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# Use of Home Health Care by ESRD and Medicare Beneficiaries

Teresa L. Kauf, Ph.D., and Ya-Chen Tina Shih, Ph.D.

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*The use of home health care (HHC) services among Medicare end stage renal disease (ESRD) enrollees remains an understudied area. In this article, the authors report sociodemographic characteristics and patterns of HHC utilization by Medicare-covered ESRD patients. The authors found that those who were female, age 85 or over, diabetic, and residing in the New England or West South Central census divisions were more likely to use HHC services and were also more intensive users. Analysis of use patterns in such high-risk populations is necessary to ensure that health policy changes do not have unintended consequences for vulnerable patients.*

## INTRODUCTION

Over the past decade, Medicare spending on HHC has expanded faster than any other expenditure component. From 1990 to 1995, Medicare home health costs grew more than 30 percent per year (Health Care Financing Administration, 1996). Much of this growth is the result of a liberalization and standardization of coverage that occurred in the late 1980s (Welch, Wennberg, and Welch, 1996). As a result, the number of home health agencies increased by more than 50 percent from 1989 to 1995 (Welch, Wennberg, and

Welch, 1996). Patterns of use among the aged have been well documented. However, the impact of this rapidly expanding HHC industry on vulnerable patient populations is still an understudied area. This study uses a national claims-based data set to examine HHC use by a special group of Medicare beneficiaries, ESRD patients. The results from the analysis are compared with the existing literature on HHC use by Medicare beneficiaries overall. The implications of recent changes to the HHC benefit resulting from the Balanced Budget Act of 1997 (BBA) are also discussed.

## ESRD PROGRAM

Since its inception in 1973, Medicare's ESRD program has provided full Medicare Parts A and B coverage to most individuals diagnosed with ESRD, including most of the cost of dialysis treatment and renal transplantation. Certain prescription medications are also covered, mainly, erythropoietin for the anemia of renal failure and immunosuppressant drugs (for a period of 3 years following transplantation). Eligibility for the ESRD program is based on confirmed diagnosis of the disease, regardless of the patient's age. This is an important distinction between elderly Medicare beneficiaries and those in the ESRD program. The distribution of sex and race among ESRD beneficiaries is much less skewed than for Medicare enrollees overall, probably due in large part to the younger age of the group, on average.

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Teresa L. Kauf is with GlaxoWellcome, Inc. Ya-Chen Tina Shih is with the University of North Carolina at Chapel Hill. The data reported here were supplied by the United States Renal Data System (USRDS). The views expressed in this article are those of the authors and do not necessarily reflect the views of GlaxoWellcome, Inc., the University of North Carolina at Chapel Hill, or the Health Care Financing Administration (HCFA).

Because of the chronic and debilitating nature of the disease, ESRD patients are much more costly than their elderly Medicare counterparts. The high cost associated with the treatment of kidney failure—either kidney transplantation or life-long dialysis—represents a potentially catastrophic cost to patients and their families. ESRD patients were included in the Medicare program to preserve their treatment options and prevent the devastating financial effects of the disease.

In 1997, Medicare covered approximately 75 percent of total ESRD costs, estimated at \$15.64 billion (United States Renal Data System, 1999). Medicare spending per patient-year during the period 1993-97 was \$43,000. Program expenses vary by dialysis modality and underlying disease state. ESRD patients receiving hemodialysis, the vast majority of program enrollees, cost Medicare an average of \$52,000 per patient-year during this time period, \$7,000 more per patient-year than patients on peritoneal dialysis and \$35,000 more per patient-year than those who had received transplants (United States Renal Data System, 1999). Across modalities and age groups, diabetic ESRD patients represent the greatest proportion of ESRD enrollees and the greatest cost per patient-year. On average, diabetic patients (one-third of ESRD enrollees) cost about \$51,000 per patient-year for the period 1993-97, compared with \$39,000 per patient-year for non-diabetic patients (United States Renal Data System, 1999). Thus, high-risk subgroups exist in this population that is already much more costly than other Medicare beneficiaries.

Both the cost and the incidence of ESRD have been increasing over the past decade, with ESRD beneficiaries generating more than seven times the expenditures of aged Medicare beneficiaries (Health Care Financing Administration, 1996). Even though the ESRD program remains a small

percentage of total Medicare spending at 5.6 percent, policymakers have been increasingly concerned about cost containment and quality of care for this population. Reimbursement and coverage decisions made on the basis of existing literature may have serious consequences for this group if its patterns of use differ from those of Medicare enrollees overall. Thus, it is important to examine utilization for this distinct patient population.

## **HOME HEALTH CARE**

HHC was originally used by hospitals in response to the prospective payment system as a way to shorten lengths of stay. Following hospitalization, patients were discharged earlier and received home health services in lieu of increased inpatient days. Research in this area has documented the impact of HHC in reducing hospital days and costs (Hughes et al., 1997; Feldman, Latimer, and Davidson, 1996). Prior to 1980, Medicare coverage of HHC was contingent upon prior hospitalization (Welch, Wennberg, and Welch, 1996). This requirement was eliminated in 1980, and subsequent changes to Medicare further expanded the scope of coverage. In 1994, nearly 8 percent of Medicare beneficiaries used HHC; the average number of visits per user increased from 52 visits in 1992 to 65 in 1994 (Mauser, 1997). The distribution of visits is highly skewed, with 14 percent of users receiving more than 150 visits yearly (Mauser, 1997).

Mauser and Miller (1994) report that many of the same variables that predict number of home health visits are also predictive of the probability of using HHC. These variables include age, race, sex, marital status, number of activities of daily living and instrumental activities of daily living, and supply variables. These authors' logistic regression analysis indi-

cates that the probability of any HHC use is higher for persons of races other than white and females, and increases with age of the patient and the number of medical conditions that a beneficiary has ever had (Mauser and Miller, 1994).

Several authors have documented growth and geographic variation in HHC services and expenditures for elderly Medicare beneficiaries. Bishop and Skwara (1993) report a wide range of persons served per 1,000 enrollees and visits per person served across the Nation. Overall, the New England, Middle Atlantic, and East South Central areas had the largest proportion of persons served (78.6 to 93.9 persons per 1,000 enrollees, compared with a U.S. average of 64.8). However, these areas did not always have the highest number of visits per person served. Though the correlation may not be perfect, there does exist a great deal of geographic variation in the use of HHC among the elderly, regardless of the unit of analysis. These findings are generally consistent with those reported elsewhere, but a few disparities do exist (Welch, Wennberg, and Welch, 1996; Kenny and Dubay, 1992). These may be partly a function of the different time periods and units of analysis reported by these articles.

## **COMPARISON OF ESRD AND MEDICARE BENEFICIARIES**

Table 1 provides a comparison of the demographic characteristics and geographic distribution of Medicare and ESRD beneficiaries. Comparisons of demographic characteristics show that, relative to Medicare beneficiaries, ESRD beneficiaries are younger, have a higher proportion of males, and a significantly higher proportion of black persons. Because the average ESRD beneficiary is younger than

the average Medicare enrollee, HHC use may be lower for ESRD patients after controlling for age and other characteristics. However, ESRD patients, because of the nature of their disease, may be sicker than their Medicare peers and therefore, consume a greater amount of all health care services, including HHC.

Table 2 shows the distribution of HHC use (persons served) among the Medicare and ESRD populations across sex, age, race, and geographic region. This table shows that, for Medicare beneficiaries overall, HHC is most often used by those patients who are white, age 75-84 years, and female. These figures can be misleading, however, because they fail to consider the underlying distribution of patients across these categories. Table 3 shows, for the same characteristics as in Table 2, the number of Medicare and ESRD home health users per 1,000 program enrollees. These figures reveal great differences in the numbers of HHC users between the Medicare population overall and the ESRD subgroup. Per 1,000 program enrollees, there were 276 HHC users in the ESRD program in 1995, compared with 103 in the total Medicare program. That is, compared with average Medicare enrollees, ESRD beneficiaries were on average more than twice as likely to use HHC services. Proportionately, the use of HHC is concentrated among those who are in the oldest age category (85 and over), white, and female.

Tables 2 and 3 also show the most recent data available on the distribution of HHC among Medicare beneficiaries (including the disabled). These figures confirm that HHC use is relatively higher in the New England, East South Central, and West South Central census divisions, although total use (in thousands of persons served) is highest in the South Atlantic census division (Health Care Financing Administration,

**Table 1**  
**Demographic Characteristics and Geographic Distribution of Medicare and ESRD Beneficiaries:**  
**United States, 1995**

Characteristic	Medicare <sup>1</sup>		ESRD Beneficiaries	
	Number in Thousands	Percent	Number in Thousands	Percent
Total	37,566	100.0	257	100.0
<b>Age</b>				
Under 65 Years	4,409	11.7	152	59.1
65-74 Years	18,291	48.7	66	25.7
75-84 Years	11,031	29.4	35	13.6
85 Years or Over	3,835	10.2	5	1.9
<b>Sex</b>				
Male	16,071	42.8	139	54.1
Female	21,495	57.2	118	45.9
<b>Race</b>				
White	32,240	85.8	147	57.2
Black	3,350	8.9	79	30.7
Other	1,568	4.2	29	11.3
<b>Census Division</b>				
New England	2,046	5.4	11	4.4
Middle Atlantic	5,866	15.6	37	14.7
East North Central	6,211	16.5	40	15.7
West North Central	2,782	7.4	15	5.8
South Atlantic	6,951	18.5	54	20.9
East South Central	2,400	6.4	19	7.2
West South Central	3,569	9.5	29	11.4
Mountain	1,959	5.2	11	4.4
Pacific	5,004	13.3	36	13.9
<b>Primary Disease Leading to ESRD</b>				
Diabetes	NA	—	87	33.7
Hypertension	NA	—	72	28.0
Glomerulonephritis	NA	—	39	15.0
Other Disease	NA	—	60	23.3

<sup>1</sup> These numbers include both aged and disabled Medicare beneficiaries and do not include beneficiaries enrolled in managed care plans.

NOTES: ESRD is end stage renal disease. NA is not available. Percentages may not sum to 100.0 because of rounding.

SOURCE: (Health Care Financing Administration, 1997.)

1997). These geographic variations, however, have not been explained by differences in demographic variables such as age, sex, and race (Mauser and Miller, 1994).

Prior to the BBA, home health agencies were reimbursed on a reasonable-cost basis. Thus, agencies would be able to pass the high cost of more intensive care services on to Medicare (i.e., higher charges would indicate more intense home care). This analysis assumes that total charges and/or paid claim amounts are indicative of resource intensity. Table 4 summarizes the resource utilization intensity of home health services provided to ESRD versus Medicare beneficiaries.

Charges for HHC were \$6,045 per person served for Medicare beneficiaries in 1995 and \$6,726 per person served for patients enrolled in the ESRD program in the same year. This difference is smaller when comparing average program payments per person served (\$4,441 for Medicare versus \$4,696 for the ESRD program).

The disparities between home health charges and program payments for the two programs are larger when the comparison is made per enrollee (as opposed to HHC users). This is the result of the combination of more intense HHC utilization and a higher proportion of ESRD enrollees using home health services compared with

**Table 2**  
**Demographic Characteristics and Geographic Distribution of Users Among All Medicare and ESRD Beneficiaries Served: United States, 1995**

Characteristic	Medicare <sup>1</sup>		ESRD Beneficiaries	
	Number in Thousands	Percent	Number in Thousands	Percent
Total	3,430	100.0	71	100.0
<b>Age</b>				
Under 65 Years	262	7.6	25	35.7
65-74 Years	946	27.6	23	32.1
75-84 Years	1,408	41.0	19	26.3
85 Years or Over	855	24.9	4	5.8
<b>Sex</b>				
Male	1,222	35.7	33	45.8
Female	2,247	65.5	39	54.2
<b>Race</b>				
White	2,935	85.5	46	64.7
Black	NA	NA	22	31.3
Other	<sup>2</sup> 534	<sup>2</sup> 15.6	3	4.0
<b>Census Division</b>				
New England	245	7.1	4	6.3
Middle Atlantic	518	15.1	11	15.8
East North Central	543	15.8	12	16.3
West North Central	223	6.5	4	5.3
South Atlantic	682	19.9	14	20.1
East South Central	306	8.9	5	7.0
West South Central	430	12.5	9	13.3
Mountain	141	4.1	2	3.5
Pacific	341	9.9	8	11.9

<sup>1</sup> Utilization rates do not reflect Medicare enrollees in managed care plans.

<sup>2</sup> Figures include all persons of unknown race or race other than white.

NOTES: ESRD is end stage renal disease. NA is not available. Percentages may not sum to 100.0 because of rounding.

SOURCE: (Health Care Financing Administration, 1997.)

Medicare beneficiaries overall. As shown in Table 4, average annual charges per enrollee were \$1,781 for the ESRD program and \$616 for Medicare in 1995. The higher charges reported in Table 4 imply that ESRD beneficiaries, on average, had more home health visits and/or that they consumed more resources during each visit.

## METHODS

### Data

This study uses detailed patient demographic and claims data extracted from the USRDS for calendar year 1995 to examine the characteristics of HHC users and geographic variation in HHC use among ESRD beneficiaries. The USRDS is a national

data system that collects, analyzes, and distributes information on the incidence, prevalence, treatment, morbidity, and mortality of ESRD in the United States (Held et al., 1997). The data consist of several files containing clinical, demographic, and claims information for most ESRD patients. Because the USRDS collects data on most persons diagnosed with ESRD, it is possible to conduct much more detailed analyses on this population than would be the case with other sources of Medicare data, such as the Current Beneficiary Survey.

The main source of data in the USRDS data base is derived from HCFA sources, including the Medicare enrollment database and ESRD program management and medical information system databases. The USRDS also receives data on non-

**Table 3**  
**Demographic and Geographic Characteristics**  
**of Home Health Care Users Among All**  
**Medicare and ESRD Beneficiaries Served:**  
**United States, 1995**

Characteristic	Medicare <sup>1</sup>	ESRD
	Per 1,000 Enrollees	
Total	103	76
<b>Age</b>		
Under 65 Years	62	167
65-74 Years	58	346
75-84 Years	142	534
85 Years and Over	241	722
<b>Sex</b>		
Male	84	234
Female	115	326
<b>Race</b>		
White	100	312
Black	NA	282
Other	2110	98
<b>Census Division</b>		
New England	127	399
Middle Atlantic	94	296
East North Central	90	286
West North Central	86	256
South Atlantic	106	266
East South Central	129	268
West South Central	127	323
Mountain	88	217
Pacific	99	238

<sup>1</sup> Utilization rates do not reflect Medicare enrollees in managed care plans.

<sup>2</sup> Figures include all persons of unknown race or race other than white.

NOTES: ESRD is end stage renal disease. NA is not available. These figures were generated by combining results from the United States Renal Data System data with figures from the Health Care Financing Administration. Because the latter gives a smaller number of ESRD beneficiaries, the figures shown are slightly overestimated.

SOURCE: (Health Care Financing Administration, 1997.)

Medicare ESRD patients through dialysis facilities, special surveys that the USRDS conducts in conjunction with HCFA, the Department of Veterans Affairs (since 1990), and other sources. Thus, the USRDS contains some information on virtually every person with ESRD in the United States. HCFA provides paid claims information for ESRD program enrollees (about 93 percent of all ESRD patients), and dialysis facilities and ESRD networks provide some cost and charge information for non-Medicare enrollees. Recently, the USRDS also coordinated with the United Network

for Organ Sharing (UNOS) to include information on kidney transplantation (United States Renal Data System, 1999).

### Statistical Analysis

To identify factors that are more likely to be associated with HHC utilization among ESRD beneficiaries, we convert the USRDS data from claims-level into patient-level data and use a logistic regression model to estimate the probability of service utilization. The model to be estimated is:

$$\text{logit}(P_i) = \ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 X_{i1} + \dots + \beta_k X_{ik} + \varepsilon_i(1)$$

$P_i$  in equation (1) is the probability of having at least one home health visit in the study period for the  $i$ th ESRD beneficiary. The explanatory variables,  $X_{i1}, \dots, X_{ik}$ , include age, race, sex, primary disease leading to ESRD, dialysis modality, dialysis history, and geographic region. Age variables are categorized into four groups: under 65, 65-74, 75-84, and 85 years or over, with the last group serving as the reference group. The race variable is broken down into three categories: white, black, and other race. The reference group is all other races. Primary disease leading to ESRD is operationalized as a dummy variable indicating either diabetes, hypertension, glomerulonephritis, or other disease, with the diabetes category as the reference group (Table 5). Dialysis modality is classified as center hemodialysis, home hemodialysis, peritoneal dialysis (including continuous ambulatory peritoneal dialysis, continuous cyclic peritoneal dialysis, and other peritoneal dialysis), and transplantation, using home hemodialysis as the reference group. Patients who switched modalities are combined into a single cate-

**Table 4**  
**Charges and Payments for Home Health Care Users Among All Medicare and ESRD Beneficiaries Served: United States, 1995**

Charges and Payments	Medicare <sup>1</sup>	ESRD
<b>Total in Thousands</b>		
Charges	\$21,591,139	\$502,204
Program Payment	15,391,094	350,656
<b>Per Person Served</b>		
Charges	6,045	6,726
Program Payment	4,441	4,696
<b>Per Enrollee</b>		
Charges	616	1,781
Program Payment	452	1,243

<sup>1</sup> Utilization rates do not reflect Medicare enrollees in managed care plans.

NOTE: ESRD is end stage renal disease.

SOURCES: (Health Care Financing Administration, 1997; United States Renal Data System, 1999.) Data analysis by the authors.

gory. History of dialysis is categorized as less than 1 year, 1-3 years, and more than 3 years. Equation (1) selects “less than 1 year” as the reference group. Geographic area is classified by dummy variables for the nine census divisions listed in Tables 1-3, with the New England division as the reference group.

To examine resource utilization intensity across various subgroups among those ESRD beneficiaries who used HHC services, a log-linear model is estimated:

$$\log(Y_j) - \beta_0 + \beta_1 X_{j1} + \dots + \beta_k X_{jk} + \epsilon_j \quad (2)$$

$Y_j$  is the annual home health charges for the  $j$ th home health service user. The explanatory variables are identical to those in equation (1). Because of the skewed distribution of home health service charges, the dependent variable was specified as the logarithm transformation of charges (Kennedy, 1998).

## RESULTS

Results for the estimation of equation (1) are given in Table 6 and closely reflect the proportional figures listed in Table 3. These suggest that ESRD beneficiaries

who received HHC at least once during the study period are somewhat similar to Medicare home health users, but with some important differences. ESRD patients with the following characteristics are more likely to use home health services: 85 years or over, female, white, switched dialysis modalities during the study period, and diabetes as the primary disease leading to ESRD. Unlike what has been observed for Medicare enrollees overall, ESRD beneficiaries who are not white are less likely to use home health services, although the difference for black persons is small. Within the ESRD population, HHC has the highest utilization rate among medically vulnerable patient groups; those patients for whom diabetes was the leading cause of ESRD were more likely to use HHC.

The results for dialysis history are especially intriguing. Patients in the reference group (less than 1 year of dialysis) were the least likely among the three groups to use HHC. However, the probability of use appears to peak in the mid-range of dialysis history (1-3 years), with use among those patients with a longer history of dialysis nearly equal to newer dialysis patients. If it is reasonable to expect that sicker patients use more HHC services, which is implied by the differences in use between Medicare and ESRD beneficiaries on average, then this pattern would seem to indicate that patients in the middle range of dialysis history are relatively sicker than patients with shorter or longer dialysis histories. This could happen if healthier patients were expected to have received a transplant by that time, eliminating them from the 1-3-year history group. One would expect patients with a long dialysis history to be relatively sicker. However, it could be the case that those in the longer history group, having survived on dialysis for an extended period of time, may also be

**Table 5**  
**Percent of ESRD Patients with Selected Non-Demographic Characteristics: United States, 1995**

Variable	Home Health Care Users	Non-Home Health Care Users
	Percent	
<b>Primary Disease Leading to ESRD</b>		
Diabetes	45.5	29.5
Hypertension	27.6	28.2
Glomerulonephritis	8.8	17.2
Other	18.1	25.1
<b>Dialysis History<sup>1</sup></b>		
Less than 1 Year	4.7	3.8
1-3 Years	57.8	47.0
More than 3 Years	37.5	49.2
<b>Dialysis Modality</b>		
Center Hemodialysis	72.6	63.2
Home Hemodialysis	3.5	2.7
Peritoneal Dialysis	7.9	9.2
Transplant	7.4	17.8
Switched Dialysis Modality	8.6	7.1

<sup>1</sup> Average dialysis history for Home Health Care users is 3.71 years; average for non-Home Health Care users is 4.8 years.

NOTE: ESRD is end stage renal disease.

SOURCES: (United States Renal Data System, 1999.) Data analysis by the authors.

a relatively healthy group. The coefficient for long dialysis history was not significant, however. Patients who had received transplants were slightly less likely than others to use HHC. The relationship between dialysis history, survival, and health is an important area for future research.

Geographic patterns of use were very similar to previous results for the entire Medicare population. Residence in the New England area significantly increased the probability of HHC use for this population, with the West South Central division also exhibiting relatively high use, even after controlling for the other variables in the model.

Table 7 gives the results for the estimation of equation (2). Among ESRD beneficiaries who use HHC, service intensity was lower for white persons than black persons, even though black persons are less likely to use HHC. Thus, although fewer black people use HHC, those that do use relatively more of these services than white people. Females, diabetic persons, and persons 85 years of age or over were more likely to use HHC and also tended to be more intensive users. Home and center hemodialysis patients were also more intensive users of

HHC, relative to other modalities. Interestingly, patients with a history of 1 to 3 years of dialysis had lower HHC charges than patients with longer or shorter histories, despite the fact that these patients were most likely to use HHC.

## DISCUSSION

Because of the unique composition of the USRDS data, the use of HHC among ESRD beneficiaries can be examined in much more detail than has typically been available for aged Medicare beneficiaries. In particular, the availability of clinical information makes it possible to better control for patient-specific characteristics, such as primary disease leading to ESRD (a marker for medical risk). However, some socioeconomic variables that have been shown by others to be significant, such as marital status and number of activities of daily living, are unavailable from this data source. The latter may be a particularly important missing variable given that several previous studies have documented a strong association between functional status and HHC use (Mauser and



**Table 6**  
**Logistic Regression Results for Home Health Care Use Among ESRD Beneficiaries:**  
**United States, 1995**

Variable	Parameter Estimate	Odds Ratio	p-Value
Intercept	0.73	NA	NA
<b>Sex</b>			
Male	-0.29	0.75	0.0001
<b>Age</b>			
Under 65 Years	-1.24	0.29	0.0001
65-74 Years	-0.59	0.56	0.0001
75-84 Years	-0.22	0.81	0.0001
<b>Race</b>			
Black	-0.06	0.94	0.0001
Other Race	-0.33	0.72	0.0001
<b>Disease Leading to ESRD</b>			
Hypertension	-0.62	0.54	0.0001
Glomerulonephritis	-0.95	0.39	0.0001
Other	-0.73	0.48	0.0001
<b>Dialysis Modality</b>			
Center Hemodialysis	0.05	1.05	0.0115
Peritoneal Dialysis	-0.07	0.93	0.0039
Transplant	-0.36	0.70	0.0001
Switch Dialysis Modality	0.50	1.65	0.0001
<b>Dialysis History</b>			
1-3 Years	0.16	1.17	0.0001
More than 3 Years	0.02	1.02	0.4323
<b>Census Division</b>			
Middle Atlantic	-0.47	0.63	0.0001
East North Central	-0.50	0.61	0.0001
West North Central	-0.65	0.52	0.0001
South Atlantic	-0.40	0.67	0.0001
East South Central	-0.42	0.66	0.0001
West South Central	-0.27	0.76	0.0001
Mountain	-0.75	0.47	0.0001
Pacific	-0.55	0.58	0.0001

NOTES: ESRD is end stage renal disease. NA is not applicable.  $N = 268,650$ ; log likelihood: 21583.26 with 20 degrees of freedom ( $p = 0.0001$ ).

SOURCES: (United States Renal Data System, 1999.) Data analysis by the authors.

Miller, 1994; Hing and Bloom, 1990; Branch et al., 1988; Soldo, 1985; Evashwick et al., 1984). To the extent that these factors influence the use of HHC by ESRD patients, the results presented in this article may be biased.

This empirical analysis does not include supply-side factors that may affect the use of HHC. Several studies have shown that factors such as number of nursing home beds or Medicare-certified home health agencies in an area influence the number of HHC visits per user and the number of users per 1,000 enrollees (Swan and

Benjamin, 1990; Kenney and Dubay, 1992; Kenney, 1993). Those studies that have found a significant impact on use typically have relied on data from earlier time periods and did not examine resource intensity. Some of these effects are substantial, but they still do not fully explain other aspects of use of interest here, such as geographic variation. The most recent available study, which uses data from the 1992 Medicare Current Beneficiary Survey, failed to show an impact of supply-side variables on the number of visits or reimbursement, nor were these variables able to explain geo-

**Table 7**  
**Log (Charge) Regression Results for Home Health Care Users Among ESRD Beneficiaries:**  
**United States, 1995**

Variable	Parameter Estimate	t-Value
Intercept	8.56	230.55
<b>Sex</b>		
Male	-0.16	-15.85
<b>Age</b>		
Under 65 Years	-0.33	-13.1
65-74 Years	-0.18	-7.73
75-84 Years	-0.10	-4.13
<b>Race</b>		
Black	0.13	11.56
Other Race	-0.02	-0.83
<b>Disease Leading to ESRD</b>		
Hypertension	-0.36	-28.34
Glomerulonephritis	-0.53	-27.88
Other	-0.41	-28.67
<b>Dialysis Modality</b>		
Center Hemodialysis	0.03	1.37
Peritoneal Dialysis	-0.01	-0.35
Transplant	-0.06	-1.9
Switch Dialysis Modality	-0.11	-3.82
<b>Dialysis History</b>		
1-3 Years	-0.11	-3.57
More than 3 Years	-0.08	-2.64
<b>Census Division</b>		
Middle Atlantic	-0.17	-7.28
East North Central	-0.17	-7.25
West North Central	-0.28	-9.43
South Atlantic	-0.09	-3.93
East South Central	0.07	2.44
West South Central	0.42	17.15
Mountain	-0.07	-2.21
Pacific	-0.11	-4.47

NOTES: ESRD is end stage renal disease.  $N = 71,032$ ; adjusted  $R^2 = 0.06$ .

SOURCES: (United States Renal Data System, 1999.) Data analysis by the authors.

graphic variation (Mauser and Miller, 1994). Because recent research has introduced some inconsistency into the effect of supply-side factors as explanatory variables for the use of and geographic variation in HHC and because usable data sources were unavailable to the authors, these were not included as part of this study. Clearly, though, the impact of supply-side forces on use and geographic variation is an important area for future research.

It is difficult to conclude whether ESRD beneficiaries who use HHC are a high-risk group overall because many of the most

intense users of HHC also seem to have the most access to those services. However, there are two groups that tended to use fewer but more intense HHC services. These groups may be especially vulnerable to changes in the home health benefit. The estimated coefficients for race indicate that black persons are slightly less likely to use HHC, but those that do are more intensive users. The results for dialysis history follow a similar pattern. Subsequent research in this area may more completely characterize users of HHC within these subgroups and ESRD

enrollees overall. Because the most recently reported data available from HCFA or through the existing literature fails to distinguish between the aged and disabled populations within Medicare, it is not possible to compare our results for the ESRD population specifically to aged Medicare beneficiaries.

High-risk groups within the ESRD program include patient groups with limited access to HHC (proxied as those who are less likely to use HHC) and those who use more intensive home care services (proxied as those with the highest HHC costs). These groups will be most affected by changes in Medicare's home health benefit, but they may be affected differently. Policies designed to provide incentives to reduce the cost of providing home care, but not necessarily limit the number of visits, will affect intensive users of HHC directly. These policies could, in turn, have an impact on the overall access to home care if the inability to fully recover costs results in fewer agencies.

The BBA has two provisions that may especially affect intensive users of home care (Forster, 1998). First, some HHC use will be moved from Part A to Part B, which usually has a higher amount of costsharing. If black ESRD patients have fewer economic resources than other groups, the copayment requirement could further reduce their access to HHC. Second, payment for home care will move to a prospective payment system designed to provide home health agencies with incentives to lower costs. If those incentives translate into an unwillingness to serve more intense users of HHC, then black ESRD patients may be at particular risk. Additionally, the BBA imposes per beneficiary annual limits on agencies. This limit does not place a restriction on the number of visits to individual patients, but it is designed to prevent further increases in average utilization per patient. The limits are aggregat-

ed to allow a balancing of higher and lower cost patients. An agency that serves a large proportion of ESRD patients, especially black persons, may have difficulty balancing the more intense needs of these patients with those of lower cost patients. In that case, the agency might avoid serving these patients.

## CONCLUSION

The figures presented here indicate that likelihood of using HHC services is greater among certain vulnerable subgroups of a population that is already at higher risk than the average Medicare beneficiary. In addition, certain groups of ESRD patients tend to use significantly more intense HHC services than other patients. Any policy pertaining to the use of HHC services will likely have a larger effect on high-risk groups within the ESRD program than for the average ESRD patient. Considering that ESRD beneficiaries, on average, are more than twice as likely to use HHC services and use more HHC compared with the average Medicare enrollee, the latter effect may be even greater than what has been shown to date for all Medicare enrollees. Also, although access to HHC does not seem to be a problem for Medicare patients overall, this may be an issue for those with ESRD, especially because black persons and diabetic persons (intense users) comprise a significant proportion of the ESRD population.

Given these facts and to the extent that the use of HHC may also influence patients' choice of dialysis modality, care must be taken in the design of cost-containment strategies, particularly payment methodologies, that will apply to all Medicare beneficiaries. Decisionmakers should engage in careful monitoring of ESRD patients and high-risk subgroups after changes in HHC or related policies to ensure that these

populations are not adversely affected. In addition, further research is necessary to examine the use of HHC among ESRD beneficiaries while addressing the limitations already discussed.

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Reprint Requests: Ya-Chen Tina Shih, Ph.D., Campus Box #7360, Beard Hall, University of North Carolina, Chapel Hill, NC 27599-7360. E-mail: [tshih@unc.edu](mailto:tshih@unc.edu)