UTILIZATION OF HOME HEALTH SERVICES AMONG RURAL MEDICARE BENEFICIARIES BEFORE AND AFTER THE PPS

Final Report

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EXECUTIVE SUMMARY

Objectives: In October 2000, Medicare transformed the reimbursement of home health agencies from a cost-based approach to a prospective, case-mix adjusted, fixed-price system. Under the prospective payment system (PPS), home health agencies receive a standardized payment amount for every 60-day episode of care. Although early evidence suggests that the PPS had a major effect on utilization, dramatically reducing total visits and altering the mix of nursing and therapy services, research has not explicitly examined how access in rural communities has been affected by the PPS. The study described in this report was conducted to gather information on the rural effects of the PPS, including whether the PPS contributed to changes in: (1) the demographic and clinical characteristics of home care users; (2) the likelihood of using each of six home care disciplines (aide, skilled nursing, physical therapy, occupational therapy, speech therapy and medical social work); and (3) the intensity of services.

***Methods*:** We compared patterns of home health use in 1997 and 2001, the period prior to and subsequent to the implementation of the PPS. To better ensure comparability across years, we constructed and analyzed episodes of care. Distinct from the home health episodes created under the PPS, we defined an episode as a home health admission that was preceded by a 60-day period without a home health visit and continued until a period of 60 days without a home health visit, an inpatient admission, or death occurred.

We used descriptive statistics to compare home health users in 1997 and 2001 in terms of the clinical and demographic characteristics. Using logistic regression, we estimated the odds that persons admitted to home health in 1997 and 2001 received care in each of six disciplines, adjusting for across-year differences in age, race, sex, dual eligibility status, major diagnostic category, Charlson Co-morbidity Index score and prior hospitalization. Odds ratios, which reflect the likelihood of receiving services in 2001 relative to 1997, are reported. Ordinary least squares regression was used to estimate PPS-related differences in total visits and visits for each service, adjusting for differences in the demographic and clinical characteristics of home health patients during the two periods which were studied.

All analyses were conducted separately for beneficiaries residing in rural and urban areas. We used a modified version of the Department of Agriculture Rural and Urban Continuum Codes (RUCC) to categorize patient residence in terms of location. Urban counties were designated as counties of any size that were located in a metropolitan area and rural counties were those located in non-metropolitan areas. We created rural subgroups by classifying non-metropolitan counties with an urban population of more than 2,500 (whether or not they were located adjacent to a metropolitan area) as a large rural county and those in which no place has a population larger than 2,500 as a remote rural county.

Key Findings: A total of 99,367 home health episodes were represented in the two years of Medicare data that we examined. In both study years, urban residents accounted for three-quarters of episodes, while residents of large rural counties and those of remote rural counties accounted for approximately 21 percent and 3 percent of episodes, respectively. Study results indicated an association between implementation of the PPS and admitting home health diagnoses, utilization and intensity of home care episodes and, for the subset of home health users admitted from an acute hospital, readmission rates.

- Differences in diagnoses of patients admitted in 1997 and 2001 were noted, with the proportion of home health users admitted for treatment of :
  - circulatory disorders declining by 12 percent in remote rural counties, 8 percent in large rural counties and 6 percent in urban counties;
  - musculoskeletal conditions increasing by about one-fifth in urban counties and by over one-quarter in both large and remote rural counties;
  - hypertensive disease declining by 43 percent in urban and 63 percent in all rural counties; and
  - diabetes increasing by about 13 percent in urban and large rural counties; differences in diabetes rates were not statistically significant in remote rural counties.

- The proportion of home health users with a prior hospitalization increased by between 11 and 12 percent in urban and large rural counties and by 14 percent in remote rural counties.

- Between 1997 and 2001, average length of and episode decreased by about one-fifth in urban, large and remote rural counties alike.

- Home health users residing in remote rural counties were nearly 2 times more likely to obtain home aide services and nearly 3 times more likely to obtain skilled nursing services in 1997 than in 2001.

- Among all rural home health users, the average number of aide visits declined by 56 percent and the average number of skilled nursing visits declined by about one-third.

- Irrespective of location, the odds of receiving physical therapy were higher in 2001 than in 1997; odds were about 43 percent higher for home health users in urban counties and about 64 percent higher for those in all rural counties.

- The average number of physical therapy visits in a home health episode declined modestly (by 9 percent for those in remote rural and 4 percent for those in large rural counties). The PPS had the greatest impact in urban counties, where physical therapy visits fell by almost one-fifth.

- Home health users in urban and remote rural counties were between 30 and 40 percent more likely to use occupational therapy services while those in large rural counties were almost 60 percent more likely to use occupational therapy in 2001.

- An approximately 20 percent and 15 percent reduction in the average number of occupational therapy visits was estimated among home health users in urban and large rural counties, respectively. Differences in the number of occupational therapy visits received by home health users in remote rural counties were not statistically significant.

- Relative to 1997, the odds that post-acute home health users would be readmitted to acute care were 36 percent higher for urban residents and 49 percent higher for residents of large rural counties. Although the odds that a post-acute home health user in a remote rural county would

be readmitted were 25 percent higher under the PPS, this finding was not significant at the 5 percent level.

Rural Implications of Results: Findings from this study suggest that the PPS has had a mixed effect on access to home care in rural counties. On the one hand, the PPS appears to have enhanced access to rehabilitative services (physical and occupational therapy) that, for many conditions, is necessary to maximize functional independence. On the other hand, the intensity of services, as measured by the number of visits (overall and for individual disciplines), declined significantly and access for patients with long-term needs, measured by the change in the proportion of patients admitted directly from the community, appears to be more restricted.

It is important to note that trends in access and utilization of home care services were not unique to one location; the PPS appears to have affected access and utilization of home care in rural counties in much the same manner and, in many cases, to the same magnitude as in urban counties. In some instances, such as access to physical and occupational therapy, the PPS appears to have assisted in narrowing the rural/urban gap that has historically existed. Nonetheless, the care of rural and urban home health users is not entirely comparable, rural home health users are still much less likely than their urban counterparts to receive therapy services.

Ultimately, judgment concerning the influence of the PPS on rural access to home care must be shaped by evidence on how the payment system has affected quality of care. To understand the impact of the PPS on quality, we examined trends in hospital readmissions among home health users with a prior acute care discharge. Suggestive that the PPS compromised quality, the odds of readmission increased in urban and large rural counties following enactment of the PPS. We observed no significant difference in the likelihood of readmission among remote rural home health users.

From this study, it is not obvious whether changes in utilization have actually had an effect on quality of care. The dramatic reduction in home care intensity, for instance, may have no effect on quality if, in fact, home care services were being over-utilized prior to the PPS. In such a case, decreased utilization could merely indicate that inefficiencies were eliminated from the system.

Moreover, an increase in readmissions could occur if post-acute patients admitted to home health in 2001 were more medically complex than those admitted to home health in 1997.
Many questions concerning the effect of the PPS on outcomes and quality of care remain. Future studies would benefit from the use of multi-dimensional measures of quality that incorporate both process and outcome measures.

Recognizing that the costs of providing home care in rural areas is higher than in other areas (due in part to higher travel and overhead costs) when it implemented the PPS Medicare incorporated an "add-on" payment that reimbursed agencies an additional amount whenever beneficiaries who resided in rural areas were treated. The add-on amount, which was initially set at 10 percent, ceased in 2003. The Medicare Modernization Act of 2003 reinstated the rural add-on at 5 percent. However, the rural add-on expired in March 2005. A National Association for HomeCare and Hospice (NAHC) study that used Medicare cost reports to examine profitability, estimated that for the period in which the rural add-on was not in place, rural home care agencies' Medicare margin averaged -10.4 percent (NAHC, 2003). An average margin of this magnitude suggests that many agencies could have been financially vulnerable during this period. To the extent that agencies depended on the add-on to cover the higher costs of caring for rural residents or that the add-on sustained agencies that would otherwise have been at the brink of closure, it is likely that access to home care would have been more restricted if this payment enhancement had not been in place. Whether or not the elimination of the add-on in 2005 will reverse any gains made between 1997 and 2001, lead to further reductions in intensity, and exacerbate rural access problems is not known. Data to address this issue is not yet available. Future research must examine the financial implications of the elimination of the rural add-on and the ramifications for home care access in order to ensure that the structure of the payment system does not have a disproportionate and negative impact on rural home health agencies and the population that they serve.

UTILIZATION OF HOME HEALTH SERVICES AMONG RURAL MEDICARE BENEFICIARIES BEFORE AND AFTER THE PPS

Introduction

The Balanced Budget Act (BBA) of 1997 mandated that the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services) implement a prospective payment system (PPS) to reign in home health expenditures following years of rapid growth. Reform of the home care payment system was conducted in two phases. The interim payment system (IPS), or the first phase, which was initiated in October 1997, lowered the per visit cap that was in place prior to the enactment of the BBA, and introduced a per-beneficiary cap which effectively limited an agency's reimbursement to its 1994 average beneficiary cost. The IPS was in place until October 2000 when CMS introduced the PPS.

The PPS transformed reimbursement of home health agencies from a cost-based approach to a prospective, case-mix adjusted, fixed-price system. Under the PPS, home health agencies receive a standardized payment amount for every 60-day episode of care (no restrictions are placed on the number of episodes a beneficiary may have). The case-mix adjustment system classifies patients into Home Health Episode Groups (HHEGs). Each HHEG is assigned a weight, based on the relative resource intensity of each case. When multiplied by the standardized prospective payment rate, the weight assigned to each HHEG determines the case-mix adjusted payment amount. Designation into an HHEG is made on the basis of clinical characteristics (e.g., diagnosis of an orthopedic, or neurological condition, or diabetes), functional characteristics (e.g., performance of activities of daily living), and utilization (e.g., receipt of ten or more occupational, physical and speech therapy visits).

Preliminary evidence indicates that the nature of and the characteristics of beneficiaries served by home care changed following the introduction of the PPS. Murtaugh et al (2003) noted changes in the diagnoses of patients using home care. Most notably, between 1997 and 2001, the proportion of home health users with an orthopedic diagnosis increased by 56.7 percent. Between 1997 and 2001, the proportion of patients with hypertensive disease and heart failure also fell by relatively large amounts. A 55.7 percent reduction in cases with hypertensive disease and a 27.4 percent reduction in cases with heart failure were observed. Using Medicare claims and records from the Outcome and Assessment Information Set (OASIS), a tool used to measure home health outcomes and for

risk adjustment, Schlenker et al (2005) also found that patients who received home care following implementation of the PPS were more likely to be clinically complex or to require therapy services.

The PPS was further associated with changes in the volume and mix of services provided to home health users. In its March 2004 report to Congress, the Medicare Payment Advisory Commission (MedPAC) noted that between 1999 and 2002 the proportion of visits in which home aide services were provided decreased from 35 percent to 23 percent. In contrast, the proportion of all home health visits in which skilled nursing was provided increased slightly, from 48 percent to 51 percent, and the proportion associated with therapy increased from 15 percent to 26 percent.

Studies have reported changes in the distribution of visits by home care discipline as well as changes in the intensity of care. Murtaugh et al (2003) reported that between 1997 and 2001 the average number of aide visits among Medicare home health users declined by 79.2 percent. During the same period, the average number of skilled visits, which includes nursing, physical and other types of therapy, declined from an average of 40.5 visits to 23.6 visits, 41.7 percent. Despite the overall reduction in utilization of skilled services, not all disciplines were equally affected; between 1997 and 2001 a slight increase (3.3 percent) in the number of physical therapy visits were found.

Although this early evidence suggests that the PPS had a major effect on patterns of home care utilization, to date there is limited empirical evidence to indicate how the prospective payment system has affected access to home care in rural communities. One of the few studies to examine the effect of Medicare reimbursement on rural home health beneficiaries (Schwartz et al., 2002) surveyed 83 rural home care administrators in Pennsylvania to inquire about how the PPS has affected their agency. Among the study's findings, a majority of administrators (59 percent) reported that due to financial constraints imposed by the PPS, agencies experience greater difficulty in serving particular groups of patients. Of particular note, patients needing wound care, those with congestive heart failure, and those with complex medical conditions were reported to be among the most difficult to serve. Among the other changes noted by survey respondents, about 54 percent of rural administrators indicated that the total number of visits declined following implementation of the PPS. About 51 percent of agency administrators indicated that the number of therapy service provided has increased and 60 percent indicated that the number of aide visits declined.

The study described in this report was conducted to gather empirical information on how rural home health users were affected by the home health prospective payment system. Analyses were designed to determine whether the PPS contributed to changes in: (1) the characteristics of patients using home care services; (2) the likelihood of using selected home care disciplines (e.g., skilled nursing services, physical therapy); and (3) the intensity of services.

Methods

We examined patterns of utilization of home care at two points in time, 1997 and 2001, the period prior and subsequent to home care payment reform, in order to generate inferences about the combined effects of the IPS and PPS on home health use. Data to conduct this study were obtained primarily from the 5 percent samples of the 1997 and 2001 Medicare Home Health Standard Analytical Files. We linked these claims-based records to data from the 1997 and 2001 Medicare Denominator files in order to create an analytical file containing information on the demographic, clinical and utilization characteristics of all Medicare beneficiaries who used home health services during these two years.

The baseline period (calendar year 1997) overlaps with the first two months in which the IPS was in place and agencies' early responses to the IPS may be captured in these data. We do not believe that this overlap should significantly bias the results of this study since the IPS was phased in over a one-year period and agencies were subject to the IPS with the start of their cost-reporting period (most were not reimbursed under the IPS until 1998).

To better ensure comparability across years, we constructed and analyzed episodes of care, rather than all home health care rendered within the year or other period. Distinct from the home health episodes created under the PPS, we defined an episode as a home health admission that was preceded by a 60-day period without a home health visit and that continued until a 60-day period without home health or an inpatient admission or death occurred. We considered only the first home health occurrence for each beneficiary.

Only Medicare aged (65 years or older) beneficiaries residing in one of the 50 states or the District of Columbia, who were eligible for Part A during the entire year of 1997 or 2001 were included in these analyses. Excluded were episodes for those persons who were in managed care for any part of

the year and those with end-stage renal disease (ESRD). We excluded the former because managed care plans are not required to submit claims and a record of having received post-acute services would not be available in these data. We excluded the latter because we expected that persons with ESRD would have a unique clinical profile and, hence, their pattern of utilization would differ from that of other beneficiaries.

We used descriptive statistics to compare home health users in 1997 and 2001 in terms of the clinical and demographic characteristics listed in Table 1. Furthermore, we estimated the proportion of home health users who received care from each of the six disciplines that comprise home health (aide, skilled nursing, physical therapy, occupational therapy, speech, and medical social work services). For all patients we estimated the average length of the episode and average total number of visits. For the subset of home health users who received care from each of these disciplines we estimated the average number of visits received during the episode.

Using logistic regression, we estimated the odds that persons admitted to home health in 1997 and 2001 received care in each of the six disciplines, adjusting for across-year differences in age, race, sex, dual eligibility status, major diagnostic category, Charlson Co-morbidity Index score (see Table 1 for a description), and prior hospitalization. Odds ratios greater than 1 indicate that home health users were more likely to receive a service in 2001 than in 1997 and odds ratios less than 1 indicate that the likelihood of receiving services from a discipline were higher in 1997 than in 2001. Ordinary least squares regression was used to estimate PPS-related differences in total visits and visits for each service, adjusting for differences in the demographic and clinical characteristics of home health patients during the two periods which were studied.

The effect of the home health PPS on quality of care was measured for the subset of home health users admitted from acute hospitals by examining rates of inpatient readmissions among rural and urban home care users. Rates of readmission are a proxy for quality and have been used in previous studies to assess the effect of payment reform on home health (OIG, 2001). For the subset of rural and urban beneficiaries who used home care following an acute inpatient episode, we employed logistic regression to estimate the 2001/1999 odds ratio of readmission during the time the patient was receiving home care services or within 30 days of discharge from home care. Estimates were

Table 1: Demographic and Clinical Characteristics of Home Health Users Examined in Study	
	Description
Demographic Characteristics	
Race / ethnicity	White, black, Hispanic, other
Gender	Male/female
Age	Age in years
Dual eligibility	Eligibility for Medicare and Medicaid
Clinical Characteristics	
Prior hospitalization	Indicator of whether the home health admission occurred within 32 days of discharge from an acute hospital.
Co-morbidities / patient severity	Score on the Romano Adaptation of the Charlson Index (Romano et al, 1993). Patients receive a weighted score for each of 19 co-morbidities identified from secondary diagnosis codes. Weights reflect the risk of mortality from that co-morbid condition. The sum of the weighted scores reflect patient severity or the burden of co-morbid disease. Co-morbid conditions include: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, connective tissue disease, ulcer disease, mild liver disease, moderate or severe liver disease, diabetes, diabetes with end organ damage, hemiplegia, any tumor, leukemia, lymphoma, metastatic solid tumor, AIDS.
Major diagnostic categories (MDCs)	The broad disease or organ system category corresponding to the home health admitting diagnosis: circulatory disorders, congenital conditions, digestive disorders, endocrine and metabolic conditions, genitourinary conditions, infectious and parasitic diseases, mental disorders, musculoskeletal and connective tissue disorders, neoplasms, nervous system conditions, respiratory disorders, ill-defined symptoms, and other.
Selected diagnoses	Indicator of whether the primary diagnosis (ICD-9) corresponds to any of the following top home health admitting diagnoses: diabetes, hypertensive disease, heart failure, cerebrovascular disease, chronic obstructive pulmonary disease, osteoarthritis, bone fracture, and ulcer(s).

adjusted for across-year differences in age, race, sex, dual eligibility status, major diagnostic category, and Charlson Co-morbidity Index score.

All analyses were conducted separately for beneficiaries residing in rural and urban areas. We used a modified version of the Department of Agriculture Rural and Urban Continuum Codes (RUCC) to categorize the location of patient residence. (RUCC designations for individual counties were obtained from the 2003 Area Resource File.) Urban counties were designated as counties of any size that were located in a metropolitan area. Urban counties were designated as counties of any size that were located in a metropolitan area and rural counties were those located in non-metropolitan areas. We created rural subgroups by classifying non-metropolitan counties with an urban population of more than 2,500 (whether or not they were located adjacent to a metropolitan area) as a large rural county and those in which no place has a population larger than 2,500 as a remote rural county.

Results

Data in this study include records for 49,410 home health episodes that occurred in 1997 and 49,957 episodes that occurred in 2001. Distribution of episodes by location was fairly consistent across years; urban residents accounted for about three-quarters of episodes, whereas residents of large rural counties accounted for approximately 21 percent and those of remote rural counties accounted for only about 3 percent of episodes.

Demographic Characteristics: In terms of most demographic characteristics – age, gender, race/ethnicity – few differences were observed between home health users in 1997 and 2001 (Table 2). A rather small (less than one year) increase in the average age of home health users was noted in all locations. That these relatively small differences were statistically significant ($p < .01$) is not particularly surprising given the large sample sizes included in this analysis.

The most notable difference in the characteristics of home health users before and after the PPS was in the proportion who were dually eligible. The percentage of dually eligible home health users increased significantly ($p < .01$) in all locations: 16 percent in urban, 18 percent in large rural and 17 percent in remote rural counties. In both study years, home health users who resided in rural counties were more likely than were their counterparts in urban and large rural counties to be dually

eligible for Medicare and Medicaid. In 2001, for instance, nearly 19 percent of home health users residing in a remote rural county were dually eligible compared to only 12 percent of those in urban and 17 percent of those in large rural counties.

Clinical Characteristics: The proportion of home health users admitted from an acute care hospital increased by between 11 and 12 percent in urban and large rural counties and by 14 percent in remote rural counties following the introduction of the home health PPS (Table 2). Approximately equal proportions (73 percent) of home health users in urban, large rural and remote rural counties were admitted to home health following an acute hospitalization in 2001.

Relative to 1997, the overall ranking of major diagnostic categories (MDC) by frequency remained generally unchanged. One of the largest differences noted was in admissions for care of a musculoskeletal condition. Perhaps reflecting the more favorable reimbursement accorded to orthopedic cases, the proportion of home health users with a diagnosis corresponding to the musculoskeletal MDC increased by about one-fifth in urban counties and by over one-quarter in both large and remote rural counties. Small differences were noted in the proportion of admissions in selected diagnostic groups. For instance, in all locations, the proportion of individuals admitted to home health for treatment of a circulatory disorder declined modestly between the two periods. In remote rural counties, the proportion with a diagnosis in this MDC declined by 12 percent compared to 8 percent and 6 percent in large rural and urban counties, respectively. Differences in the proportion with these conditions were statistically significant at the $p < .05$ level or better.

As another means to assess the effect of the PPS on case-mix we examined the distribution of patients in the top home health admitting diagnoses in 1997 and 2001. The data are reported in Table 2. Of particular note, the proportion of home health users with hypertensive disease as the principal admitting diagnosis declined substantially in all areas: 43 percent in urban and by 63 percent in all rural counties. In contrast, the proportion of home health users with diabetes increased; rates of increase were modest and varied by location. A 13 percent increase in the rate of diabetes was noted in both urban and large rural counties. A more modest, 4 percent, increase in the rate of admissions for diabetes was observed in remote rural counties; however, this result was not statistically significant at the $p < .05$ level.

Table 2: Characteristics of Home Health Users, by Location, 1997 and 2001

	URBAN		LARGE RURAL		REMOTE RURAL		ALL RURAL	
	1997	2001	1997	2001	1997	2001	1997	2001
	37,195	38,004	10,641	10,503	1,574	1,450	12,215	11,953
Demographic Characteristics								
Female (%)	60.0†	59.7†	58.4†	59.1†	56.0†	55.1†	58.1†	58.6†
Race (%)								
White	88.4	88.2	92.0	92.2	91.9†	91.4†	92.0	92.1
Black	8.5	8.9	5.8	6.1	6.5†	7.5†	5.9	6.2
Hispanic	1.4	1.6	0.8	0.9	0.4†	0.4†	0.8	0.9
Other	1.6	1.3	1.3	0.8	1.3†	0.7†	1.3	0.8
Average Age (yrs)	78.3	79.0	78.1	78.5	77.9	78.5	78.0	78.5
Dual eligible (%)	10.1	11.7	14.2	16.7	16.1	18.8	85.6	83.1
Clinical Characteristic								
Prior Hospitalization (%)	65.6	72.8	64.8	72.6	64.2	73.0	64.8	72.7
Charlson score (%)								
0	71.0	66.7	70.2	63.3	70.7	61.2	70.3	63.0
1	19.6	22.6	20.3	24.8	20.0	25.1	20.3	24.8
2-4	8.8	10.0	8.7	11.4	8.5	12.8	8.7	11.5
5+	0.6	0.7	0.7	0.6	0.8	0.9	0.7†	0.7†
Major Admitting Diagnosis Groups								
Circulatory Disease	28.8	27.0	28.0	25.7	30.6	27.0	28.3	25.9
Musculoskeletal	14.4	17.3	14.9	18.8	14.7	18.6	14.9	18.8
Injuries & poisonings	13.7†	13.5†	13.7†	14.0†	12.1†	13.7†	13.5†	13.9†
Respiratory disorders	7.3	6.6	7.9	7.2	6.4†	8.1†	7.8†	7.3†
Endocrine diseases	6.5†	6.3†	7.7†	7.1†	8.9†	7.4†	7.9†	7.2†
Neoplasms	6.4	5.5	6.0†	5.7†	5.9†	5.7†	5.9†	5.7†
Digestive disorders	4.3	4.0	4.2†	4.4†	3.8†	4.1†	4.2†	4.3†
Nervous system	2.5	2.8	2.4†	2.4†	2.0†	2.7†	2.3†	2.5†
Other	16.1	17.0	15.2	14.7	15.6	12.7	15.2	14.4
Selected Diagnoses								
Diabetes	4.0	4.5	4.5	5.1	5.3†	5.5†	4.6†	5.1†
Hypertensive disease	3.7	2.1	4.0	1.5	4.9	1.5	4.1	1.5
Heart failure	4.9†	5.1†	4.7†	4.7†	5.3†	5.2†	4.8†	4.8†
Cerebrovascular disease	4.5†	4.3†	4.1†	4.3†	6.0†	4.5†	4.4†	4.4†
Chronic obstructive pulmonary	2.5	2.1	2.4	1.9	1.9†	2.3†	2.3†	2.0†
Osteoarthritis	7.9†	8.0†	8.4	9.4	8.2†	9.6†	8.4	9.4
Fractures	3.5†	3.3†	3.1	3.7	3.5†	3.6†	3.2	3.6
Skin ulcer	1.7	2.1	1.5	2.2	1.1†	2.0†	1.5	2.2

Note: Across-year differences are statistically significant at the $p < .05$ level unless otherwise denoted with a '†'.

As suggested by the Charlson Index score, home health users in 2001 tended to have a greater number of co-morbid conditions than did home health users in 1997. In fact, in remote rural

counties the proportion of home health admissions with a Charlson Index score of at least 1 increased from about 29 percent of admissions in 1997 to 39 percent of admissions in 2001. Increases in the proportion of home health admissions with a Charlson score greater than 1 were observed in urban and large rural counties as well, but rates of increase were smaller than that observed in remote rural counties. The trend toward increasing Charlson score appears to have been driven by increased co-morbidity in post-acute users. For instance, in 1997 the Charlson Index score among residents of remote rural counties averaged 0.42 for post-acute users and 0.48 for home health users admitted from the community (differences were not statistically significant at the level of $p < .10$ or better.) In 2001, post-acute users had an average Charlson score of 0.61 compared to an average of 0.51 for those admitted from the community (differences are significant at the level of $p = .07$).

Utilization of Services: Table 3 contains regression adjusted estimates of the number and percentage change in length of episodes and visits and Table 4 reports the adjusted odds ratio of utilizing each of the home care disciplines. (Unadjusted utilization estimates are reported in Appendix A.) As shown in Table 3, the PPS was associated with a reduction in both length and intensity of episodes. Between 1997 and 2001, the average length of a home health episode decreased by about one-fifth in urban and all rural counties alike. The average regression adjusted total visits also decreased uniformly, by approximately one-third or more in all areas. Changes in the utilization of each of the six standard home health disciplines were observed, and are described below.

- *Home Health Aide Services:* In both years, home health users residing in rural counties were more likely to receive aide services than were urban residents; in 2001, 29 percent of those in a rural county had aide visits compared to only 22 percent of those in urban counties (Appendix A). The odds of receiving aide services in 2001 were less than it was in 1997 for all locations. In fact, in all locations home health users were about two times more likely to receive aide services in the period prior to the PPS (Table 4). Among those who received care from a home aide, the average number of visits declined dramatically between the two study years; from a decrease of 52.8 percent for home health users in remote rural counties to a decrease of 58.9 percent for those in urban counties.

- *Skilled Nursing Services:* Regardless of location, almost all (between 92 and 95 percent) home health users received skilled nursing services in 1997 (Appendix A). Although the proportion using skilled nursing was still high in 2001, those in urban and large rural counties were over two times more likely and those in remote rural counties were close to three times more likely to receive skilled nursing services prior to than after the PPS was in place (Table 4). In all locations, the average number of skilled nursing visits declined by about one-third.

- *Physical Therapy:* Irrespective of location, the odds of receiving physical therapy were higher in 2001 than in 1997. Home health users in urban counties were about 43 percent more likely and those in all rural counties combined were about 64 percent more likely to use the services of a physical therapist after the PPS went into effect. Despite growth in the proportion using PT, after controlling for differences in patient characteristics during the two time periods the number of physical therapy visits provided to residents of large and remote rural counties declined modestly (by 9.0 percent and 5 percent, respectively). The PPS had the greatest impact in urban counties, where physical therapy visits fell by almost one-fifth.

- *Occupational Therapy:* In all locations, the likelihood of receiving occupational therapy was higher after the PPS. Home health users in urban and remote rural counties were between 30 and 40 percent more likely and those in large rural counties were almost 60 percent more likely to use occupational therapy in 2001 than in 1997. Post-PPS reductions in the number of occupational therapy visits were also noted. An approximately 20 percent reduction in occupational therapy visits was estimated in urban counties and a nearly 15 percent reduction was noted in large rural counties. Differences in the number of occupational therapy visits were not statistically significant ($p < .05$) for those in remote rural counties.

- *Speech Therapy:* Only a small number of home health users received speech therapy services in either of the study years. In 2001, for instance, this proportion ranged from 3.1 percent in urban counties to 2.6 percent in remote rural counties. Perhaps because of the small number that used the services of a speech therapist, particularly in rural counties, estimates of changes in use or in average visits were not statistically significant.

- *Medical Social Services:* In 1997, fewer than 3 percent of Medicare home health users received medical social services. Despite the small number, home health users in all rural counties combined were about one-half as likely to receive social services in 2001 as in 1997. Similarly, the PPS was associated with a reduction in the number of social services visits; the extent to which utilization declined during the study period did not vary substantially and was between 27 and 33 percent, depending on location.

Table 3: Regression Adjusted 1997-2001 Change (Δ) in Length of Episode and Number of Visits, and Difference as a Percentage (%) of 1997 Visits

	URBAN		LARGE RURAL		REMOTE RURAL		ALL RURAL	
	Δ	%	Δ	%	Δ	%	Δ	%
Length of Episode	-10.5	-20.6	-12.5	-21.4	-12.6	-21.0	-12.6	-21.4
Visits								
Total	-12.3	-37.5	-11.4	-33.0	-11.1	-32.9	-11.4	-33.0
Home Health Aide	-16.8	-58.9	-17.7	-55.7	-17.1	-52.8	-17.7	-55.5
Skilled nursing	-5.7	-35.4	-5.3	-31.5	-4.9	-30.4	-5.2	-31.1
Physical therapy	-2.0	-18.0	-0.5	-4.8	-1.0†	-9.0	-0.5	-4.8
Occupational therapy	-1.4	-20.1	-1.0	-15.4	-1.4†	-20.3	-1.0	-15.2
Speech therapy	-2.8	-29.2	-1.1†	-12.5	+0.1†	+1.3	-0.9	-10.3
Social work	-0.7	-29.2	-0.7	-26.9	-1.0	-33.3	-0.7	-26.9

Note: Across-year differences are statistically significant at the $p < .05$ level unless otherwise denoted with a '†'.

Table 4: Regression Adjusted Odds Ratio
Utilization of Selected Home Health Services, 1997 and 2001
OR = Odds Ratio (2001Odds ÷ 1997 Odds) CI = 95 percent confidence interval

	URBAN		LARGE RURAL		REMOTE RURAL		ALL RURAL	
	OR	CI	OR	CI	OR	CI	OR	CI
Home Health Aide	0.46	0.45 – 0.48	0.55	0.52 – 0.58	0.58	0.50 – 0.68	0.55	0.52 – 0.59
Skilled nursing	0.44	0.42 – 0.46	0.45	0.41 – 0.50	0.37	0.27 – 0.50	0.44	0.40 – 0.49
Physical therapy	1.43	1.39 – 1.49	1.64	1.54 – 1.72	1.64	1.39 – 1.92	1.64	1.55 – 1.73
Occupational therapy	1.32	1.27 – 1.37	1.59	1.45 – 1.72	1.39	1.08 – 1.82	1.58	1.45 – 1.71
Speech therapy	0.83	0.77 – 0.90	0.98	0.83 – 1.15	0.73	0.47 – 1.14	0.96	0.82 – 1.11
Social work	0.61	0.59 – 0.64	0.54	0.50 – 0.59	0.54	0.42 – 0.70	0.54	0.50 – 0.59

Hospital Readmissions: Relative to 1997, the odds that a post-acute home health user would be readmitted to an acute care hospital in 2001 were 36 percent higher for urban residents and 49 percent higher for residents of large rural counties (Table 5). Although the odds of readmission for

home health users in remote rural counties were 25 percent higher under the PPS, this finding was not significant at the 5 percent level.

Table 5: Regression Adjusted Odds Ratio of Readmission, Post-Acute Home Health Users, 1997 and 2001

Odds Ratio = 2001Odds ÷ 1997 Odds

Location	Odds Ratio	Confidence Interval (95%)
Urban	1.36	1.29 – 1.43
Large Rural	1.49	1.35 – 1.63
Remote Rural	1.25	0.98 – 1.59
All Rural	1.45	1.33 – 1.59

DISCUSSION

Limitations: In evaluating the results of this study and their implications, it is necessary to consider how characteristics of the data and the design of the study could limit the inferences drawn from these analyses. To begin with, across-year comparisons of utilization may fail to adequately control for differences in case mix. In using regression techniques to estimate the odds of using individual home health disciplines, changes in number of visits, and odds of readmission, we controlled for selected demographic characteristics as well as admitting diagnosis, presence of co-morbidities and prior hospitalization. For purposes of estimating these models, however, it was impractical to control for all admitting diagnoses or co-morbidities separately and because data on physical and cognitive functioning were also not available, we were also unable to adjust estimates for functional status differences. The clinical measures that we used to adjust for across-year differences in diagnosis and disease severity, the MDCs and the Charlson Index Score, classify patients broadly and into groups that are still relatively heterogeneous in terms of resource use. Categorizations of this type may mask key differences in the populations who used home care in each of the two study periods and, it is therefore possible that the trends noted in this study could be driven, at least in part, by unexplained variation in demographic, clinical or functional characteristics.

Following the implementation of the PPS, the number of home health agencies in operation declined significantly. (Reductions in the number of home care agencies have been attributed to several factors, including the government's stepped-up efforts to eliminate fraud and abuse in the home care industry and the financial pressure caused by the per-visit and aggregate, per-beneficiary cost limits of the IPS (MedPAC, 2004)). Between 1998 and 2000, for example, 21 percent of

agencies were no longer operating. In theory, agencies that were able to withstand the financial pressures resulting from the IPS could be more efficient than those that closed. Agencies that survived might use a more cost-effective mix of providers and visits, or may have been even more likely during this time to take advantage of efficiency-enhancing advances in home care procedures and technologies (e.g., point-of-care technologies, telehealth). We were unable to account for changes in efficiency and it is possible that some of the effects noted in this study, such as the reduction in total number of visits, represent not only PPS-induced changes in provider practice patterns, but also greater efficiency of agencies represented in the 2001 data.

Recent growth in the supply of therapists may have made it easier for agencies to fill vacant positions (Mathwig et al., 2001). Findings from at least one research study suggest that home health agencies operating in 2001 were more apt to incorporate physical and occupational therapy into their service line (Sutton, 2004). Another potential limitation of this analysis is that changes in utilization that we ascribe to the PPS, such as increases in the proportion of home health users that receive physical and occupational therapy, could be due, at least in part, to changes in capacity, which may have occurred even if Medicare had not implemented the PPS. Additional study is necessary to isolate the effects of environmental and organizational factors from that of the PPS.

PPS-related Changes in Utilization and Quality: Despite these limitations, however, this study offers important insight into the evolution of the home care delivery system in rural counties. The PPS fueled modest changes in case-mix, a significant reduction in overall home health and nursing intensity, and growth in the proportion of patients who received physical and occupational therapy. These trends in access and utilization of home care services were not unique to one location or another; the PPS appears to have affected access and utilization of home care in rural counties in much the same manner and, in many cases, to the same magnitude as in urban counties.

As originally conceived, Medicare's home health benefit was designed to assist in the short-term recovery of patients discharged from an acute inpatient hospital. Modifications to the benefit that occurred in the 1980s (e.g., elimination of both the prior hospital stay requirement and limit of 100 visits) prompted the use of home health for the treatment of patients with chronic or long-term care needs. Data from this study indicate that between 1997 and 2001, the proportion of home health users with a prior hospital admission increased across all locations, from about two-thirds to three-

quarters. Along with the increase in post-acute users, the reduction in use and intensity of nursing services, which occurred concurrent to an increase in the proportion who received physical and occupational therapy, supports contentions (MedPAC 2004) that the PPS is serving to re-focus the home care benefit from maintenance of chronically ill or disabled populations to recovery from acute illnesses.

Because of the large sample sizes involved in this study even small differences in distribution of diagnoses across-years may be statistically significant. In fact, many of the changes in the distribution of episodes by admitting diagnoses were modest and, since the case-mix adjuster only went into effect in 2000 and study data represented 2001 claims, it may still be too early to say with certainty whether access is better or worse for specific diagnostic groups. For at least one diagnostic group in which a considerable change in magnitude occurred, musculoskeletal conditions, the direction of change was consistent with the financial incentives of the PPS. In other words, growth in the proportion of patients with a musculoskeletal admitting diagnosis may be explained by the fact that the classification system weights patients with orthopedic conditions more heavily and, hence, payment is higher, than for patients in many other diagnostic categories. Further monitoring of case-mix is necessary in order to detect possible access problems.

The PPS further contributed to dramatic changes in home care utilization. Intensity of home care episodes declined significantly, with home care users receiving about one-third fewer visits. Moreover, while the likelihood of receiving nursing services was between two and three times higher in 1997 than in 2001, Medicare beneficiaries who used the home care benefit after the PPS went into effect were substantially more likely to have access to physical and occupational therapy. The finding that patients are more likely to use therapy services in the post-PPS period, but that the average number of therapy visits declined, is not surprising given the structure of the payment system and, in particular, the fact that cases in which at least 10 therapy services are rendered are more heavily weighted in the classification system.

From this study, it is not possible to determine whether changes in case-mix and utilization were driven by differences in how agencies code diagnoses (either increased accuracy or "upcoding" to maximize payment), how they select cases, or both. In the 2005 Report to Congress, MedPAC indicated that additional studies are needed to determine the accuracy of the case-mix adjustment

system in distributing payments, the extent to which the PPS accounts for high-cost patient characteristics, and the ability of agencies to manipulate inaccuracies in the PPS to maximize income. Continued study of the case-mix adjustment system as well as monitoring of the effects of the PPS on case-mix is, indeed, necessary to ensure that access is not compromised.

Ultimately, judgment concerning the influence of the PPS on rural access to home care must be shaped by evidence on how the payment system has affected quality of care. To understand the impact of the PPS on quality, we examined trends in hospital readmissions among home health users with a prior acute care discharge. Suggestive that the PPS compromised quality, the odds of readmission increased in urban and large rural counties following enactment of the PPS. We observed no significant difference in the likelihood that home health users in remote rural counties would be readmitted. From this study, it is not obvious whether changes in utilization have actually had an effect on quality of care. The dramatic reduction in home care intensity, for instance, may have no effect on quality if, in fact, home care services were being over-utilized prior to the PPS. In such a case, decreased utilization could merely indicate that inefficiencies were eliminated from the system. Moreover, an increase in readmissions could occur if post-acute patients admitted to home health in 2001 were more medically complex than those admitted to home health in 1997. Findings showing an increase in the average Charlson score suggest that this could be the case.

Many questions concerning the effect of the PPS on outcomes and quality of care remain. Future studies would benefit from the use of multi-dimensional measures of quality that incorporate both process and outcome measures.

Rural Implications of the Results: Together, findings from this study suggest that the PPS had a mixed effect on rural access to home care. On the one hand, the PPS appears to have enhanced access to rehabilitative services (physical and occupational therapy) that, for many conditions, is necessary to maximize functional independence. On the other hand, the intensity of services, as measured by the number of visits (overall and for individual disciplines), declined significantly and access for patients with long-term needs, measured by the change in the proportion of patients admitted directly from the community, appears to be more restricted.

In some cases, such as access to physical and occupational therapy, the PPS appeared to assist in narrowing the rural/urban gap that has historically existed. Nonetheless, the care of rural and urban home health users is not entirely comparable. Rural residents, for instance, are still significantly less likely than are their urban counterparts to use the services of a skilled therapist. Research on how the supply of therapy specialists, differences in provider practice patterns, differences in efficiency, and variation in case-mix may contribute to these rural/urban disparities is necessary in order to identify options for ensuring equity of access.

Recognizing that the costs of providing home care in rural areas is higher than in other areas (due in part to higher travel and overhead costs) when it implemented the PPS, Medicare incorporated an "add-on" payment that reimbursed agencies an additional amount whenever they treated beneficiaries who resided in rural areas. The add-on amount, which was initially set at 10 percent, ceased in 2003. The Medicare Modernization Act of 2003 reinstated the rural add-on at 5 percent. However, the rural add-on expired in March 2005. It is not clear whether access to home care would have been more restricted if this payment enhancement had not been in place. A National Association for HomeCare and Hospice (NAHC) study that used Medicare cost reports to examine profitability, estimated that for the period in which the rural add-on was not in place, rural home care agencies' Medicare margin averaged -10.4 percent (NAHC, 2003). This figure suggests that many rural agencies were financially vulnerable during this time. To the extent that agencies depended on the add-on to cover the higher costs of caring for rural residents, or that its elimination leads to agency closures, the expiration of the rural add-on could reverse any gains made between 1997 and 2001, lead to further reductions in intensity, and exacerbate rural access problems. Although data to address this issue is not yet available, research must examine the financial implications of the elimination of the rural add-on and ramifications for home care access in order to ensure that the structure of the payment system does not have a disproportionate and negative impact on rural home health agencies and the population that they serve.

REFERENCES

Goldberg HR, Delargy D, Schmitz RJ, Moore T, Wrobel M, Mackiernan YD, et al. (1999) Case-Mix Adjustment for a National Home Health Prospective Payment System. Cambridge MA: Abt Associates.

Mathwig K, Clarke F, Owens T, Gramet P. (2001). Selection criteria for employment of entry-level physical therapists: A survey of New York state employers. Journal of Physical Therapy Education, Spring

Medicare Payment Advisory Commission (MedPAC). Report to the Congress: Medicare Payment Policy. Washington, D.C.: MedPAC, March 2004.

Medicare Payment Advisory Commission (MedPAC). Report to the Congress: Medicare Payment Policy. Washington, D.C.: MedPAC, March 2005.

Murtaugh CM, McCall N, Moore S, Meadow A. Trends in Medicare Home Health Care Use: 1997-2001. 2003. Health Affairs 22(5): 246-156.

National Association for HomeCare and Hospice. HomeCare & Hospice: Seeking Stability in the Medicare Home Health Benefit – Margins Evaporate; Agencies in Financial Jeopardy. June 2003.

Office of Inspector General. Department of Health and Human Services. Adequacy of Home Health Services: Hospital Re-Admissions and Emergency Room Visits. OEI-02-99-00531. September 2000.

Romano PS, Roos LL, Jollis J. (1993). Adapting a clinical comorbidity index for use with ICD-9-CM administrative data. Journal of Clinical Epidemiology, 46(10), 1075-1079.

Schlenker RE, Powell MC, Goodrich GK. Initial Home Health Outcomes under Prospective Payment. Health Services Research. 2005;40(1):177-193.

Schwartz MR, Davis LA, Leon J, Davitt JK, Marainen J. The Effect of New Medicare Reimbursement Methodologies on Rural Home Health Agencies and their Beneficiaries. November 2002.

Sutton J. Home Health Payment Reform: Trends in the Supply of Rural Agencies and Availability of Home-based Skilled Services. NORC Walsh Center for Rural Health Analysis, W Series, No. 6. March 2005.

APPENDIX

Unadjusted Utilization of Home Health Services, by Discipline, 1997 and 2001
(Across-year differences are statistically significant at the $p < .05$ level unless otherwise denoted as '†')

	URBAN		LARGE RURAL		REMOTE RURAL		ALL RURAL	
	1997	2001	1997	2001	1997	2001	1997	2001
% Receiving Selected Services								
Home health aide	37.2	22.4	41.1	28.8	40.6	30.0	41.1	28.9
Skilled nursing	91.8	83.0	93.6	86.5	95.4	88.3	93.8	86.7
Physical therapy	49.2	59.9	40.2	53.4	35.6	48.4	39.6	52.8
Occupational therapy	13.9	18.1	9.1	14.1	7.3	10.7	8.9	13.7
Speech therapy	3.7	3.1	3.0†	2.8†	3.2†	2.6†	3.0†	2.8†
Social Services	18.3	12.1	15.9	9.2	12.9	7.5	15.5	9.0
Average Number of Visits								
Total	32.8	20.7	34.6	23.3	33.7	22.7	34.4	23.3
Home Health Aide	28.5	12.0	31.8	14.4	32.4	14.8	31.9	14.4
Skilled nursing	16.1	10.5	16.8	11.4	16.1	11.1	16.7	11.4
Physical therapy	11.1	9.1	10.4	9.9	11.1	9.9	10.4	9.9
Occupational therapy	6.9	5.4	6.5	5.5	6.9†	5.4†	6.6	5.4
Speech therapy	9.6	6.6	8.8†	7.7†	8.0†	8.7†	8.7†	7.8†
Social work	2.4	1.7	2.6	1.9	3.0	1.8	2.6	1.9
Length of Stay (days)								
Average length of stay	51.0	40.3	58.6	45.5	60.0	46.6	58.8	45.7
Readmissions Among Post-acute Users (%)								
Readmission Rate	11.1	14.2	12.7	17.2	15.0	17.4	13.0	17.3