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Different Populations Served by the Medicare Home Health Benefit: Comparison of Post-acute versus Community-entry Home Health in Rural Areas

KEY FINDINGS

▪ Rural, fee-for-service Medicare beneficiaries who are admitted to home health from the community (community-entry) are significantly different from those who are admitted to home health following an inpatient stay (post-acute). Higher rates of community-entry were seen among beneficiaries who were older, female, non-white, living alone, and dually eligible for Medicare and Medicaid, and who had lower clinical severity, lower functional status, more cognitive impairment, and higher need for caregiver assistance for supervision and safety.

▪ Wide variation by state exists in rates of community-entry home health episodes for rural beneficiaries, even after controlling for beneficiary characteristics. Maryland had the lowest percentage of community-entry home health episodes as a percentage of all home health episodes (17.6%), while Texas had the highest (38.8%).

▪ County-level community characteristics—including rurality, persistent poverty, population loss, number of acute hospital beds, number of skilled nursing facility beds, number of home health agencies, and state-level Medicaid expenditures on home- and community-based services—also have significant but relatively small associations with rates of community-entry compared with state and beneficiary characteristics.

BACKGROUND

Since Medicare implemented prospective payment for home health as mandated by the Balanced Budget Act of 1997, the home health benefit for fee-for-service Medicare beneficiaries has changed dramatically. An increase in "community-entry" home health episodes, which are not preceded by inpatient hospitalization or skilled nursing facility stay, has been a key driver in the overall growth in home health utilization despite the original intent of the home health benefit as a post-acute care service. From 2001 to 2015, community-entry episodes more than doubled from 2.1 million to 4.4 million compared to a 1.9 million to 2.2 million increase in post-acute care episodes.[1] The Centers for Medicare & Medicaid Services (CMS) recently proposed a prospective payment system revision that distinguishes between community-entry and post-acute episodes.[2] Yet most research on home health to date has focused on the post-acute population.

Rural beneficiaries are of particular interest because many characteristics of rural communities may hinder access to home health care.[3] Rural-related characteristics include lower per capita income, educational attainment, and employment compared to urban residents.[4] Geographic characteristics include isolation in the form of longer drive times between beneficiaries' homes. Overall, home health care use is similar in rural and urban areas,[5] even though rural home health patients tend to be sicker than their urban counterparts.[6] In addition, intra-rural variation in the use of home health care by certain populations exists,[1,5,7] and some rural beneficiaries experience reduced access to services other than nursing.[8]

The purpose of this study was to explore differences between community-entry and post-acute care home health for rural Medicare beneficiaries based on characteristics of beneficiaries (e.g., sociodemographic, clinical, functional) and the communities in which they live (e.g., rurality, region, economic indicators, health resources).

METHODS

This study was a retrospective cohort analysis of rural, fee-for-service Medicare beneficiaries who received home health services from 2011 to 2013. Data sources included Medicare administrative data from 2011 to 2013 including home health claims, the Outcomes and Assessment Information Set (OASIS), and Provider of Services (POS) files, the 2012 Area Health Resource File (AHRF), U.S. Department of Agriculture Economic Research Service (USDA ERS) 2015 county typology file, and published reports on state-level Medicaid expenditures on home- and community-based services (HCBS) from 2011 to 2013.[9]

We identified the initial qualifying home health episode for rural beneficiaries during the study timeframe and classified the episode as either post-acute or community-entry based on an OASIS item indicating whether any inpatient stay occurred within 14 days prior to home health admission. Episodes that were not preceded by an inpatient stay were considered community-entry rather than post-acute. Beneficiary characteristics included age, sex, race, dual-eligibility (Medicare and Medicaid) status, living situation (alone or with others), diagnosis, clinical severity, functional and cognitive status, and caregiving needs for medication management and supervision and safety. Community characteristics included level of rurality of the beneficiary residence; state-level spending on Medicaid HCBS; county-level indicators of persistent poverty, low employment, low education, population loss; and county-level number of acute hospital beds, skilled nursing facility beds, home health agencies, primary care doctors, and rural health clinics per beneficiary.

We examined differences in beneficiary characteristics between post-acute and community-entry episodes using chi-square tests. We then used hierarchical logistic regression to examine which beneficiary and community characteristics were associated with community-entry versus post-acute episodes, accounting for home health agency factors. The predicted marginal effects of beneficiary and community characteristics from the fully adjusted regression model are presented in the findings. The predicted marginal effects can be interpreted as the adjusted rates of community-entry home health episodes as a share of total home health episodes based on beneficiary and community characteristics. More details about study methodology, including variable definitions, are available in the Technical Appendix. The study was approved by the University of Washington Human Subjects Division.

FINDINGS

A total of 858,683 home health episodes for rural, fee-for-service Medicare beneficiaries were included in the analysis, of which 29.4% were classified as community-entry and 70.6% as post-acute. Table 1 shows beneficiary characteristics by type of episode. Beneficiaries utilizing community-entry versus post-acute home health were significantly older and more likely to be female, non-white, live alone, and dually eligible for Medicare and Medicaid. Beneficiaries with community-entry episodes

also had more cognitive impairment upon admission to home health and required more caregiver assistance for supervision and safety compared with beneficiaries with post-acute episodes. There were more beneficiaries with low or high versus moderate functional status as well as clinical severity utilizing community-entry compared with post-acute home health. The primary diagnosis also varied widely with more endocrine, nutritional and metabolic diseases, skin diseases, and diseases

Table 1. Characteristics of Rural Medicare Beneficiaries Receiving Community-entry and Post-acute Home Health Care[1], 2011-2013

	All (n=858,683)	Community-entry (n=252,138)	Post-acute (n=606,545)
Age***, column %[2]			
<65	13.5	14.0	13.3
65-74	28.2	21.4	31.0
75-84	34.4	33.7	34.7
85+	23.9	30.9	21.0
Sex***, column %			
Male	39.2	35.2	40.8
Female	60.8	64.8	59.2
Race***, column %			
White	90.2	87.1	91.5
Non-white	9.8	12.9	8.5
Dually eligible***, column %			
Yes	30.4	36.9	27.7
No	69.6	63.1	72.3
Diagnosis***, column %			
Other[3]	4.8	6.1	4.3
Neoplasms	4.7	4.2	4.9
Endocrine, nutritional, and metabolic diseases	5.4	9.4	3.8
Diseases of the nervous system and sense organs	2.8	5.3	1.8
Diseases of the circulatory system: cardiac conditions	13.5	14.3	13.2
Diseases of the circulatory system: all other conditions	8.8	5.8	10.1
Diseases of the respiratory system: asthma, bronchitis, COPD	4.8	4.0	5.1
Diseases of the respiratory system: all other conditions	3.5	1.2	4.4
Diseases of the digestive system	3.3	1.0	4.2
Diseases of the skin	4.2	6.7	3.2
Diseases of the musculoskeletal system and connective tissue	8.8	12.1	7.5
Symptoms, signs, and ill-defined conditions	4.2	5.6	3.7
Injury and poisoning	4.0	4.3	3.8
Fractures and related supplementary classification	6.1	3.6	7.1
Supplementary classification: joint replacement	8.7	0.2	12.2
Supplementary classification: rehabilitation	9.4	13.6	7.7
Supplementary classification: all other[4]	2.9	2.6	3.1
Clinical severity***, column %			
Low	24.0	24.7	23.8
Moderate	35.2	33.6	35.8
High	40.8	41.7	40.4
Functional status on admission***, column %			
Low	21.2	23.3	20.3
Moderate	59.4	55.2	61.1
High	19.4	21.5	18.6
Cognitive status on admission***, column %			
Intact	56.8	47.8	60.6
Mild impairment	30.1	33.9	28.5
Moderate to severe impairment	13.1	18.3	10.9

	All (n=858,683)	Community-entry (n=252,138)	Post-acute (n=606,545)
Lives alone*, column %			
Yes	28.3	32.8	26.5
No	71.7	67.2	73.5
Medication management*, column %			
No assist needed	29.5	28.6	29.9
Caregiver currently assisting	53.5	54.9	52.9
Assist needed but not currently sufficient	17.1	16.5	17.3
Supervision and safety*, column %			
No assist needed	40.2	35.3	42.3
Caregiver currently assisting	50.1	53.4	48.7
Assist needed but not currently sufficient	9.7	11.4	9.0

Overall chi-square: *p<.05, **p<.01, ***p<.001
1. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.
2. Percentages do not total to 100.0 due to rounding.
3. "Other" category includes: infection and parasitic diseases, diseases of blood and blood-forming organs, mental disorders, diseases of the genitourinary system, complications of pregnancy and childbirth, congenital anomalies, and conditions originating in the perinatal period.
4. "Supplementary classification: all other" category includes all supplementary classification of factors influencing health status and contact with health services V codes not included in above categories.

Source: Beneficiary characteristics were drawn from the OASIS performed upon admission to the initial 60-day episode of home health following an acute hospitalization or community entry.

of the nervous system and fewer non-cardiac circulatory conditions, respiratory conditions, digestive system diseases, and fractures among beneficiaries with community-entry versus post-acute episodes.

With respect to community characteristics, 48 states were represented in the analysis; New Jersey and Rhode Island were excluded because of a very small number of rural beneficiaries receiving home health in those states and the District of Columbia was excluded because it does not contain rural areas. In terms of county-level economic indicators, 37.5% were designated as "low employment," 15.1% as "low education," 12.3% as "persistent poverty," and 16.7% as "population loss" counties. In terms of county-level health resources, these rural counties had an average of 16.5 acute care hospital beds, 50.5 skilled nursing facility beds, 2.9 primary care physicians, 0.6 rural health clinics, and 0.3 home health agencies per 1,000 Medicare beneficiaries.

Table 2 presents the adjusted rates of community-entry and post-acute episodes by beneficiary characteristics from the fully adjusted regression model. For example, among males who are otherwise similar in terms of all other variables (i.e., characteristics of the beneficiary, the community in which the beneficiary lives, and the home health agency providing care), 27.7% entered home health from the community compared with 72.3% following acute hospitalization; among females, 30.4% entered home health from the community compared with 69.6% following acute hospitalization. After controlling for community and home health agency characteristics, the relationships between beneficiary characteristics and community-entry remained significant (p<.001 for all beneficiary characteristics). Higher rates of community-entry were found to be associated with being older, female, non-white, living alone, and dually eligible for Medicaid, and having lower clinical severity, lower functional status, lower cognitive status, and higher need for caregiver assistance for supervision and safety.

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Table 2. Adjusted Rates[1] of Community-entry and Post-acute Home Health Episodes among Rural Medicare Beneficiaries by Beneficiary Characteristics, 2011-2013

	Community-entry[2]	Post-acute[2]
Age*		
<65	26.6%	73.4%
65-74	24.6%	75.4%
75-84	29.4%	70.6%
85+	35.8%	64.2%
Sex*		
Male	27.7%	72.3%
Female	30.4%	69.6%
Race*		
White	29.2%	70.8%
Non-white	30.8%	69.2%
Dually eligible*		
Yes	32.7%	67.3%
No	27.8%	72.2%
Diagnosis*		
Other[3]	33.4%	66.6%
Neoplasms	30.2%	69.8%
Endocrine, nutritional, and metabolic diseases	46.3%	53.7%
Diseases of the nervous system and sense organs	51.0%	49.0%
Diseases of the circulatory system: cardiac conditions	27.4%	72.6%
Diseases of the circulatory system: all other conditions	20.6%	79.4%
Diseases of the respiratory system: asthma, bronchitis, COPD	24.8%	75.2%
Diseases of the respiratory system: all other conditions	10.8%	89.2%
Diseases of the digestive system	9.7%	90.3%
Diseases of the skin	47.5%	52.5%
Diseases of the musculoskeletal system and connective tissue	37.4%	62.6%
Symptoms, signs, and ill-defined conditions	37.0%	63.0%
Injury and poisoning	34.6%	65.4%
Fractures and related supplementary classification	17.4%	82.6%
Supplementary classification: joint replacement	1.1%	98.9%
Supplementary classification: rehabilitation	43.6%	56.4%
Supplementary classification: all other[4]	29.2%	70.8%
Clinical severity*		
Low	31.8%	68.2%
Moderate	29.4%	70.6%
High	28.1%	71.9%
Functional status on admission*		
Low	33.7%	66.3%
Moderate	28.2%	71.8%
High	28.3%	71.7%
Cognitive status on admission*		
Intact	26.5%	73.5%
Mild impairment	31.0%	69.0%
Moderate to severe impairment	36.6%	63.4%
Lives alone*		
Yes	32.0%	68.0%
No	28.3%	71.7%
Medication management*		
No assist needed	31.8%	68.2%
Caregiver currently assisting	29.0%	71.0%
Assist needed but not currently sufficient	26.8%	73.2%
Supervision and safety*		
No assist needed	28.2%	71.8%
Caregiver currently assisting	29.6%	70.4%
Assist needed but not currently sufficient	32.6%	67.4%

Table 2 table notes continued next page

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Table 3 presents adjusted rates of community-entry and post-acute episodes by community characteristics. Although many of these relationships were statistically significant in the fully adjusted regression model, the magnitudes of these associations were generally smaller than the magnitudes of the associations between entry into home health and beneficiary characteristics. However, there was wide variation in adjusted rates of community-entry by state (see Figure 1) with a range of 17.6% (Maryland) to 38.8% (Texas) and an average of 27.8% nationwide.

Table 3. Adjusted Rates[1] of Community-Entry and Post-acute Home Health Episodes among Rural Medicare Beneficiaries by Community Characteristics, 2011-2013

	Community-entry[2]	Post-acute[2]
Rurality*		
Large rural	29.5%	70.5%
Small rural	29.5%	70.5%
Isolated small rural	28.9%	71.1%
County-level Health Resources		
Acute hospital beds**		
Lowest quartile	30.2%	69.8%
Second quartile	29.4%	70.6%
Third quartile	29.3%	70.7%
Highest quartile	28.6%	71.4%
Skilled nursing facility beds*		
Lowest quartile	29.0%	71.0%
Second quartile	29.4%	70.6%
Third quartile	29.1%	70.9%
Highest quartile	30.0%	70.0%
Home health agencies**		
Lowest quartile	28.8%	71.2%
Second quartile	28.9%	71.1%
Third quartile	29.2%	70.8%
Highest quartile	30.6%	69.4%
Primary care doctors		
Lowest quartile	29.0%	71.0%
Second quartile	29.4%	70.6%
Third quartile	29.5%	70.5%
Highest quartile	29.5%	70.5%
Rural health clinics		
Lowest quartile	29.5%	70.5%
Second quartile	29.5%	70.5%
Third quartile	29.5%	70.5%
Highest quartile	29.0%	71.0%

	Community-entry[2]	Post-acute[2]
Economic Indicators[3]		
Persistent poverty county*		
Yes	30.8%	69.2%
No	29.1%	70.9%
Low employment county		
Yes	29.6%	70.4%
No	29.2%	70.8%
Low education county		
Yes	29.8%	70.2%
No	29.3%	70.7%
Population loss county**		
Yes	28.5%	71.5%
No	29.5%	70.5%
Medicaid Home- and Community-Based Services		
Expenditures per resident*		
Lowest quartile	28.2%	71.8%
Second quartile	29.5%	70.5%
Third quartile	30.2%	69.8%
Highest quartile	30.4%	69.6%
Percentage of spending on long-term services & supports**[4]**		
Lowest quartile	29.7%	70.3%
Second quartile	30.4%	69.6%
Third quartile	28.9%	71.1%
Highest quartile	28.5%	71.5%

Wald F test: *$p<.05$, **$p<.01$, ***$p<.001$

1. Adjusted rates represent the percent of community-entry or post-acute home health episodes as a share of all home health episodes and are presented as row percentages. Rates are adjusted for state of beneficiary residence and all other community characteristics included in table; beneficiary characteristics including age, sex, race, dual-eligibility status, living situation, primary diagnosis, clinical severity, functional and cognitive status, and caregiving needs for medication management and supervision and safety; and home health agency characteristics including rurality of agency, profit status, facility type, rural volume, agency size based on full-time equivalent clinical staff, and contracting status of clinical staff.

2. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.

3. Persistent poverty means 20% or more residents of a county were poor as measured by the 1980, 1990, and 2000 Census and the American Community Survey (ACS) 5-year average between 2007 and 2011; low employment means less than 65% of county residents ages 25 to 64 were employed based on the ACS 5-year average between 2008 and 2012; low education means 20% or more county residents had neither a high school diploma nor GED based on the ACS 5-year average between 2008 and 2012; and population loss means the number of county residents declined both between the 1990 and 2000 Census and between the 2000 and 2010 Census.

4. Percentage of spending on long-term services and supports for older adults and individuals with physical disabilities.

Sources: Outcome and beneficiary characteristics were drawn from the OASIS performed upon admission to the initial 60-day episode of home health. Rurality was determined using Rural Urban Commuting Area (RUCA) codes. State-level spending on Medicaid home-and community-based services was drawn from publicly-available summary reports from Truven Health Analytics. County-level economic indicators were drawn from the U.S. Department of Agriculture Economic Research Service files. County-level health resources were drawn from the Area Health Resource File and standardized by county-level Medicare enrollment.

Figure 1. Adjusted Rates[1] of Community-Entry Home Health Episodes among Rural Medicare Beneficiaries by State, 2011-2013
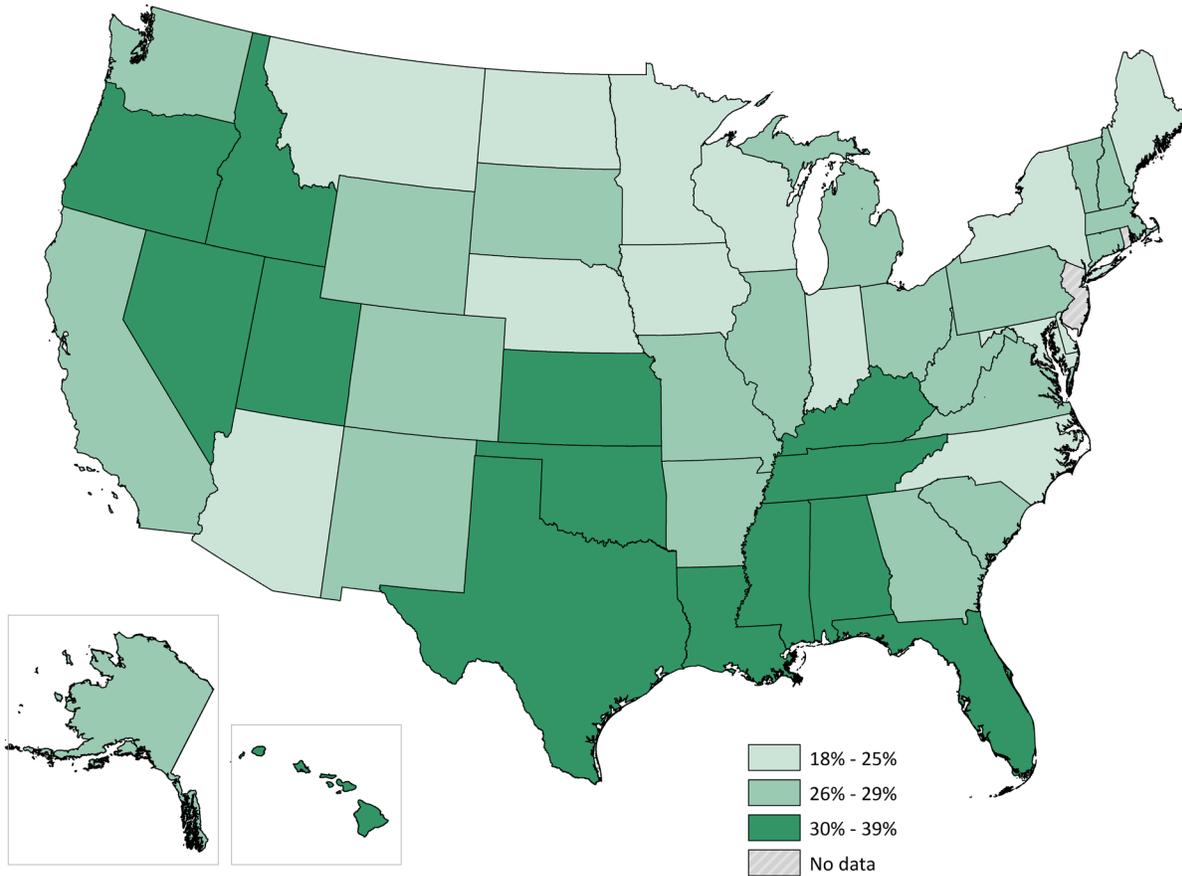
Legend:
- 18% - 25%
- 26% - 29%
- 30% - 39%
- No data

1. Adjusted rates represent the percent of community-entry home health episodes as a share of all home health episodes. Rates are adjusted for beneficiary characteristics including age, sex, race, dual-eligibility status, living situation, diagnosis, clinical severity, functional and cognitive status, and caregiving needs for medication management and supervision and safety; community characteristics including rurality of beneficiary residence, state-level spending on Medicaid home- and community-based services, county-level indicators of persistent poverty, low employment, low education, population loss, and county-level number of acute hospital beds, skilled nursing facility beds, home health agencies, primary care doctors, and rural health clinics per beneficiary; and home health agency characteristics including rurality of agency, profit status, facility type, rural volume, agency size based on full-time equivalent clinical staff, and contracting status of clinical staff.

2. Episodes were classified based on response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, and 7) were classified as post-acute.

Sources: Outcome and beneficiary characteristics were drawn from the OASIS performed upon admission to the initial 60-day episode of home health care. Rurality was determined using Rural Urban Commuting Area (RUCA) codes. County-level economic indicators were drawn from the U.S. Department of Agriculture Economic Research Service. State-level spending on Medicaid home-and community-based services was drawn from publicly-available summary reports from Truven Health Analytics. County-level health resources were drawn from the Area Health Resource File and standardized by county-level Medicare enrollment. Home health agency characteristics were drawn from the Provider of Services files.

CONCLUSIONS

The Medicare home health benefit appears to be serving two quite different populations in rural communities: beneficiaries who are admitted from the community, and beneficiaries who are admitted following an inpatient stay. Community-entry home health is more likely among beneficiaries who are older, live alone, require caregiver assistance for supervision or safety, and have lower functional status and higher cognitive impairment which suggests community-entry home health may be serving as a long-term care benefit in some cases. Furthermore, the higher rate of community-entry among beneficiaries dually eligible for Medicare/Medicaid and in states with lower Medicaid expenditures on HCBS (as a percentage of spending on all long-term services and supports) may indicate community-entry home health under the Medicare benefit is potentially serving as a partial substitute for Medicaid HCBS for certain beneficiaries. Whether the challenges older adults living in rural areas face in accessing long-term care[10] are greater than challenges to accessing home health care under the Medicare benefit is unknown, however; further research among the dually eligible population with local- or individual-level Medicaid expenditures on HCBS is needed to examine the occurrence and extent of substitution of these services.

The presence of significant state-level variation in rates of community-entry home health, even after adjusting for beneficiary characteristics and other community characteristics, echoes geographic variation in the use of post-acute care among Medicare beneficiaries.[11, 12]

LIMITATIONS

As this study was limited to rural beneficiaries receiving home health care, we cannot compare urban-rural differences in rates of community-entry versus post-acute home health. We also cannot report results on Medicare Advantage beneficiaries (approximately 20% of rural Medicare beneficiaries[13]) because information on their utilization of home health was not included in our datasets. In addition, use of state-level expenditures for Medicaid HCBS cannot account for variations in these expenditures at the county- or individual-level for dually eligible beneficiaries.

IMPLICATIONS FOR POLICY AND PRACTICE

Results of this study indicate differences in characteristics of rural beneficiaries served under the Medicare home health benefit based on whether the home health episode is community-entry or post-acute. These findings lend initial support to differentiating between community-entry and post-acute episodes for payment. CMS has recently proposed this change as part of the Home Health Groupings Model, a major revision to case-mix adjustment and payment calculations within the home health prospective payment system.[2] The Bipartisan Budget Act of 2018[14] mandates a new case-mix system for home health by 2020. If the Home Health Groupings Model is implemented, home health agencies would receive higher payments for post-acute versus community-entry episodes.

Further research is needed to better understand differences in service provision between these types of home health episodes among rural populations as this emerging model may discourage home health agencies from providing community-entry home health for beneficiaries with high care needs. The potential for decreased access to care is especially concerning for rural Medicare beneficiaries and should be examined in conjunction with geographic variation in and access to Medicaid HCBS and other post-acute care services (e.g., skilled nursing facilities). Additional studies by the WWAMI Rural Health Research Center are investigating differences in service provision by community-entry versus post-acute home health episodes for rural Medicare beneficiaries as well as the potential for unmet need for home health in rural communities versus urban communities. This series of studies aligns with the CMS Rural Health Strategy by applying a rural lens to the impact of Medicare programs and policies which will help inform continued efforts to revise the home health prospective payment system to better serve all beneficiaries.[15]

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TECHNICAL APPENDIX

This appendix contains detailed technical notes regarding the methods used in this study.

Design and data sources:

This study was a retrospective cohort analysis of rural, fee-for-service Medicare beneficiaries who utilized home health care between 2011 and 2013. Data included Medicare administrative data from 2011 to 2013, specifically home health claims and the Outcomes and Assessment Information Set (OASIS), linked with data from the Area Health Resource File (AHRF) for 2012, the 2015 Edition of County Typology Codes from the U.S. Department of Agriculture Economic Research Service (USDA ERS), and publicly available summary reports on state-level Medicaid expenditures on home and community-based services (HCBS) between 2011 and 2013 from Truven Health Analytics. Home health claims provide beneficiary-level detail on home health episodes. The OASIS is a comprehensive assessment specific to home health that was designed to collect necessary information for care planning by home health agencies and measure outcomes for quality improvement. The OASIS is completed upon admission, discharge, changes in status including transfer to a hospital, and renewal of services for each 60-day episode of care. Items from the OASIS also contribute to case-mix adjustment for Medicare reimbursement. The AHRF provides information on health resources at the county level including hospital beds, skilled nursing facility beds, home health agencies, rural health clinics, and primary care providers. The ERS data classifies all U.S. counties in terms of economic dependence indicators, including low employment, persistent poverty, low education, and population loss, that are derived from U.S. Census data and the American Community Survey (ACS).

Sample:

We used the following inclusion criteria: 1) Medicare fee-for-service beneficiary, 2) rural-residing based on beneficiary's residential ZIP code classified into any rural category of the ZIP code approximation of the Rural Urban Commuting Area

(RUCA) codes, version 3.10[16] (https://ruralhealth.und.edu/ruca; additional classification details below), and 3) began home health episode on or after January 1, 2011 and ended on or before December 31, 2013. We excluded beneficiaries who 1) transferred care between home health agencies during the initial home health episode or 2) had an unknown status at the end of the initial home health episode. For beneficiaries who were admitted to home health multiple times during the study period, we used the first initial home health episode during the study period that satisfied inclusion and exclusion criteria.

Dependent variable/outcome:
Episodes were classified based on the response to OASIS item M1000 (From which of the following inpatient facilities was the patient discharged during the past 14 days?). Patients who had not been discharged from an inpatient facility (response option 'NA') were classified as community-entry. Patients who had been discharged from an inpatient facility (response options 1, 2, 3, 4, 5, 6, or 7) were classified as post-acute.

Independent variables/beneficiary characteristics:
Beneficiary characteristics included: demographics, dual-eligibility status for Medicare and Medicaid, diagnosis, clinical severity, functional and cognitive status upon admission, living situation, and caregiving needs. Demographics included age (<65, 65-74, 75-84, and 85+), sex, and race (white vs. non-white). Dual-eligibility status (yes/no) was determined based on enrollment in Medicaid at any point during the calendar year in which home health services were received from the enrollment file. The ICD-9 code for the primary diagnosis for the home health episode was classified into one of 17 categories based on major diagnostic groups and high frequency conditions (see Table A1). Clinical severity and functional status upon admission were determined based on the OASIS-derived case-mix measures for prospective payment. Clinical severity, categorized as

Table A1. ICD-9 Codes for Diagnosis Groups

Diagnosis Group	Associated ICD-9 Codes
Neoplasms	140.0-239.9, V58.42
Endocrine, nutritional, and metabolic diseases	240.0-279.9
Diseases of the nervous system and sense organs	320.0-389.9, V58.71, V58.72
Diseases of the circulatory system: cardiac conditions	390-429.9
Diseases of the circulatory system: all other conditions	430-459.9, V58.73
Diseases of the respiratory system: asthma, bronchitis, COPD	490-493.92, 496
Diseases of the respiratory system: all other conditions	460-488.89, 494.0-495.9, 500-519.9, V58.74
Diseases of the digestive system	520.0-579.9, V58.75
Diseases of the skin	680.0-709.9, V58.77
Diseases of the musculoskeletal system and connective tissue	710.0-739.9, V58.78
Symptoms, signs, and ill-defined conditions	780.0-799.9
Injury and poisoning	800.0-804.99, 850.0-999.9
Fractures and related supplementary classification	805.0-848.9, V54.0-V54.29, V54.82-V54.9
Supplementary classification: joint replacement	V54.81, V43.60-V43.69
Supplementary classification: rehabilitation	V57.0-V57.9
Supplementary classification: all other	V01-V89 (except V43.60-V43.69, V54.0-V54.29, V54.81-V54.89, V57.0-V57.9, V58.42, V58.71-V58.79)
Other: infection and parasitic diseases, diseases of the blood and blood-forming organs, mental disorders, diseases of the genitourinary system, complications of pregnancy and childbirth, congenital anomalies, and conditions originating in the perinatal period	001.0-139.8, 280.0-289.9, 290.0-319, 580.0-629.9, V58.76, 630-679.14, 740.0-759.9, 760.0-779.9

low, moderate, or high in the case-mix measure, depends on clinical factors such as need for intravenous or parenteral therapy, vision limitations, wounds, pressure ulcers, bowel incontinence, and shortness of breath. Functional impairment, categorized as low, moderate, or high in the case-mix measure, is based on physical assistance required with dressing, bathing, toileting, transfers, and ambulation. Cognitive status was based on an OASIS item on global cognitive status categorized into intact, mild impairment, and moderate to severe impairment. Living situation was dichotomized into lives alone versus lives with others. Caregiving needs were derived from the OASIS and included medication management (none needed, caregiver currently providing assistance, or assistance needed but not currently sufficient) and supervision and safety (no assistance needed, caregiver currently providing assistance, or assistance needed but not currently sufficient).

Independent variables/community characteristics:

Community characteristics included: rurality of beneficiary residence, state of beneficiary residence, county-level economic indicators, county-level available health resources, and state-level Medicaid spending on HCBS. Rurality of beneficiary residence was determined based on the 2010 RUCA codes, version 3.10 for the beneficiary's ZIP code. We used the ZIP code approximation of the RUCA census tract-based classification scheme, which characterizes the urban/rural status of areas based on U.S. Census Bureau definitions and work commuting information. Rurality was classified as large rural (codes 4.0, 5.0, 6.0), small rural (7.0, 7.2, 8.0, 8.2, 9.0), or isolated small rural (10.0, 10.2, 10.3). State of beneficiary residence included 48 states; New Jersey, Rhode Island, and the District of Columbia were excluded from analysis due to no rural counties or small cell sizes for rural beneficiaries. Available health resources from the AHRF included number of acute care hospital beds, skilled nursing facility beds, home health agencies, rural health clinics, and primary care physicians within each county in 2012, standardized by county-level Medicare enrollment ages 65 and over and grouped by quartile. County-level economic indicators from the ERS data included dichotomous variables indicating persistent poverty, low employment, low education, and population loss (USDA-ERS, 2016). Persistent poverty indicates that 20% or more residents of a county were poor as measured by the 1980, 1990, and 2000 Census and the ACS 5-year average between 2007 and 2011. Low employment indicates that less than 65% of county residents ages 25 to 64 were employed based on the ACS 5-year average between 2008 and 2012. Low education indicates that 20% or more county residents had neither a high school diploma nor GED based on the ACS 5-year average between 2008 and 2012. Counties designated with population loss had the number of county residents decline both between the 1990 and 2000 Census and between the 2000 and 2010 Census. Two variables derived from publicly-available reports from Truven Health Analytics were used to describe Medicaid spending on HCBS between 2011 and 2013: 1) quartiles of state-level Medicaid expenditures on HCBS, and 2) quartiles of state-level Medicaid expenditures on HCBS as a percentage of spending on all long-term services and supports (LTSS) for older adults and adults with physical disabilities. For this analysis, Federal Fiscal Year data on Medicaid HCBS were treated as Calendar Year data and Medicaid HCBS spending variables were pegged to the year of the beneficiary episode using start date of the episode.

Independent variables/home health agency characteristics:

Home health agency characteristics were used as control variables in the analysis and included: profit status, facility type, rural volume, size based on full-time equivalent (FTE) staffing and use of contracting for therapy and medical social work staff. Profit status was categorized as for-profit, non-profit, or governmental. Facility type was categorized as free-standing versus facility-based (i.e., based within a hospital, skilled nursing facility, or other inpatient facility). Variables for home health agency size were calculated based on FTE for each service type and categorized based on variable distributions. Size variables included FTE for registered nurse (<3, 3-5.99, 6-11.99, 12+), licensed practical nurse (<1, 1-1.99, 2-2.99, 3+), home health aide (<1, 1-1.99, 2-2.99, 3+), physical therapist (0, .01-.99, 1-2.99, 3+), occupational therapist (0, .01-.49, .50-.99, 1+), speech language pathologist (0, .01-.25, >.25), and medical social worker (0, .01-.49, .50+). Use of contracting for therapy and medical social work services were variables indicating whether physical therapy, occupational therapy, and medical social work were provided by in-house staff only, through the use of contract staff or a combination of in-house and contract staff, or

not provided. Rural volume, calculated from claims data using the number of total annual visits provided by the home health agency without exclusion, was categorized as <500, 500-2,499, 2,500-4,999, 5,000-9,9999, and 10,000+ total annual visits.

Analyses:

Descriptive analysis regarding beneficiary characteristics by community-entry versus post-acute home health episode compared measures of proportion with chi-square tests. To assess the relationship between beneficiary and community characteristics with community-entry home health, we used a three-level hierarchical multiple regression model. We used generalized estimating equation methods in the regression analyses to account for clustering of beneficiaries within agencies and states. From this logistic regression model we calculated adjusted rates of community-entry episodes. Analyses were completed using SAS software, Version 9.4 of the SAS System for Windows and SUDAAN software, Version 11.1. Complete case analysis was used for final models as less than 1% of beneficiaries who otherwise met inclusion and exclusion criteria were missing data.