Managed Care Analytic Sample</b>					
	<b>CAHPS 2002 Managed Care Sample (n=172,769)</b>		<b>CAHPS +HOS Managed Care Analytic Sample (n=3,603)</b>		<b>Effect Size</b>
	<b>Number of Enrollees</b>	<b>Percent of Sample</b>	<b>Number of Enrollees</b>	<b>Percent of Sample</b>	
<u>Rating of Doctor or Nurse</u>					
Low (0-8)	44,286	35.24%	983	32.68%	0.054
High (9-10)	81,386	64.76%	2,025	67.32%	0.054
Total Excluding Missing	125,672		3,008		
<u>Rating of Health Care</u>					
Low (0-8)	33,655	32.38%	669	27.03%	0.117
High (9-10)	70,279	67.62%	1,806	72.97%	0.117
Total Excluding Missing	103,934		2,475		
<u>Rating of Health Plan</u>					
Low (0-8)	53,507	40.16%	1,042	32.36%	0.162
High (9-10)	79,727	59.84%	2,178	67.64%	0.162
Total Excluding Missing	133,234		3,220		0.000
<u>General Health</u>					
Excellent/Very Good	42,412	30.89%	954	29.26%	0.035
Good	53,829	39.21%	1,318	40.43%	0.025
Fair/Poor	41,056	29.90%	988	30.31%	0.009
Total Excluding Missing	137,297		3,260		0.000
<u>Mental Health</u>					
Excellent/Very Good	82,937	60.47%	1,964	60.39%	0.002
Good	39,212	28.59%	972	29.89%	0.029
Fair/Poor	15,005	10.94%	316	9.72%	0.040
Total Excluding Missing	137,154		3,252		
<u>Health Compared to One year Ago</u>					
Much Better/Better	24,916	18.15%	463	14.24%	0.106
Same	86,977	63.36%	2,125	65.34%	0.041
Much Worse/Worse	25,378	18.49%	664	20.42%	0.049
Total Excluding Missing	137,271		3,252		

<sup>a</sup> Demographic and other characteristics were derived from the CAHPS survey

<sup>b</sup> Information was derived from the Medicare Enrollment Database

\* Denotes small effect size (0.20 - 0.49) for differences between total HOS sample and analytic sample