

Socioeconomic Disparities in the Use of Home Health Services in a Medicare Managed Care Population

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Objective. To investigate socioeconomic disparities in access to home health visits and durable medical equipment by persons enrolled in two Medicare managed care health plans.

Data Sources. A telephone survey of 4,613 Medicare managed care enrollees conducted between April and October of 2000 and linked to administrative claims for a subsequent 12-month period.

Study Design. We estimated a series of logistic regression models to determine which socioeconomic factors were related to home health visits and the use of durable medical equipment (DME) among Medicare managed care enrollees.

Principal Findings. Controlling for health and demographic differences, Medicare managed care enrollees in the lowest tertile for nonhousing assets had 50 percent greater odds than those in the highest tertile of having one or more home health visits. All else equal, enrollees with less than a high school education had 30 percent lower odds than those who had graduated from high school of using durable medical equipment.

Conclusions. Medicare managed care enrollees of low socioeconomic status do not appear to have reduced access to home health visits; however, use of durable medical equipment is considerably lower for enrollees with less than a high school education. Physicians and therapists working with Medicare managed care enrollees may want to actively target DME prescriptions to those with educational disadvantages.

Key Words. Home health, durable medical equipment (DME), Medicare, access to care, managed care, health maintenance organization (HMO)

Home health care services are a critical part of both the long-term and acute care continuums for older Americans covered by Medicare. Use of the term “home health care” is inconsistent but often includes skilled nursing visits, home health aide visits, and various therapy services (e.g., physical, occupational, speech) delivered in a patient’s home. The term may also be extended, although less frequently, to include expenditures for durable medical equipment (DME) used in the home.

Although few studies of Medicare DME utilization have been conducted, analyses of home health care often demonstrate such services to be

cost-effective and lead to better outcomes than many alternative venues of care (Chen, Kane, and Finch 2000). Home health care is associated with reduced hospital stays for patients with certain conditions (Shepperd et al. 1998; Stewart et al. 1998; Mayo et al. 2000; Anderson, Rubenach et al. 2000; Anderson, Mhurchu et al. 2000; Hughes et al. 1997); and may reduce overall care costs without compromising clinical outcomes (Cummings et al. 1990; Hughes et al. 1992; Cotton et al. 2000; Skwarska et al. 2000; Stewart et al. 1998; Landefeld and Hanus 1993; von Koch et al. 2001; Mayo et al. 2000; Anderson, Rubenach et al. 2000; Anderson, Mhurchu et al. 2000). Home health care can lower the risk of functional decline and institutionalization (Martin, Oyewole, and Moloney 1994; Fabacher et al. 1994; Mayo et al. 2000; Hansen, Spedtsberg, and Schroll 1992; Stuck et al. 2002). In addition, patients usually prefer home health care over inpatient or skilled nursing care as long as the home care services can meet their needs (Cummings et al. 1990; Hughes et al. 1992).

Despite these important advantages, several studies have shown that access to home health visits has not been uniform. Income exhibits a U-shaped relationship with home health care, with higher usage among the poorest and wealthiest (Kemper 1992; Logan and Spitze 1994; Stoller and Cutler 1993; Coughlin et al. 1992; Stum, Bauer, and Delaney 1996; Liu, Manton, and Aragon 2000). Results with respect to Medicaid status have been mixed, with Kemper (1992) showing no relationship and Coughlin et al. (1992) finding Medicaid eligibility improves access to home health care. Education also appears to be related to access, with lower educated seniors less likely to use paid care at home and more likely to report unmet need with respect to home health use following hospital discharge (Solomon et al. 1993; Bowles, Naylor, and Foust 2002).

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With respect to device use, far fewer studies have considered economic resources. The few studies that have considered such information generally fail to show a relationship between income and device use (Norburn et al. 1995; Zimmer and Chappell 1994) and between education and device use (Agree 1999; Norburn et al. 1995; Logan and Spitze 1994; Zimmer and Chappell 1994). However, two recent studies of mobility devices suggest income does facilitate the purchase of such equipment (Mathieson, Kronenfeld, and Keith 2002) and education facilitates its use alone or in combination with formal home care services (Agree, Freedman, and Sengupta 2004).

These studies largely ignore, or exclude altogether, the growing Medicare managed care population, now numbering 20 percent of Medicare enrollees (Hileman et al. 2002). Although disagreement exists regarding which payment scheme yields better outcomes (Holtzman, Chen, and Kane 1998; Adams, Kramer, and Wilson 1995; Shaughnessy, Schlenker, and Hittle 1994a; Experton et al. 1997), several recent studies suggest that Medicare managed care home health users receive fewer home health visits and incur lower home health expenses than users in the traditional Medicare plan (Shaughnessy, Schlenker, and Hittle 1994a, 1994b; Schlenker, Shaughnessy, and Hittle 1995; Experton et al. 1997). Such differences may be attributed in part to differential case mix; Shaughnessy et al. (1995), for example, show that among Medicare enrollees, health maintenance organization (HMO) home health users had fewer impairments than users in the traditional fee-for-service plan and were somewhat younger, less likely to be female, more likely to be married, more often living with a spouse, and more likely to receive informal care.

It remains unclear, however, whether access to home health care in managed care plans is equal across socioeconomic groups. One of the only studies to examine access disparities within managed care suggests that some vulnerable groups are more likely than other patients to report problems with access to home health care (Nelson et al. 1997). Notably, the only measure of socioeconomic status considered—having a low income—predicted home health access problems; however, these disparities were largely explained by differences across income groups in health-related factors.

Thus, the nature of the link between home health access and socioeconomic status within managed care has not been investigated. At least four pathways through which socioeconomic status may operate on home health and DME access in a managed care setting are: (1) socioeconomic status affects health status, which in turn influences utilization, (2) socioeconomic status, including home ownership, affects preferences for home care and various alternatives to home care, for example informal care versus more formal

residential care or nursing home settings, (3) as reflected in education, socioeconomic status influences the ability to navigate the managed care system and to adhere to treatment regimes, and (4) as reflected in income and liquid assets, socioeconomic status may influence the ability to pay out-of-pocket for care.

Because of these complexities, it remains unclear whether, on balance, poor socioeconomic status results in reduced access to home care within the managed care system. One might hypothesize that by requiring primary care physicians to make referrals to specialty care, managed care may lead to socioeconomic differences in access to care, particularly with respect to education. On the other hand, it is possible managed care plans because of their minimal copays and use of the home care benefit to transition individuals from the hospital to community, may minimize socioeconomic differences in benefit utilization in relation to income or wealth.

This article uses unique survey and administrative data from two Medicare managed care plans to examine socioeconomic differences in home health utilization in Medicare managed care. We define socioeconomic status broadly and include measures of education, income, and liquid and housing assets. We include as outcomes measures skilled nursing, therapies, and home health aide visits as well as durable medical equipment and control for a rich selection of health-related and demographic characteristics.

DATA AND METHODS

Setting

Data for this study came from a unique data collection effort that links survey and administrative data for individuals aged 65 and older enrolled in two Medicare managed care health plans. Both health plans in this study have Medicare risk contracts and participate in the Medicare+Choice program. Both plans are independent practice association (IPA)-model HMOs that contract with health care providers in their communities to create provider networks. One plan is located in a Northeastern metropolitan area, the other in the Midwest. Enrollees in both plans are required to select a primary care physician. The Northeastern plan requires enrollees to obtain referrals for specialty care whereas the Midwestern plan does not. At the time of the study, the copayment for an office visit was \$15 in the Northeast plan and \$10 in the Midwest plan. Other benefits were similar in both plans, and both provided limited coverage for prescription drugs. With respect to home health benefits,

both plans had no copay for home health visits, no visit limit, and a 20 percent coinsurance for durable medical equipment, the latter of which was subject to an annual \$500 out-of-pocket limit for all outpatient services in the Midwestern plan.

Study Sample

The target population for our study consisted of 20,227 Medicare beneficiaries aged 65 or older enrolled in the two study plans during January of 2000. Because our main goal was to assess the effect of socioeconomic status on utilization of services, we used stratified random sampling to increase the number of low-income enrollees in the study sample. For each study plan, one stratum consisted of enrollees who were dually eligible for Medicaid in addition to Medicare. The remaining enrollees in each plan were assigned to a low-income or high-income stratum based on their zip code of residence. Specifically, enrollees were assigned to the low-income stratum if they resided in a zip code where the majority of households had incomes less than twice the federal poverty line, according to the 1990 census.

We oversampled dually eligible beneficiaries and beneficiaries in the low-income strata, using sampling probabilities chosen to obtain roughly equal numbers of enrollees from each plan. The resulting initial sample consisted of 6,996 enrollees from the two plans, including 942 dually eligible enrollees, 700 enrollees who resided in low-income zip codes, and 5,354 enrollees who resided in high-income zip codes. A total of 528 enrollees in the initial study sample were ineligible because they were no longer enrolled in a study plan when they were contacted for the telephone survey. Of the remaining 6,468 enrollees, 4,613 completed the survey, for a 72 percent response rate.¹

Data Sources

The data sources for the study consisted of a telephone survey of plan enrollees (conducted between April and October of 2000) and administrative files from the study plans. The survey included modules on demographic and socioeconomic characteristics, health status, family and household structure, and lifetime experience with health insurance and health care.

The module on demographic and socioeconomic status obtained information on sex, race and ethnicity, educational attainment, household income, and household wealth. Wealth was calculated as the sum of the current worth of the following assets: real estate; checking and savings accounts; certificates

of deposits, government savings bonds, and treasury bills; Individual Retirement Accounts and Keogh plans; and stocks and mutual funds (see Smith 1995, 1997). Income was calculated as the sum of the reported amounts for 1999 from the following income sources: Social Security; Supplemental Security Income (SSI); retirement pensions; annuities, Keogh plans, or Individual Retirement Accounts (IRAs); wages and salaries; and other sources (e.g., savings accounts, stocks or mutual funds, other investments, and financial support from relatives or friends). To minimize nonresponse, a common problem in measuring income and wealth, respondents who reported they did not know the value of a particular source were asked a series of unfolding follow-up questions designed to place the value within a particular range (see Smith 1995 for details on this approach).

We assessed health status using comprehensive measures that were multidimensional and had distinct physical and mental components. The module elicited information on the presence of select chronic conditions (self-reported by whether a physician had ever told the respondent that they had a given condition) and recent symptoms in the last four weeks (i.e., persistent swelling in the feet or ankles, shortness of breath, persistent dizziness or light-headedness, persistent back pain, persistent headaches, severe fatigue or exhaustion, persistent wheezing or cough, unexplained weight loss of 10 lbs. or more, pain or swelling in any joints during the day, repeated indigestion or abdominal pain, or one or more falls). Physical and mental functioning were assessed using the 12-Item Health Survey from the Medical Outcomes Study (SF-12) along with a more detailed 10-item physical functioning scale from the 36-Item Health Survey (SF-36) (Ware et al. 1995; Ware, Kosinski, and Keller 1996).² The module on family and household structure elicited information on marital status, and number and sex of children.

The module on lifetime experience with health insurance and health care elicited information on respondents' cumulative years of insurance coverage before Medicare, whether they had a usual source of medical care before Medicare, and whether they ever belonged to an HMO before their current enrollment in a study plan.

The administrative data consisted of provider and facility claims billed to the health plan for all services provided to enrollees in the initial study sample for 12 months beginning with the month of the telephone interview. Skilled nursing, therapy, home health aide visits, and durable medical expenditures were identified from adjudicated claims based on the care delivery site and the Centers for Medicare and Medicaid Services Common Procedure Coding System codes. About 80 percent of enrollees remained in the plan for the full

12-month period; those who left the plan during the year did not differ significantly from those enrolled for the full 12-month period with respect to home health use and DME use, but they were less likely to be poor. Specifically, only 8.6 percent of beneficiaries who left the plans had annual incomes below the poverty line whereas 11.1 percent of beneficiaries who remained enrolled for the entire year did so ($p < .05$).

Regression Models

We present adjusted odds ratios (OR) from a series of logistic regression models to assess the effects of socioeconomic factors on the use of home health services and DME. We begin by introducing socioeconomic indicators as a group, then control for differences in health status, and finally control for additional demographic and health insurance related characteristics. Successive improvements in goodness of fit are assessed using nested chi-square tests based on the difference in -2 log likelihood. More detailed descriptions of the measures included in these models follow.

Dependent Variables. The dependent variables in the regression models were binary (dummy) variables that indicated receipt during the 12-month period following the interview of any home visit (including skilled nursing, home health aide, or skilled therapy visit) and any expenditures for durable medical equipment. We also examine descriptively the amount of expenditures for both home health visits and durable medical equipment, although limited sample sizes preclude our modeling expenditures for these outcomes.

Independent Variables. The main independent variables of interest relate to the socioeconomic status of enrollees and include the following indicators: living below the federal poverty threshold (an income below \$8,258 for one family unit households and \$10,408 for two family unit households); having at least a high school diploma or a G.E.D.; owning a home (defined as having any housing assets); and three categories of nonhousing assets based on percentiles of the distribution of nonhousing assets across the sample—0–33rd percentile (nonhousing assets of less than \$1,967), 33–67th percentile (\$1,967—\$34,452), and 67–100th percentile (\$34,453 or more). We examined several more detailed classifications of the variables reflecting socioeconomic status; however, we found the categories presented here represented the most important contrasts and were not significantly different from more detailed classifications. For 16 percent of respondents with missing information on nonhousing assets and 22 percent of respondent missing one

or more sources of income,³ we used the unfolding questions to impute a continuous measure from which we created percentiles.⁴

In addition, we control for health status at the beginning of the utilization period using four health-related indicators: the SF-12 MCS score, the 10-item physical functioning score from the SF-36, ever having been diagnosed with diabetes, or diagnosed with a fractured or broken hip, and a count of recent symptoms. For the SF-12 and physical health dimension of the SF-36, we used a regression-based model to impute information, most often the response to a single item, in less than 3 percent and 5 percent of cases, respectively.

We control for several demographic items including: sex; race (African American or not); three age categories (65–79, 80–84, ≥ 85); living with a spouse; having at least one living son; having at least one living daughter; having belonged to an HMO in the past; and having had health insurance none or only some of the time between ages 18 and 64. We also included an indicator distinguishing the Midwestern plan from the Northeast plan and controlled for the number of months enrolled in the year following the interview. These variables were generally missing for less than 1 percent of cases. Depending on the specific variable we either imputed the modal value or assigned information based on cross checks with other informative fields.

In additional analyses (not shown), we explored including Medicaid status as an independent variable but ultimately excluded this information for three reasons: first, Medicaid is highly correlated with income and asset status; and second, Medicaid was not a significant predictor of use when included in a model with other socioeconomic status indicators; and third, including the Medicaid indicator in the models did not change our findings with respect to other socioeconomic characteristics. In addition, we explored whether the socioeconomic effects we found were robust across plans (by introducing interactions between SES and plan) and found that they were. Consequently, only the main results are reported here.

Estimation. All descriptive statistics and model estimates have been weighted to reflect the complex design of the sample. The weights were developed using a two-step procedure. The first stage adjusts for the complex sampling design (to account for the differential probabilities of selection by plan—Northeast, Midwest) and socioeconomic status (Medicaid, low-income area, high-income area). The second stage adjusts for nonresponse using a 36-way stratification by plan, gender, age, and socioeconomic status. We used *STATA* to calculate descriptive statistics, model estimates, and associated statistical tests. Statistical tests take into account differential sampling (stratification) by plan and socioeconomic status.

RESULTS

Sample Characteristics

Characteristics of enrollees in the two Medicare managed care plans in this study are shown in Table 1, along with characteristics of all Medicare HMO and fee-for-service enrollees in 1999 based on national data from the Centers for Medicare and Medicaid Services (Centers for Medicare and Medicaid Services 1999). Enrollees in the two plans in this study are less likely to be African American and are more likely to be living without a spouse or partner. On other measures, such as education, poverty status, and sex and age distribution, the enrollees in the two plans match the national Medicare managed care population more closely.

Use of Home Health

Table 2 describes home health and DME utilization in the plans combined and in each of the plans separately. In the two plans combined, 10.8 percent of the Medicare managed care enrollees received at least one skilled nursing or home health aide visit and 5.8 percent received a therapy visit of some kind (occupational, physical, or speech). In total, 11.7 percent of the managed care enrollees had some type of home health visit over the course of the year.

Among those having one or more home health visit, the mean expenditure was \$907 and the mean number of visits was 15.5. A similar percentage (12.4 percent) of enrollees had an expenditure during the year for durable medical equipment (DME). The mean expenditure for DME among those using this benefit was \$749.

Comparing utilization across plans, the percentage of Medicare managed care enrollees receiving any visit was lower in the Midwestern plan than in the Northeastern plan (10.4 percent versus 12.3 percent, $p < .05$ for test of difference). Enrollees in the Midwestern plan were significantly less likely to have a skilled nursing or aid visit ($p < .05$) but among those receiving therapy, they received on average nearly twice as many therapy visits ($p < .05$). No statistically significant differences across plans were observed in the use of DME.

Socioeconomic Status and Home Health Utilization

The percentage of enrollees using home health and DME is shown by socioeconomic status for both plans combined in Table 3. For all measures of socioeconomic status we considered, enrollees of low socioeconomic status are significantly more likely than those of high socioeconomic status to have one or more home health visits. For example, 15.5 percent of plan enrollees

Table 1: Characteristics of Enrollees in Two Medicare Managed Care Plans

	Medicare		
	Plans A and B Mean (SD)/ Percentage (n = 4,613)	HMO enrollees Mean/ Percentage	FFS Mean/ Percentage
Income			
Percent living below the poverty threshold*	10.6	N/R	N/R
Percent with less than \$10,000 annual income	20.3	22.3 [†]	32.9 [†]
Assets			
Mean (SD) total household assets, excluding housing	\$61,457 (\$176,332)	N/R	N/R
Percent who do not own a home	37.7	N/R	N/R
Education			
Percent without a high school degree	38.2	32.0 [†]	35.0 [†]
Health			
Mean score (SD) on SF-36 Physical Health 10-item subscale	68.4 (30.1)	N/R	N/R
Mean score (SD) on SF-12 Mental Health 6-item summary scale	54.4 (9.6)	N/R	N/R
Mean number of symptoms experienced in past 4 weeks	1.6 (2.0)	N/R	N/R
Percent who have diabetes	17.5	17.2 [†]	17.3 [†]
Percent with a history of fractured or broken hip	3.4	N/R	N/R
Age			
Mean age, in years	74.7 (7.1)	N/R	N/R
Percent who are 75 to 84 years of age	37.4	34.1	36.4
Percent who are 80 to 84 years of age	14.1	N/R	N/R
Percent 85 and older	8.4	9.3	14.0
Sex			
Percent female	55.8	56.8	58.6
Race			
Percent African American	7.1	9.0	7.4
Family Structure			
Percent living with a spouse or partner	43.1	52.0 [†]	48.7 [†]
Percent who have at least one living adult son	73.1	N/R	N/R
Percent who have at least one living adult daughter	74.3	N/R	N/R
Health Insurance History			
Percent who lacked health insurance most or all of the time between age 18 and 64	15.7	N/R	N/R
Percent who have belonged to an HMO in the past	25.6	N/R	N/R
Design Variables			
Mean months (SD) of enrollment after interview months	11.0 (2.5)	N/A	N/A
Percent in Plan A (Midwest)	31.4	N/A	N/A

Source: Data on nationwide fee-for-service (FFS) and HMO beneficiary characteristics are from Centers for Medicare and Medicaid Services (CMS) analysis of the 1999 Medicare Current Beneficiary Survey (MCBS), available at <http://cms.hhs.gov/mcbs/CMSsrc/1999/sec6.pdf>

All Plan A and Plan B numbers are weighted. N/R = not reported. N/A = not applicable.

*\$8,258 for one-family-unit households and \$10,408 for two-family-unit households

[†]Includes disabled nonelderly Medicare beneficiaries.

Table 2: Home Health Utilization in Two Medicare Managed Care Plans

	<i>Plans A and B</i> (<i>n</i> = 4,613)	<i>Plan A</i> (<i>Midwest</i>) (<i>n</i> = 2,206)	<i>Plan B</i> (<i>Northeast</i>) (<i>n</i> = 2,407)
Any Visit (Skilled Nursing, Home Health Aide, or Therapy Visit)			
Percentage with any visit	11.7	10.4	12.3**
Mean number (SD) of visits	15.5 (24.4)	16.8 (22.4)	14.9 (23.3)
Mean expenditure (SD)	\$907 (\$1,488)	\$1,107 (\$1,542)	\$829 (\$1,379)**
Skilled Nursing or Home Health Aide Visit			
Percentage with any visit	10.8	9.1	11.6***
Mean number (SD) of visits	13.1 (23.2)	13.1 (19.3)	13.1 (22.4)
Mean expenditure (SD)	\$739 (\$1,408)	\$845 (\$1,331)	\$700 (\$1,337)
Therapy Visit (Occupational, Physical, or Speech)			
Percentage with any visit	5.8	6.2	5.6
Mean number (SD) of visits	6.7 (6.6)	9.0 (9.6)	5.6 (4.8)***
Mean expenditure (SD)	\$449 (\$454)	\$610 (\$678)	\$366 (\$317)***
Durable Medical Equipment (DME)			
Percentage with DME use	12.4	13.4	11.9
Mean expenditure (SD)	\$749 (\$1,679)	\$713 (\$1,368)	\$767 (\$1,649)

All numbers are weighted. The reported expenditures and number of visits are the means for those using said services and not the mean for all enrollees.

* $p < .10$;

** $p < .05$;

*** $p < .01$ for tests of differences across plans in utilization and expenditures.

living below poverty used home health in the course of a year whereas only 11.2 percent of those living above poverty did so ($p < .05$). A similar relationship is evident for DME, but for only two measures of socioeconomic status, having few assets (having the lowest tertile of nonhousing assets and not owning a home) and being dually eligible for Medicaid.

When all measures of socioeconomic status (except Medicaid eligibility for reasons discussed above) are placed simultaneously in a logistic regression model predicting home health visits (see Table 4), the amount of liquid (non-housing) assets emerges as the salient socioeconomic indicator. For example, enrollees in the lowest tertile of assets have nearly twice the odds of persons in the highest tertile of having one or more home health visits. Enrollees in the middle tertile or who do not own a home have roughly 1.5 times the odds of other persons of having a visit.

Controlling for health status substantially reduces the effect of assets on home health utilization (OR reduced to 1.40 from 1.97) but the relationship

Table 3: Home Health Use by SES Characteristics ($n = 4,613$)

<i>Enrollee Characteristic</i>	<i>Any Home Health Visits</i>	<i>Any DME Use</i>
Income		
Living below the poverty threshold	15.5%**	12.9%
Not living below the poverty threshold	11.2%	12.3%
Assets		
Lowest tertile of nonhousing assets	15.9%***	14.5%***
Mid-tertile of nonhousing assets	12.0%	13.3%
Top tertile of nonhousing assets	7.2%	9.3%
Does not own a home	15.4%***	14.6%***
Owens a home	9.4%	11.1%
Education		
No high school degree or G.E.D.	13.7%***	12.5%
High school degree or G.E.D.	10.4%	12.3%
Medicaid Eligibility		
Dual Medicare/Medicaid	16.5%***	19.8%***
Medicare only	11.5%	12.0%

All percentages are weighted.

* $p < .10$;

** $p < .05$;

*** $p < .01$.

remains significant. Note that the model with controls for health status fits significantly better than one without ($p < .01$ for difference between models). Adding additional variables representing demographic characteristics and a history of health insurance does not appreciably change the results, but improves the model fit ($p < .01$).

Other indicators that emerge as salient in predicting home health among Medicare managed care enrollees are age, physical and mental health, and plan (with enrollees from the Midwest having far lower likelihood of home health use all else equal).

When all measures of socioeconomic status that we considered are placed simultaneously in a logistic regression model predicting DME utilization (see Table 5), assets emerges as the salient socioeconomic indicator in a pattern similar to that found for home health visits. However, once we control for health status, assets are no longer a significant predictor, but having less than a high school education emerges as a significant barrier to having a DME expenditure. That is, an enrollee who has not graduated from high school has three-fourths the chances of someone who has graduated from high school of having a DME expenditure. This finding remains significant and of similar magnitude after controlling for demographic characteristics and insurance-

Table 4: Odds Ratio of Having One or More Home Health Visits ($n = 4,613$)

<i>Enrollee Characteristic</i>	<i>SES Only</i>	<i>SES+ Health</i>	<i>SES+ Health+ Demographic Characteristics</i>
Income			
Living below the poverty threshold	1.06	1.01	0.97
Assets			
Lowest tertile of nonhousing assets	1.97***	1.40**	1.42**
Mid-tertile of nonhousing assets	1.57***	1.28	1.23
Not owning a home	1.42***	1.17	1.03
Education			
Not having a high school degree or G.E.D.	1.12	0.95	0.88
Health			
Mean score on SF-36 Physical Health 10-item subscale		0.98***	0.98***
Mean score on SF-12 Mental Health 6-item summary scale		0.98***	0.98***
Mean number of symptoms experienced in past 4 weeks		1.07**	1.08**
Having diabetes		1.60***	1.64***
History of fractured or broken hip		1.74**	1.55*
Age			
Age 80 to 84			1.79***
Age 85 or older			1.93***
Sex			
Female			0.82
Race			
African American			1.17
Family Structure			
Living with a spouse or partner			0.80
One or more living sons			1.06
One or more living daughters			0.86
Health Insurance History			
Having lacked health insurance all or most of the time since age 18			1.22
Having belonged to an HMO in the past			1.07
Not knowing whether have belonged to an HMO in the past			0.83
Design Variables			
Months of enrollment after interview months			1.04
Midwestern HMO (Plan A)			0.66***
Log-likelihood	-1,620.6	-146.5	-1,446.2
χ^2 , d.f.		306.2***, 5	42.6***, 12

All numbers are weighted. Chi-squares (χ^2) and degrees of freedom (d.f.) are for the test between the model shown in the column and the model on the left.

* $p < .10$;

** $p < .05$;

*** $p < .01$.

Table 5: Odds Ratio of Having DME Expenditures ($n = 4,613$)

<i>Enrollee Characteristic</i>	<i>SES Only</i>	<i>SES+ Health</i>	<i>SES+ Health+ Demographic Characteristics</i>
Income			
Living below the poverty threshold	0.89	0.87	0.82
Assets			
Lowest tertile of nonhousing assets	1.60***	1.16	1.10
Mid-tertile of nonhousing assets	1.47***	1.22	1.18
Not owning a home	1.24**	1.02	0.98
Education			
Not having a high school degree or G.E.D.	0.90	0.76**	0.76**
Health			
Mean score on SF-36 Physical Health 10-item subscale		0.98***	0.98***
Mean score on SF-12 Mental Health 6-item summary scale		0.99**	0.99**
Mean number of symptoms experienced in past 4 weeks		1.07**	1.07**
Having diabetes		2.03***	2.07***
History of fractured or broken hip		0.87	0.82
Age			
Age 80 to 84			1.16
Age 85 or older			0.91
Sex			
Female			1.01
Race			
African American			0.87
Family Structure			
Living with a spouse or partner			0.82
One or more living sons			0.90
One or more living daughters			1.29**
Health Insurance History			
Having lacked health insurance all or most of the time since age 18			1.27*
Having belonged to an HMO in the past			1.05
Not knowing whether have belonged to an HMO in the past			0.67
Design Variables			
Months of enrollment after interview months			1.05*
Midwestern HMO (Plan A)			1.07
Log-likelihood	-1,772.0	-1,630.7	-1,621.8
χ^2 , d.f.		282.4***, 5	17.9, 12

All numbers are weighted. Chi-squares (χ^2) and degrees of freedom (d.f.) are for the test between the model shown in the column and the model on the left.

* $p < .10$;

** $p < .05$;

*** $p < .01$.

related history. Note that the model controlling for health status fits significantly better than one without ($p < .01$ for difference), although the addition of demographic variables does not improve model fit ($p > .10$).

Other factors that predict DME use include family structure (having one or more living daughters) and physical and mental health.

DISCUSSION

Consistent with the existing literature, we found that within two Medicare managed care plans there was significant use of the home health benefit. In the plans we examined 12 percent of Medicare managed beneficiaries received one or more home health visits in a 12-month period; in Nelson's national sample (1997) the figure was 8 percent and in a national sample of cancer patients, Freiman and Breen (1997) found 11 percent had one or more home health visit during the course of the year. Although we were unable to identify any studies for comparison, we also found equally substantial use of the plans' durable medical equipment benefit. More than 12 percent of beneficiaries had an expenditure, averaging \$750 among users in a 12-month period.

More importantly, perhaps, we found large differences according to socioeconomic status in the use of home health services. With respect to home health visits, the disparities favored those with the *least* financial resources at their disposal; that is, individuals with few assets were more likely to have a home health visit. Our findings are consistent with the hypothesis that, perhaps because of their minimal copays, Medicare managed care plans may minimize access difficulties for those of poor socioeconomic status, as measured by income or liquid assets.

Previous studies of Medicare managed care home health that have limited consideration of socioeconomic status to measures of income have missed these important nuances. For example, Nelson (1997) found income differentials in home health utilization in Medicare managed care were largely explained by differences in case mix. However, our analysis of home care use suggests that income differentials are minimal once assets are taken into account. Others have noted the importance in studying older populations when considering assets as a measure of socioeconomic status, since it reflects resources built up over the life course (Kington and Smith 1997).

Why high-wealth individuals are less likely to receive home health visits in the Medicare managed care plans we considered remains unclear. It may be that home health care through Medicare is considered in economic terminology to be an "inferior" good; that is, the more resources an individual has

the more likely he or she will seek other goods to meet their health care needs at home. It may be that wealthier individuals are choosing alternative living options such as assisted living or hiring private assistance outside of the Medicare benefits. A better understanding of the alternative sources of care in use by seniors enrolled in Medicare managed care would be a useful next step.

For durable medical equipment, education seems to be the more important measure of socioeconomic status to consider. We found that utilization of durable medical equipment gap favored the educated. That is, a lack of education appears to be a barrier within the managed care system, in this case impeding the adoption of medical equipment in the home. With one exception (Agree, Freedman, and Sengupta 2004), studies of the older population not limited to those enrolled in managed care fail to find such educational differences. We also can only speculate with the data at hand as to why enrollees with less than a high school education were less likely, all else equal, to have an expenditure for medical equipment. Others (Gitlin and Levine 1992) have noted the important role of the rehabilitation and physical therapist and physician in prescribing equipment and related assistive technologies, the latter of which is not covered by the Medicare DME benefit. Other significant factors that have been identified as related to the use of technology, and which may be correlated with education, include perceived stigma of device use, awareness of services, and involvement in device selection (Gitlin 1995). Hence, it may be that DME is less likely to be prescribed to individuals with low levels of education or that enrollees with lower levels of education are simply less likely to purchase such equipment when prescribed. Further studies are needed to more closely examine both the use of and barriers to the durable medical equipment benefit in Medicare managed care.

Our study focuses on only two Medicare managed plans and thus generalizability may be limited. The majority of Medicare managed care enrollees reside in three states—California, Florida, and Arizona—and our analysis was limited to plans in the Northeast and Midwest. Given the importance of regional differences in Medicare home health patterns (Centers for Medicare Services 2000), investigation of socioeconomic differentials in additional states is warranted. However, most of the reported HMO home health user characteristics in this managed care population—education, income, and demographic profile—are fairly consistent with what has been reported nationally (Centers for Medicare and Medicaid Services 1999). Moreover, our findings with respect to socioeconomic status were extremely robust across plans (available from authors upon request).

An additional limitation of this study is that we had insufficient sample size to fully investigate socioeconomic differences in the amount of home

health and DME utilization. The comparatively low number of visits we find among Medicare managed care enrollees is consistent with what has been reported previously (Brown et al. 1993; Shaughnessy, Schlenker, and Hittle 1994a; 1995). Shaughnessy, Schlenker, and Hittle (1994a; 1995), for example, found an average of 12.7 visits per user in the 60 days following admission or until discharge; we found across the two plans an average of 13.1 visits per user. A useful next step would be to extend the analysis of socioeconomic disparities beyond questions of access to appropriate levels of use.

A third limitation is that the enrollees we interviewed were clustered within particular physicians, providers, and health plans and these may be correlated with their socioeconomic status and utilization patterns. By design our survey included only two health plans, so clustering within plans could not be fully explored. We did investigate, however, whether results were robust across plans (by introducing interactions between plan and socioeconomic indicators) and found that they were. We were unable to investigate clustering by physician or provider in the current analysis. Future analyses should investigate utilization patterns by plan, provider, and primary care physician.

Despite these limitations, the findings from this study provide two insights for practitioners working with Medicare managed care enrollees. First, our findings suggest that the access problems like those identified in previous studies with respect to home health (Nelson et al. 1997) do not appear to differentially affect those of low-socioeconomic status. On the contrary, those with low lifetime accumulation of assets are more likely than others to have one or more home health visits, controlling for differences in health status and key demographic factors. Second, DME is not a rare benefit within the Medicare managed care population. To the contrary, similar proportions of seniors used the DME benefit as had a home health visit. Ensuring equal access for all seniors to medical equipment in the home will be an increasingly important goal as the array of technologies available in the home continues to expand. Physicians and therapists working with Medicare managed care enrollees may want to actively target DME prescriptions to those with educational disadvantages and follow-up with enrollees to ensure not only the purchase of, but also the proper fit and use of the equipment.

Finally, for those interested in continuing to monitor seniors' access to care within Medicare managed care plans, our findings suggest that income is not an adequate measure to tap socioeconomic disparities in home health utilization. Instead, we found that assets, which represent a lifetime of earnings, savings, and investment behavior and education level, were more important in predicting utilization in this population. Future studies of this group

should consider including both education and asset measures and adopting the bracketing response techniques described by Smith (1995) and applied here to minimize missing data.

NOTES

1. In 606 cases, respondents were unable to participate in the survey themselves and in those cases we allowed proxy respondents, most often a spouse or family member to respond.
2. Because of the importance of physical functioning—particularly limitations in activities of daily living and mobility—in predicting home health use, and the limited number of physical functioning items in the SF-12, we included in the survey instrument several additional items from SF-36, so that a more detailed 10-item physical functioning scale could be formed for this analysis (see Ware 1995; 1996 for statistical properties and scoring algorithms).
3. Missing data rates were extremely low for individual income and asset items. For example, missing data on exact asset amounts ranged from 3.7% for stocks and mutual funds to 10.6% for checking, savings, and money market accounts. For exact income amounts, missing data rates ranged from 0.3% for SSI to 5.2% for Social Security benefits of a spouse.
4. Respondents who did not provide a precise response to a question about their income from a particular source or the worth of a particular asset were asked a series of follow-up questions that enabled us to assign the response to a narrow range of values. Following Smith (1995; 1997) and others, we used information provided by respondents about the range of values for a particular source of income to impute an exact value within the given range. For those missing a bracket (generally less than 1% of the sample), we imputed an exact value based on OLS regression. We found in exploratory analyses that including flags in the models to indicate cases with imputed values did not change substantive findings.

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