

Intensity of Service Provision for Medicare Beneficiaries Utilizing Home Health Services: A Closer Look at Cerebrovascular Disease, Diabetes, and Joint Replacement



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Intensity of Service Provision for Medicare Beneficiaries Utilizing Home Health Services: A Closer Look at Cerebrovascular Disease, Diabetes and Joint Replacement

Executive Summary

Medicare pays for home health (HH) services for beneficiaries who are homebound or for whom travel for care would be difficult or detrimental to health. These HH services are paid on a per-episode basis with an episode consisting of all services provided over a 60-day period. Each episode or claim can entail a varying number of visits; payment is adjusted to account for large differences in the number of visits. Patients with ongoing problems can receive more than one episode of care.

In a report to the Congress, the Medicare Payment Advisory Commission (MEDPAC) recommended a significant reduction in HH payments and the introduction of cost-sharing for beneficiaries. Proposed payment reforms could have detrimental impacts on HH service provision to elderly persons in rural America given the financial vulnerability of rural HH agencies (MedPAC, 2009) and the reliance of rural elderly on Medicare HH services (Adams, Mechel, Defrates, and Corbett, 2001; McAuley, Spector, Van Nostrand, and Shaffer, 2004). Little is known about the current types of HH service and payments for these services across rural and urban Medicare beneficiaries. The research reported here examined the intensity of HH services per episode (number of visits and types of provider) and median payments per episode across levels of rurality. To ensure comparability between rural and urban patients, we restricted the analysis to patients receiving care for three conditions each analyzed separately: cerebrovascular disease (stroke and related diagnoses), diabetes and joint replacement.

The report is based on 2009 HH service files obtained from the Centers for Medicare and Medicaid Services (CMS) Research Data Assistance Center (ResDAC). For details, please see Section IV: Methodology.

Key Findings:

Beneficiaries with cerebrovascular disease (hereafter, stroke):

- While rural residents averaged more episodes than urban residents (1.5 episodes for rural versus 1.4 for urban), rural and urban beneficiaries with stroke received a similar number of HH visits overall (mean=31.5).
- Rural beneficiaries with stroke were less likely to have been cared for by a rehabilitation specialist at some point during their care:
 - Physical therapist: 79.2 percent rural versus 86.1 percent urban
 - Speech language pathologist: 22.6 percent rural versus 26.0 percent urban
 - Even after statistically adjusting for characteristics of the beneficiary and the county of residence, rural beneficiaries had lower odds of receiving services from rehabilitation specialists than similar urban patients (Odds ratio 0.62, 95% Confidence Interval 0.52-0.74).
- The median payment, across all episodes of care, was higher for urban beneficiaries (\$4,464) than for rural beneficiaries (\$3,761).

Beneficiaries with diabetes:

- Rural and urban residents averaged a similar number of episodes (2.2 episodes), but urban beneficiaries received significantly more HH visits in total (mean=102.6) than their rural peers (mean=43.6).
- Rural residents with diabetes were less likely to be seen by rehabilitation specialists. Examining the types of therapist most frequently reported:
 - Physical therapist: 41.3 percent rural versus 51.2 percent urban
 - Occupational therapist: 15.2 percent rural versus 18.0 percent urban
 - After adjusting for personal and community characteristics, rural beneficiaries had lower odds of receiving services from any rehabilitation specialist compared to their urban peers (OR=0.68, 95% Confidence Interval 0.62-0.74).
- The median payment, across all episodes of care, was 21.6 percent higher for urban beneficiaries (\$4,383) than for rural beneficiaries (\$3,603).

Beneficiaries with knee or hip replacement:

- There were no rural-urban differences in the number of episodes or number of HH visits per beneficiary.
- Virtually all beneficiaries, 97.6 percent, received HH services from a physical therapist with no difference between rural and urban residents. Rural residents were less likely than urban beneficiaries to have been seen by an occupational therapist (21.5 percent rural versus 27.3 percent urban).
- The median payment, across all episodes of care, was 14.8 percent higher for urban beneficiaries (\$3,243) than for rural beneficiaries (\$2,826).

Implications:

- Although the findings indicated significant differences between rural and urban beneficiaries, it is not clear if rural Medicare beneficiaries are not receiving necessary HH services or urban beneficiaries are overusing such services. Additional research is needed to understand the context of these differences and explore the consequences of this gap for beneficiary health.
- In general, evidence suggests that the use of rehabilitation professionals improves outcomes and reduces costs among older adults who have been hospitalized. To ensure that these benefits reach rural populations, methods for increasing the availability of specialized rehabilitation specialists in rural areas are needed. Options include strategies such as pairing with urban health care or a training institute to provide personnel or building local infrastructure through training and location incentives.

Section I: Background and Report Purpose

Home health care is important for rural America because the rural population as a whole includes proportionately more persons over age 65 and more persons with chronic conditions such as diabetes and heart disease. Appropriate use of home health care can reduce re-hospitalization and deter the use of more intensive forms of home health care.

Medicare coverage includes home health (HH) services for beneficiaries who require particular types of medical care but for whom travel is physically and/or mentally difficult or not medically recommended. An example might be a beneficiary who has experienced a stroke and needs rehabilitative and support care during the recovery period. Covered services include skilled nursing care; physical, occupational and speech-language pathology services; medical social services; and home health aide services. Medicare pays for HH services on a per-episode basis with an episode consisting of all services provided over a 60-day period. Each episode or claim can entail a varying number of visits by practitioners to the patient's home; payment is adjusted to account for large differences in the number of visits. Patients with ongoing problems can receive more than one episode of care.

In 2012, Medicare-funded home health care services were received by approximately 3.4 million beneficiaries at a cost of \$18 billion.¹ The large size of this program, together with the increase in the number and proportion of beneficiaries using the service when compared to 2000, has led to the Medicare Payment Advisory Commission (MedPAC) to reiterate recommendations and concerns expressed in its 2010 report. These recommendations included rebasing reimbursement rates, revising the HH case-mix system to use patient characteristics to set payments rather than the number of therapy visits and adding a cost-sharing requirement for patients in the form of a co-payment thus discouraging high intensity therapy HH services. Such policy changes could have a disproportionate impact on smaller HH agencies serving rural areas due to contextual factors, such as distance, that influence their operating costs. An adverse impact on HH agencies may reduce access to services among rural Medicare beneficiaries.

Previous research has examined the rural impact of payment changes subsequent to the Balanced Budget Act of 1997. Since that time, few studies have explored the current status of HH service provision across rural America. A better understanding of how HH is currently provided is necessary to estimate the potential impact of proposed changes in the Medicare reimbursement policy for rural HH services. Therefore, our analysis compares the intensity of HH services, types of providers visiting the patient and median payments for HH services between rural and urban beneficiaries.

Our analysis is based on 2009 HH Medicare files, obtained from the CMS Research Data Assistance Center. These files included billing data and did not include indicators for severity. Working with Medicare billing data, we could not fully adjust for case mix differences between rural and urban patients. In order to make patients being compared as similar as possible despite this limitation, our analysis is restricted on three specific conditions indicated as the principal diagnosis responsible for the HH episode: stroke (cerebrovascular disease), diabetes and joint (hip and knee) replacement. Stroke and diabetes were selected because they are the most common diagnoses among HH recipients based on the 2007 National HH and Hospice Care Survey. Joint replacement

¹ Medicare Payment Advisory Commission. (2014). Report to the Congress: Medicare Payment Policy (p. Chapter 9). Washington, DC. Retrieved from http://medpac.gov/documents/Mar14_EntireReport.pdf

procedures were selected because they have specific post-hospitalization care requirements such as wound care and physical therapy. Details about the data set and the specific ICD codes used to identify patients with each of the three conditions are provided in the Methodology (Section IV).

Results are reported in Section II with separate sub-sections providing findings of each selected health condition: stroke, diabetes and joint replacement. We report on the demographic characteristics of each patient and the number of comorbidities flagged in their billing information. We then report the number of visits received by each HH patient and, most importantly, the proportion of visits that include rehabilitation specialist services including physical, speech /language and occupational therapists. Physical therapists assist patients in the recovery process by teaching and assisting with appropriate exercise and equipment to facilitate recovery of function. Occupational therapists focus on assisting patients to reestablish the fine motor control needed to carry out activities of daily living including the use of specialized devices. Within the Medicare population, speech / language therapists are essential for the recovery of function lost through stroke or other illness. Section III, Discussion, pulls together findings and offers suggestions for addressing rural needs.

Section II: Results

Stroke and other cerebrovascular disease

Interruptions in the blood flow in the brain that lead to problems are referred to as cerebrovascular disease (hereafter, stroke). In the case of stroke, rehabilitation is necessary to restore the specific functions lost due to brain damage to the extent possible. Treatment can include physical therapy, occupational therapy and speech therapy, as needed, in addition to ongoing medical monitoring of the patient's condition.

There were 6,767 beneficiaries with a principal diagnosis of stroke who received HH services in 2009; these individuals had 9,367 unique HH episodes. Demographic characteristics of the sample are displayed in Table 1. Among beneficiaries with stroke, approximately a third were aged 85 years or older and more than two thirds were female (Table 1). Urban beneficiaries were more likely to fall in the oldest age category, 85 years or older, than were rural beneficiaries (urban, 36.3 percent; rural, 32.9 percent). Rural beneficiaries with stroke were more likely to be white than were urban beneficiaries (85.5 percent and 74.5 percent, respectively). Rural and urban beneficiaries had similar numbers of co-morbid conditions. Rural beneficiaries were more likely to live in a county without a hospital (6.8 percent versus 1.9 percent; $p < .0001$), with fewer HH agencies (1.0 in rural versus 12.0 in urban; $p < .0001$), and with fewer primary care providers (Table 1).

Overall, beneficiaries with stroke averaged 1.4 HH episodes per person during 2009; rural residents averaged more episodes than urban residents (1.5 rural versus 1.4 urban). Rural and urban beneficiaries had a similar number of total HH visits and were seen by a similar number of providers (Table 2). Rural beneficiaries, however, were more likely to receive home health services from a registered nurse or licensed practical nurse (RN/LPN) and were slightly less likely to receive services from rehabilitation specialists than were urban beneficiaries (Table 2). Rural beneficiaries were less likely to have been cared for by a physical therapist than were urban beneficiaries: 79.2 percent rural versus 86.1 percent urban. Rural residents were also less likely than urban beneficiaries to have been seen by a speech language pathologist (22.6 percent rural versus 26.0 percent urban) at some point during their care.

To confirm that rurality was associated with receipt of services from any rehabilitation specialist (physical, occupational or speech/language therapy), we conducted a multivariate analysis controlling for patient age, sex, race, dual eligible status, number of co-morbid conditions and region of residence. Disparities between rural and urban patients remained with rural stroke beneficiaries having lower odds of receiving services from rehabilitation specialists than similar urban patients (Odds ratio 0.62, 95% Confidence Interval 0.52-0.74; data not in table).

Overall, the median payment per episode was significantly higher for urban beneficiaries (\$4,464) than for rural beneficiaries (\$3,761) (Table 2). Because multiple factors are associated with costs, including regional and rural payment adjustments in addition to patient considerations, it is difficult to assess the reasons behind payment differences. However, multivariate analysis found that rural residence and lack of services from a rehabilitation specialist were each associated with lower payment.

Table 1. Demographic characteristics of Medicare beneficiaries with stroke receiving HH services, by level of rurality of county of residence, 2009

Characteristic	Total Beneficiaries (n=6,767)	Urban (n=5,463)	Rural (n=1,304)	p-value (urban v. rural)
	%	%	%	
Age (years)				
65-74	23.3	23.1	24.2	.36
75-84	41.1	40.7	42.9	.15
≥85	35.6	36.3	32.9	.02
Sex				
Male	33.3	32.9	35.0	.15
Race				
White	76.6	74.5	85.5	<.0001
Black	16.8	18.2	11.3	<.0001
Other	6.6	7.4	3.2	<.0001
Dual enrollment	19.6	19.5	19.9	.71
Region				
Northeast	17.6	19.9	7.6	<.0001
Midwest	21.6	22.4	18.6	.003
South	45.6	42.1	65.4	<.0001
West	14.2	15.6	8.4	<.0001
Number of co-morbidities				
0	9.3	9.7	7.9	.05
1-2	18.8	18.6	19.9	.25
≥3	71.9	71.8	72.2	.78
Home Health Agencies in county				
Mean	55.3	68.1	1.9	<.0001
Median	8.0	12.0	1.0	<.0001
No hospital in county	2.8	1.9	6.8	<.0001
Physician availability (PCP per 1,000 residents in county) in quartiles				
0.00 – 0.81	25.1	17.8	55.7	<.0001
0.82 – 1.14	23.3	22.8	25.5	.03
1.15 – 1.37	16.2	18.5	6.4	<.0001
1.38 – 9.58	32.1	37.5	9.5	<.0001

Table 2. HH service characteristics among Medicare beneficiaries with stroke, by level of rurality of county of residence, 2009

Episode Characteristic	Total Beneficiaries (n=6,767)	Urban (n=5,463)	Rural (n=1,304)	p-value
Episodes (number)				
Mean	1.4	1.4	1.5	<.0001
Total HH visits (number)				
Mean	31.5	31.4	32.0	.68
Number of providers seen, across all episodes (number)				
Mean	3.6	3.6	3.7	.90
Provider types, across all episodes (%)				
Physical Therapists	84.8	86.1	79.2	<.0001
Occupational Therapists	49.6	50.2	47.3	.06
Speech Language Pathologist	25.3	26.0	22.6	.01
Other ^a	36.5	36.4	37.0	.70
Any Rehabilitation Specialist ^b	88.7	89.8	84.1	<.0001
Nurses ^c	90.3	90.0	92.0	.03
Total payment, across all episodes (\$)				
Median	4324.7	4464.1	3761.3	<.0001

Notes:

^aOther providers include clinical social worker, home health/hospice aide, home health aide or certified nurse assistant

^bRehabilitation Specialists include: physical therapists, occupational therapists, and speech language pathologists

^cNurses refer to LPN or RN

Diabetes

While diabetes is generally self-managed, patients with uncontrolled diabetes or those with diabetic wounds or foot ulcers can benefit from home health services. There were 14,082 Medicare beneficiaries with a principal diagnosis of diabetes in 2009 who received 31,332 HH episodes. Among these beneficiaries, approximately two in three were women in both urban and rural areas (Table 3). Rural beneficiaries receiving HH services were younger, with approximately 46.5 percent between the ages of 75 and 84 years compared to 43.0 percent among urban beneficiaries ($p < .001$). Rural beneficiaries were more likely to be white compared to their urban peers (74.4 percent vs. 59.7 percent respectively). Approximately 37 percent of HH recipients were dually enrolled in Medicaid; rural beneficiaries were less likely to be dual eligible than their urban counterparts (33.7 percent versus 37.7 percent, $p < 0.001$). Rural beneficiaries were less likely to have no co-morbid conditions when compared to urban beneficiaries (8.9 percent versus 13.0 percent, $p < .0001$). Rural beneficiaries were more likely to live in a county without a hospital (8.8 percent versus 1.4 percent; $p < .0001$), with fewer HH agencies (2.0 in rural versus 30.0 in urban; $p < .0001$) and less than 1 primary care provider per 1,000 residents (Table 3).

Table 4 describes the intensity of HH services documented on episodes billed for beneficiaries with diabetes. Beneficiaries with diabetes averaged 2.2 episodes per person during 2009, irrespective of rurality. Overall, urban HH beneficiaries with diabetes received significantly more HH visits (mean=102.6) than did rural beneficiaries (mean=43.6; $p < .0001$). There were about four different types of providers seen by HH beneficiaries, with rural beneficiaries being cared for by slightly fewer types of provider (3.6 types among rural beneficiaries versus 3.9 types among urban patients; $p < .01$).

Paralleling the previous section, we analyzed receipt of specialist services at the beneficiary level to account for all services potentially received over multiple episodes of care. Table 4 shows the proportion of beneficiaries with diabetes seeing specific types of providers across all episodes. A higher proportion of HH services were provided by nurses in rural areas compared to urban areas ($p < .01$). Nationally, 49.2 percent of beneficiaries received services from a physical therapist with rural residents being less likely to receive this service than were urban beneficiaries (41.3 percent rural versus 51.2 percent urban). Rural residents were also less likely than urban beneficiaries to have been seen by an occupational therapist at some point during their care. The proportion of beneficiaries with diabetes who received services from a speech language pathologist was quite low nationally (2.0 percent), reflecting the lower need within this group of patients. In multivariate analysis, controlling for patient age, sex, race, dual eligible status, number of co-morbid conditions and region of residence, rural beneficiaries with diabetes had lower odds of receiving services from any rehabilitation specialist compared to their urban peers (OR=0.68, 95% Confidence Interval 0.62-0.74; data not in table).

Median payment per episode was significantly higher ($p < .0001$) in episodes for urban residents (\$4,383) compared to episodes for rural residents (\$3,603). This difference remained significant in multivariate analysis even after controlling for patient age, sex, race, number of co-morbidities, dual eligibility and region.

Table 3. Demographic characteristics of Medicare beneficiaries with diabetes receiving HH services, by level of rurality of county of residence, 2009

Characteristic	Total Beneficiaries (n=14,082)	Urban (n=11,307)	Rural (n=2,775)	p-value (urban v. rural)
	%	%	%	
Age (years)				
65-74	33.8	34.3	32.0	.02
75-84	43.7	43.0	46.5	<.001
≥85	22.5	22.8	21.5	.16
Sex				
Male	31.0	31.4	29.3	.04
Race				
White	62.6	59.7	74.4	<.0001
Black	23.3	24.1	19.8	<.0001
Other	14.2	16.2	5.8	<.0001
Dual enrollment	36.9	37.7	33.7	<.0001
Region				
Northeast	11.7	13.3	5.1	<.0001
Midwest	18.9	20.5	12.4	<.0001
South	58.1	53.2	78.3	<.0001
West	11.3	13.0	4.2	<.0001
Number of co-morbidities				
0	12.2	13.0	8.9	<.0001
1-2	18.9	18.4	20.8	<.01
≥3	68.9	68.5	70.2	.08
Home Health Agencies in county				
Mean	115.2	142.9	2.3	<.0001
Median	14.0	30.0	2.0	<.0001
No hospital in county	2.9	1.4	8.8	<.0001
Physician availability (PCP per 1,000 residents in county) in quartiles				
0.00 – 0.81	28.7	20.1	63.7	<.0001
0.82 – 1.14	21.8	21.6	22.6	.25
1.15 – 1.37	20.6	24.5	5.1	<.0001
1.38 – 9.58	25.9	30.9	5.2	<.0001

Table 4. HH service characteristics among Medicare beneficiaries with diabetes, by level of rurality of county of residence, 2009

Episode Characteristic	Total Beneficiaries (n=14,082)	Urban (n=11,307)	Rural (n=2,775)	p-value
Episodes (number)				
Mean	2.2	2.2	2.2	0.11
Total HH visits (number)				
Mean	91.0	102.6	43.6	<.0001
Number of providers seen, across all episodes (number)				
Mean	3.8	3.9	3.6	<.01
Provider types, across all episodes (%)				
Physical Therapists	49.2	51.2	41.3	<.0001
Occupational Therapists	17.5	18.0	15.2	<.001
Speech Language Pathologist	2.0	2.0	1.8	.53
Other ^a	34.0	34.5	32.0	.01
Any Rehabilitation Specialists ^b	51.3	53.1	43.7	<.0001
Nurses ^c	99.4	99.4	99.8	<.01
Total payment, across all episodes (\$)				
Median	4198.1	4383.2	3603.0	<.0001

Notes:

^aOther providers include clinical social worker, home health/hospice aide, home health aide or certified nurse assistant

^bRehabilitation Specialists include: physical therapists, occupational therapists, and speech language pathologists

^cNurses refer to LPN or RN

Knee or Hip Joint Replacement

There were 10,979 Medicare beneficiaries with knee or hip replacement in the 2009 data set who generated 11,607 episodes of HH services (Table 5). Most beneficiaries receiving knee or hip joint replacement were younger than 85 years (88.3 percent; Table 5). The sample was predominantly white, particularly in rural areas (rural 94.8 percent, urban 91.3 percent; $p < 0.0001$). Most recipients were female (70 percent) in both urban and rural settings. Just over half of joint replacement patients had three or more co-morbid conditions (57.7 percent) irrespective of rurality. Rural beneficiaries were more likely to live in a county without a hospital (9.0 percent versus 3.0 percent; $p < .0001$), fewer HH agencies (1.0 in rural versus 9.0 in urban; $p < .0001$) and with fewer primary care providers (Table 5).

Reflecting the short-term nature of recovery from surgery, beneficiaries with joint replacement averaged 1.1 episodes per person during 2009 among both rural and urban beneficiaries. Rural and urban joint replacement patients received a similar number of HH visits (Table 6). On average, two types of professionals were seen by beneficiaries with no rural / urban differences. Urban episodes were paid at a median of \$3,243 versus \$2,826 for rural patients, and these differences remained significant in multivariate analysis.

Table 6 shows the proportion of beneficiaries with joint replacement seeing specific types of providers, across all episodes. Physical therapists were key HH providers across all levels of rurality seen by nearly all patients. Episodes for rural patients were less likely to include an occupational therapist (rural 21.5 percent, urban 27.3 percent; $p < .0001$) and correspondingly slightly more likely to be seen by a nurse ($p < .01$; Table 6). Overall, when combined together, there were no significant differences in service provision by any rehabilitation specialist by rurality in multivariate analysis.

Table 5. Demographic characteristics of Medicare beneficiaries with joint replacement receiving HH services, by level of rurality of county of residence, 2009

Characteristic	Total Beneficiaries (n=10,979)	Urban (n=8,855)	Rural (n=2,124)	p-value (urban v. rural)
	%	%	%	
Age (years)				
65-74	45.8	45.2	48.3	.01
75-84	42.5	42.9	40.9	.10
≥85	11.7	12.0	10.8	.15
Sex				
Male	29.5	29.7	29.7	0.88
Race				
White	92.0	91.3	94.8	<.0001
Black	4.9	5.2	3.6	<.01
Other	3.2	3.5	1.6	<.0001
Dual enrollment	6.1	6.1	6.0	.87
Region				
Northeast	19.0	20.7	11.9	<.0001
Midwest	23.3	22.8	25.5	<.01
South	40.7	38.6	49.8	<.0001
West	16.9	17.9	12.8	<.0001
Number of co-morbidities				
0	8.9	9.3	7.3	<.01
1-2	33.4	32.6	36.6	<.001
≥3	57.7	58.1	56.0	.08
Home Health Agencies in county				
Mean	34.0	41.8	1.6	<.0001
Median	6.0	9.0	1.0	<.0001
No hospital in county	4.1	3.0	9.0	<.0001
Physician availability (PCP per 1,000 residents in county)				
0.00 – 0.81	25.4	19.1	51.8	<.0001
0.82 – 1.14	23.6	23.1	26.0	<.01
1.15 – 1.37	16.4	18.2	8.6	<.0001
1.38 – 9.58	31.7	36.6	11.0	<.0001

Table 6. HH service characteristics among Medicare beneficiaries with joint replacement, by level rurality of county of residence, 2009

Episode Characteristic	Total Beneficiaries (n=10,979)	Urban (n=8,855)	Rural (n=2,124)	p-value
Episodes (number)				
Mean	1.1	1.1	1.1	.97
Total HH visits (number)				
Mean	16.8	16.7	17.1	.15
Number of providers seen, across all episodes (number)				
Mean	2.4	2.4	2.4	.26
Provider types, across all episodes (%)				
Physical Therapists	97.6	97.7	97.1	.10
Occupational Therapists	26.2	27.3	21.5	<.0001
Speech Language Pathologist	.54	.63	---	---
Other ^a	15.0	14.7	16.1	.10
Any Rehabilitation Specialists ^b	98.0	98.2	97.4	.02
Nurses ^c	88.9	88.5	90.7	<.01
Total payment, across all episodes (\$)				
Median	3155.9	3242.9	2826.3	<.0001

Notes:

Cell sizes < 30 are suppressed (---)

^aOther providers include clinical social worker, home health/hospice aide, home health aide or certified nurse assistant

^bRehabilitation Specialists include: physical therapists, occupational therapists, and speech language pathologists

^cNurses refer to LPN or RN

Section III: Discussion

Service intensity has two aspects: the number of visits made to a patient's home and the type of specialist providing care during the visit. For two conditions studied, stroke and joint replacement, there were no significant differences between rural and urban beneficiaries with regard to number of visits. With regard to specialists seen, there were rural differences for two of the three conditions studied that may have implications for patient recovery. These findings are discussed further below.

Service Intensity: Number of Visits

The mean number of visits received by rural and urban beneficiaries with a principal diagnosis of stroke (31.5 visits, nationally) or joint replacement (16.8 visits, nationally) did not differ statistically. Among persons receiving home health care with a principal diagnosis of diabetes, however, rural patients averaged far fewer visits (43.6) than their urban counterparts (102.6). Given the potential severity of diabetic complications (amputation, blindness), there is reason for concern that rural patients may be underserved. Further research is needed to clarify this issue.

Service Intensity: Use of Rehabilitation Specialists

Nurses provided the majority of HH care: nursing care was recorded in more than 90 percent of all stroke and diabetes episodes and 89 percent of all joint replacement episodes. Rural disparities became evident when more specialized practitioners were considered:

- Stroke has complex and variable outcomes; physical therapy, occupational therapy and speech therapy may all be appropriate. However, rural patients were less likely to have been seen by one of these rehabilitation specialists (84.1 percent rural versus 89.8 percent urban).
- Diabetes, like stroke, has serious consequences that can range from persistent sores to amputation. Rural HH patients with diabetes were less likely than urban patients to receive rehabilitation specialist care (43.7 percent rural versus 53.1 percent urban).
- For joint replacement, rural patients were only slightly less likely than urban patients to receive rehabilitation care (97.4 percent rural versus 98.2 percent urban) with most of the difference stemming from a lower proportion of rural than urban patients being seen by an occupational therapist (21.5 percent rural versus 27.3 percent urban).

These findings are consistent with previous reports that rural beneficiaries are less likely to receive therapy services from specialized health care professionals (Cheh & Phillips, 1993; Kenney, 1993; Sutton, 2005).² Without detailed assessment of clinical needs and clinical outcomes among HH patients, it is impossible to determine if rural patients are underserved or urban patients are over-served. Additional limitations to the analysis are noted in Section IV: Methodology. However, the magnitude of differences found for patients with stroke and diabetes, particularly as regards

² Cheh V, Phillips B. (1993) Adequate access to posthospital home health services: differences between urban and rural areas. *J Rural Health*;9(4):262-9; Kenney GM. (1993) Rural and urban differentials in Medicare home health use. *Health Care Financ Rev*;14(4):39-57.; Sutton JP. (2005) Home health payment reform: Trends in the supply of rural agencies and availability of home-based skilled services. Bethesda, MD: NORC - Walsh Center for Rural Health Analysis; Jia H, Cowper DC, Tang Y, Litt E, Wilson L. (2012) Postacute stroke rehabilitation utilization: are there differences between rural-urban patients and taxonomies? *J Rural Health*. 2012 Summer;28(3):242-7.

access to rehabilitation specialists, provides cause for concern that rural patients may not receive optimal services.

Payments for HH services

Overall, median payments per HH episode were lower for rural than for urban beneficiaries across all diagnoses. Urban payments exceeded rural payments in multivariate analysis examining log-transformed payments after controlling for service provision by rehabilitation specialties, race, region, dual eligibility and comorbidities. The Centers for Medicare and Medicaid Services carefully regulates HH reimbursement to reflect a mix of patient characteristics and local wage structures. It appears likely that much of the rural-urban payment differential stems from this adjustment factor.

Conclusions & Implications

While we found rural-urban disparities, particularly for the use of rehabilitation specialists, it is unclear if these findings represent under-utilization by rural beneficiaries or over-utilization by urban beneficiaries. Further, it is not known whether these differences affect outcomes for rural patients both in terms of improvement through the episode of HH care and in terms of long term health and functioning. Additional research is needed to explore the health consequences of different types and levels of HH care.

The mix of professions providing HH care has financial implications for the HH agency. In its 2014 Report to Congress, MedPAC expressed concern that therapist services might be overused because they are associated with higher profit margins. If rural agencies are not able to provide these services when they are legitimately needed by the patient, both the Medicare beneficiary and the HH agency are adversely affected. Patients may lag or fail to attain full recovery while the HH agency has reduced financial return.

Relative underuse of therapist services may be due to an absence of professionals in rural areas. Despite improvement in practitioner/population ratios for physical therapists, occupational therapists and speech-language pathologists in rural counties between 1980 and 2000, rural counties continued to lag urban counties in provider availability.³ Innovative approaches will be needed to improve provider availability for HH services. Telemedicine and telemonitoring have been shown to improve outcomes and reduce hospitalizations among patients with chronic disease principally through communication with the patient rather than the direct application of therapies.⁴ Research is needed to ascertain whether telemedicine technologies can assist in the delivery of appropriate rehabilitation services to HH patients perhaps by connecting nurses to therapists for consultations.

³ Wilson, R. D., Lewis, S. A., & Murray, P. K. (2009). Trends in the rehabilitation therapist workforce in underserved areas: 1980-2000, *J Rural Health* 25(1), 26–32.

⁴ Parker, E., Zimmerman, S., Rodriguez, S., & Lee, T. (2013). Exploring Best Practices in Home Health Care: A Review of Available Evidence on Select Innovations . Home Health Care Management & Practice . Retrieved from <http://hhc.sagepub.com/content/early/2013/10/02/1084822313499916.abstract>

Section IV: Methodology

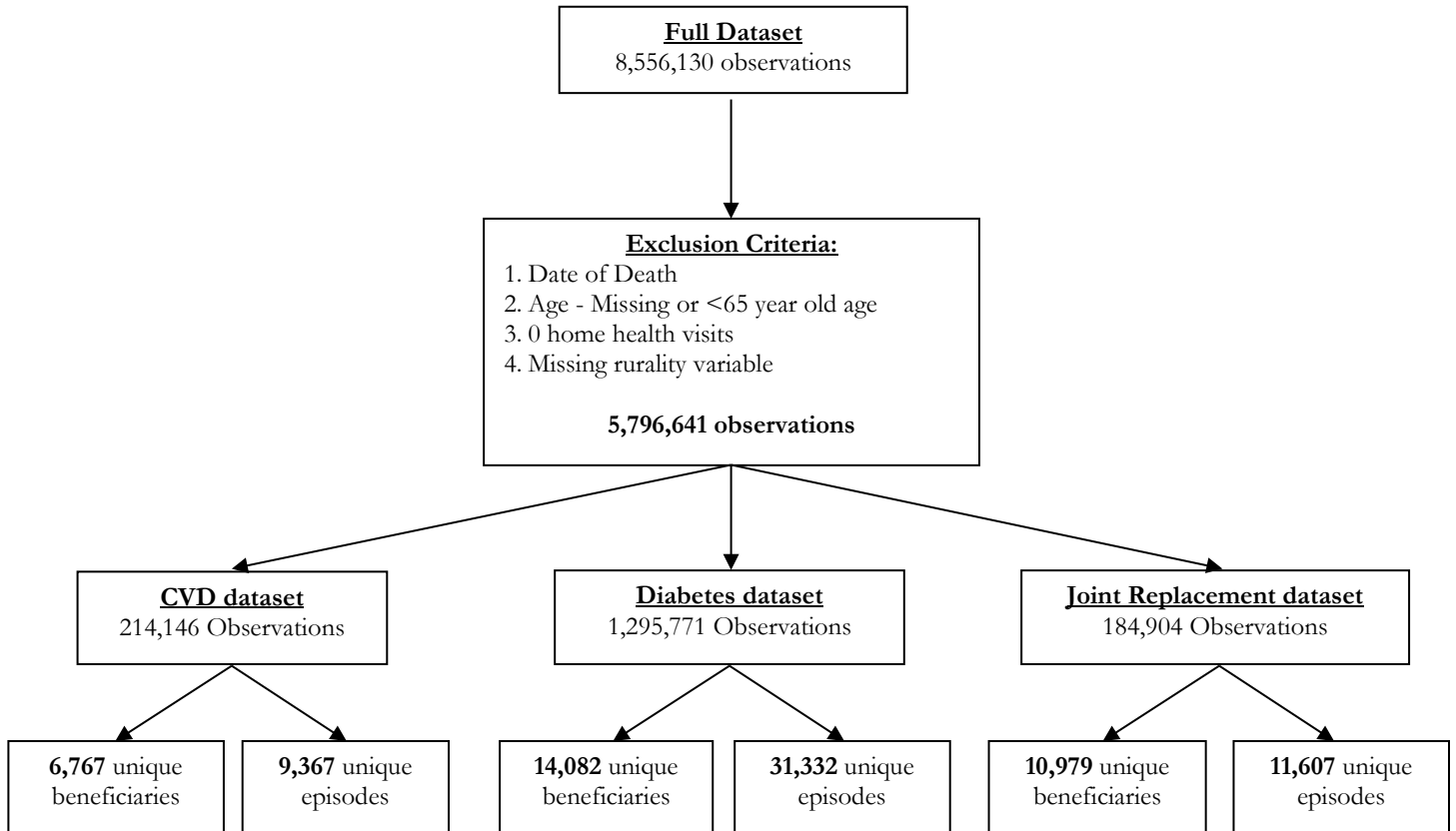
Data source and population specification

The Home Health Agency (HHA) Base Claim File (Version J), HHA Condition Code File, HHA Occurrence Code File, HH Revenue Center File (Version J), HHA Span Code File, HHA Value Code File, Beneficiary Annual File, and Beneficiary A/B/D Eligibility Summary Files were obtained from ResDac for the year 2009 and subsequently merged by beneficiary identification number (BENE_ID) and claim identification number (CLM_ID).

More than 8.5 million episodes were reviewed and grouped by beneficiary. Beneficiaries were excluded from the final dataset if: 1) they had died during 2009, 2) they were younger than 65 years or age information was missing, 3) they had no (0) home health visits or 4) residence information was missing from their record. See Figure below.

Separate datasets were created for each of the conditions of interest (cerebrovascular disease, diabetes and joint replacement) based on the principal diagnosis responsible for the episode of HH care. Stroke was defined using the ICD-9 codes between 430.00 and 439.00. Diabetes was defined using the ICD-9 codes between 249.00 and 251.00. Joint replacement was defined using the following ICD-9 codes: V43.60, V43.61, V43.62, V43.63, V43.64, V43.65, V43.66, V43.69, V43.70, and V54.81.

Figure 1. Selection of sample for each condition of interest



Definitions and analytic approach

Rurality was defined at the county level based on the beneficiary's residence. Patients were assigned to counties based on the ZIP Code of their address. The Urban Influence Code (UIC) from the 2011 Area Resource File was used to determine rurality at the county level (USDA, 2003). Counties were categorized as "urban" (UIC 1 or 2) and "rural" (UIC 3 through 12). The initial plan of examining HH intensity across all levels of rurality was modified to dichotomizing the area of residence into urban or rural given several small cell sizes when considered by all levels.

The type of provider was determined using the Healthcare Common Procedure Coding System (HCPCS) code set. The following codes were used for each provider type: physical therapist (G0151), occupational therapist (G0152), speech language pathologist (G0153, S9128), LPN or RN (G0154), Clinical Social Worker (G0155, S9127), Home Health/Hospice Aide (G0156), and Home Health Aide or Certified Nurse Assistance (S9122, T1021).

Descriptive analyses were conducted using SAS version 9.3 (SAS, 1984). Chi square tests and t-tests, as appropriate, were conducted to examine rural-urban differences at 95 percent confidence interval.

Potential study limitations

As a secondary data analysis, our study has several limitations. First, it is possible that some HH rehabilitation specialist services were provided to rural residents but billed under the Medicare Part B benefit rather than the home health benefit. Part B bills were not present in the data set. However, this would appear unlikely for two reasons. Only 2.6 million visits were billed under Part B in 2011, versus 59 million through the home health benefit (MedPAC 2013 Chap 9). Further, the billable rate for a visit under the home health prospective payment system is more than twice that for a similar visit billed through Part B with no beneficiary deductible. Second, the measure used to assess patient acuity, number of co-morbid conditions, may underestimate the needs of some patients. A single condition may present complex management challenges not considered in the analysis. Third, we did not assess regional patterns of care. MedPAC has suggested that regional differences, such as between the Northeast and sparsely populated Western States, may exceed rural-urban differences (MedPAC 2011). However, we did include region in our multivariable analysis; rural effects remained. Fourth, we did not include case-mix consideration in the analyses. While we restricted based on principal diagnosis, it is possible that secondary diagnoses are contributing to rural-urban differences. Finally, the findings reported here do not offer any insights into whether the rural-urban differences were due to underutilization of HH services by rural residents or overutilization by their urban peers.