

PATTERNS OF POST-ACUTE UTILIZATION IN RURAL AND URBAN COMMUNITIES: HOME HEALTH, SKILLED NURSING, AND INPATIENT MEDICAL REHABILITATION

Final Report

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Janet P. Sutton, Ph.D.

NORC Walsh Center for Rural Health Analysis
7500 Old Georgetown Road, Suite 620
Bethesda, Maryland 20814
301-951-5070

N O R C
A national organization for research

at the University of Chicago

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NORC Walsh Center for Rural Health Analysis

7500 Old Georgetown Road, Suite 620

Bethesda, Maryland 20814

301-951-5070

301-951-5082 (fax)

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Executive Summary

Background: Concerned with rising post-acute care expenditures, Congress mandated that the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services, or CMS) implement a prospective payment system (PPS) for all post acute venues – skilled nursing facilities (SNF), home health agencies (HHA), inpatient rehabilitation facilities (IRF), and long-term care (LTC) facilities. With changes in the structure of these reimbursement systems, patterns of utilization of post-acute services have likewise changed. A 2003 MedPAC Report to Congress indicates that the overall use of post-acute services declined between 1996 and 2001. As the post-acute PPS continues to evolve and with changes in the post-acute industry it will be important for the Federal Office of Rural Health Policy, CMS, policy-makers and researchers to continually monitor post-acute utilization patterns to detect how policies affect access. The purpose of this study is to describe rural Medicare beneficiaries' patterns of post-acute utilization of home health services, skilled nursing facilities, and inpatient rehabilitation facilities. This study provides baseline data that policymakers, researchers, and others who are interested in rural health care issues may use to monitor how changes in Medicare policies affect access to post-acute care in rural communities.

Approach: Using data from MEDPAR and the Home Health Standard Analytical Files, we identified Medicare beneficiaries with an acute care discharge during the first quarter of 2000 and tracked these patients' claims from the point of discharge through 2001. We constructed post acute episodes to classify patients in terms of whether they received no post acute care, only HHA care, only SNF care, only IRF care, or a combination of different types of post-acute care. We initiated an episode if the beneficiary received these services between the dates of discharge from acute care up to 32 days following the acute inpatient discharge, all post-acute services following inpatient discharge counted as part of the same episode. We terminated an episode if the patient experienced a 32-day period without any post acute service, an acute inpatient readmission occurred, or the patient died.

We narrowed the study population to include only those beneficiaries with a principal acute care diagnosis corresponding to one of the following Diagnosis Related Groups (DRGs):

(1) DRG 107, coronary bypass with cardiac catheterization; (2) DRG 109, coronary bypass without cardiac catheterization; (3) DRG 127, heart failure and shock; (4) DRG 209, surgical procedures of the joint; (5) DRG 210, hip & femur procedures; and (5) DRG 294, diabetes.

Using cross tabulations we estimated the proportion of Medicare beneficiaries residing in metropolitan and non-metropolitan counties who received post-acute care in any or a combination of settings. We estimated the odds that metro and non-metro residents would use any post-acute care as well as care in each type of post-acute setting, adjusting for differences in age, race, sex and dual eligibility status. Among the subset of Medicare beneficiaries who were discharged to either home health or SNF care we examined differences in resource consumption or intensity. Finally, we conducted a correlation analysis to test the assumption that the supply of post acute providers drives placement decisions.

We applied a modified version of the Department of Agriculture Rural and Urban Continuum Codes to identify metropolitan counties and establish non-metropolitan county subgroups, ranging from the least to the most rural. Metropolitan (metro) counties were designated as counties of any size that were located in a metropolitan area. We designated non-metropolitan county subgroups based on both size and adjacency to a metropolitan area. Non-metropolitan counties with an urban population of more than 2,500 that are located in an area adjacent to a metropolitan area were grouped into a category that we refer to as “metro adjacent.” We also grouped non-metropolitan counties with an urban population of more than 2,500 that are located in an area that is not adjacent to a metropolitan area into a category referred to as “non-metro adjacent.” Finally, counties in which no place has a population larger than 2,500, whether located adjacent to a metropolitan area, were considered to be “rural” counties.

Key Findings: Among the major findings of this study:

- Non-metro beneficiaries were significantly less likely than were metro beneficiaries to use any post-acute care even after we controlled for selected demographic characteristics (age, race, gender, dual eligibility). For most DRGs we also observed a lower likelihood of post-acute use for all non-metro subgroups that we examined.
- Non-metro beneficiaries were between two-thirds and four-fifths as likely as metro beneficiaries were to use home health care.

- For the DRGs in which medical rehabilitation is more frequently used – surgical procedures of the joint and hip/femur procedures – non-metro beneficiaries were approximately one-half to two-thirds as likely to be admitted to an IRF.
- Although non-metro beneficiaries in most DRGs were less likely to use SNF services, non-metro beneficiaries with an acute care discharge for a hip/femur procedure were slightly more likely to receive treatment in a SNF.
- Across most of the diagnoses that we looked at metro and non-metro post-acute users did not differ in the intensity of SNF care; lengths of stay were relatively comparable.
- We noted few differences in patterns of home care utilization across location. Where present, differences were associated with the use of skilled disciplines. For DRGs 107, 127 and 209, non-metro beneficiaries were significantly less likely to use any physical therapy services. Non-metro beneficiaries represented in DRG 127 and DRG 209 also received fewer physical therapy visits. In the case of DRG 209, we further found that the proportion of beneficiaries who received occupational therapy was lower in non-metro than in metro areas.
- Use of post-acute services was only weakly correlated with provider supply.

Discussion of Findings:

Medicare beneficiaries residing in non-metro subgroups were less likely than were beneficiaries in metro areas to use any post-acute services. Across most DRGs, the odds of receiving SNF, HHA, or IRF care was also less for non-metro subgroups. One exception was DRG 210 (hip/femur procedures). Perhaps because most patients in this DRG received post-acute care (and use of post-acute care is therefore less discretionary) and a large proportion of care was rendered in a SNF, use of post-acute care or in the proportion who received SNF care were not significant across metro and non-metro subgroups.

In considering this particular result, it is necessary to note that the clinical characteristics of patients within the same DRG are not homogeneous and that differences in utilization could reflect differences in severity, co-morbidities or functional status that we were unable to control for in the course of this study. An implicit assumption of this study was that rural and urban elderly would utilize post-acute services at a comparable rate. However, research indicates that the health status of the rural elderly is often worse than that of the urban elderly. (Probst et al., 2002). If the rural elderly represented in each DRG are, in fact, sicker, they should be expected to utilize post-acute services at a higher rate than their urban counterparts. The finding that rural

elderly are less likely to use post-acute services therefore suggests that the rural-urban gap may be even larger than the data indicates.

We hypothesized that supply would drive post-acute use and that the extent to which beneficiaries received care in each setting would be directly related to provider availability. The observations that the use of particular post-acute settings was only weakly correlated with provider supply fails to support this hypothesis. The magnitude of the supply effect suggests to us that other factors are possibly driving post-acute use. In addition to patient health and functional status, these factors may include local practice patterns or provider perceptions concerning the appropriateness and efficacy of post-acute placement in treating selected conditions. As research continues, it will be necessary to evaluate how guidelines, practice patterns or standards of care influence urban/rural patterns of post-acute use.

We cannot discount the possibility that we did not observe a stronger relationship between supply and post-acute use because of limitations in how we measured both markets and supply. Markets designated based on county boundaries may not reflect actual provider referral patterns. County estimates of the total or per capita number of agencies are crude proxies for home health capacity. Moreover, the supply measures that we used failed to account for differences in staffing ratios or the mix of skilled and non-skilled labor. It is possible that the availability of skilled personnel (as opposed to agencies or facilities) is a better measure of post-acute capacity. We found that for the two rehabilitation diagnostic groups (DRGs 209, and 210), non-metro residents were less likely than their metro counterparts to use physical therapy, and/or the number of visits was less. Non-metro residents in both diagnostic groups were also less likely to receive occupational therapy. The finding that non-metro beneficiaries represented in DRG 209 were more likely to use skilled nursing services is of particular interest since it offers some support for the assertion that home care agencies in rural areas with shortages of physical or occupational therapists use nurses to provide rehabilitative services.

The observation that non-metro beneficiaries are less likely to receive therapy and the possibility that agencies substitute nursing for therapy services is important for two reasons. One reason is that, for many conditions, physical and occupational therapy is essential for patients to achieve optimal functioning and to maintain independence. The lower rate of therapy use raises questions about whether the quality or outcomes of post-acute care are comparable for rural and urban residents. A second reason is that under the home care PPS, therapy services qualify for

higher reimbursement rates. Agencies only qualify for this higher rate if services are rendered by a licensed physical therapist; to the extent that rural agencies substitute nurses for therapists they do not benefit from the more favorable rates. Data are not directly available to test the hypothesis that the supply of skilled health therapists is driving patterns of rural home health use. Future studies should seek to collect and incorporate this information into studies of post-acute use in order to address these concerns.

Findings from this study suggest that rural Medicare beneficiaries continue to experience barriers in accessing post-acute services. We recommend that researchers, policy analysts and policymakers seek a further understanding of the factors that affect use of post-acute services and that they continue to monitor the effect of these and other Medicare policies on post-acute access.

Post-Acute Utilization in Rural and Urban Communities following Implementation of the Home Health and SNF PPS

BACKGROUND

Objective: The purpose of this study is to describe rural Medicare beneficiaries' patterns of post-acute utilization of home health services, skilled nursing facilities, and rehabilitation hospitals. This study provides baseline data that policymakers, researchers, and others who are interested in rural health care issues may use to monitor how changes in Medicare policies affect utilization and access to post-acute care.

Policy Significance: Concerned with rising post-acute care expenditures, Congress mandated that the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services, or CMS) implement a prospective payment system (PPS) for all post acute venues – skilled nursing facilities (SNF), home health agencies (HHA), inpatient rehabilitation facilities (IRF), and long-term care (LTC) facilities.¹ Beginning in 1997 with home health and continuing to the present with the LTC phase-in, CMS has or is in the process of transitioning payment in each of these settings from a cost basis to a prospective basis.

As was intended, the shift to prospective payment initially resulted in significant cost savings. After increasing at an average annual rate of 21 percent between 1992 and 1997, Medicare spending on post-acute care declined by 30 percent between 1997 and 2000, the period in which the home health and SNF PPS were being phased-in. Much of the slow-down in growth was attributed to the dramatic decline in home health expenditures. During this time, SNF spending declined by 15 percent whereas home health expenditures fell by 50 percent. Spending for IRF and LTC providers, who continued to be reimbursed on a cost basis, increased by 8 percent and 42 percent, respectively (MedPAC, 2004.)

The introduction of these post-acute payment systems was also associated with marked changes in the supply of certain post-acute care providers. Most notable was the reduction in

¹ Legislation shifting post-acute reimbursement to prospective payment was included in the 1997 Balanced Budget Act, the 1999 Balanced Budget Refinement Act, and the 2000 Medicare, Medicaid and SCHIP Benefits Improvement and Protection Act.

Medicare-certified home health agencies that occurred during the time in which the home health interim payment system (IPS) was in place. The IPS lowered the per-visit cap that was in place prior to enactment of the BBA and introduced a per-beneficiary cap which effectively limited an agency's reimbursement to their 1994 average beneficiary cost. Largely because of the IPS, about one-third of home health agencies dropped out of the Medicare program between 1997 and 2001.² Metropolitan areas of the country experienced a 38 percent reduction and non-metropolitan areas experienced a 27 percent reduction in the number of home health agencies. The supply of SNFs in both metropolitan and non-metropolitan areas was relatively unchanged during this period.³

As CMS continued to refine these post-acute reimbursement systems, and with the attendant changes in supply, patterns of utilization of post-acute services likewise changed. A 2003 MedPAC Report to Congress indicates that the overall use of post-acute services declined between 1996 and 2001. Interestingly, although discharges to home health declined during this period, discharges to other post

Summary of Post-Acute Payment Systems

Home Health Agencies: The home health PPS provides for a case-mix adjusted rate per 60-day episode of care. The case-mix adjustment system classifies patients into Home Health Episode Groups (HHEG) based on clinical characteristics, functional status and service utilization. Each HHEG is assigned a weight that, when multiplied by the standardized prospective payment rate, determines the case-mix adjusted prospective payment rate.

Skilled Nursing Facilities: After a three-year transition that began in 1998, the Medicare program adopted a PPS that reimburses SNFs a case-mix adjusted per diem amount. The case-mix classification system, Resource Utilization Groups (RUGs), groups patients based on functional characteristics, admitting diagnosis, types of nursing procedures required, and utilization of rehabilitation disciplines. The total reimbursement amount consists of several components and includes separate rates for nursing and therapy services.

Inpatient Rehabilitation Facilities: After a delayed start of more than one year, the inpatient rehabilitation PPS was implemented in January 2002. The IRF PPS provides for a per-discharge amount for separate Case-mix Groups (CMGs). CMGs are established using clinical information (e.g., motor and cognitive functional status, co-morbidities) obtained from the Patient Assessment Instrument (PAI) and information on expected resource needs.

acute venues increased slightly. For certain conditions (e.g., septicemia and ventilator support) SNF use increased by approximately the same percentage as home health care use declined, suggesting that SNF services might be partly replacing home health care (MedPAC 2003).

As the post-acute PPS continues to evolve and with changes in the post-acute industry it will be important for the Federal Office of Rural Health Policy, CMS, policy-makers and researchers to continually monitor post-acute placement patterns, to detect how changes in these

² Another factor that may have contributed to the reduction in the number of home health agencies during this period was the increased focus on eliminating fraud and abuse in the home care industry.

³ Estimates are from an unpublished Walsh Center Analysis of the Medicare Providers of Services File.

policies affect post-acute access. To the extent that studies have shown that the site of post-acute placement may affect outcomes (Kramer et al 1997, Chen et al., 2000), substitution of post-acute settings could further contribute to quality of care problems. This study will provide baseline data that is necessary to monitor how changes in payment policy could affect access to post-acute care in rural communities.

Evidence on Patterns of Post-Acute Utilization: Research has significantly contributed to an understanding of the characteristics of persons who use post-acute care. In the Medicare population, studies have shown that the use of post-acute care is, among other factors, linked to socio-demographic characteristics, clinical characteristics and characteristics of the health care infrastructure.⁴ In general, persons of advanced age, women, and whites are among the most likely to use any post-acute care. Other socio-demographic characteristics that are associated with an increased likelihood of post-acute use include the lack of an informal caregiver (e.g., widowed or unmarried) and eligibility for both Medicare and Medicaid. Patients with selected acute care discharge diagnoses tend to have a higher rate of post-acute care use; among these diagnoses are stroke, heart disease, and hip fracture. Additionally, patients whose functional status is poor and who have had longer acute inpatient hospital lengths of stay are more likely to receive post-acute services. Although studies have found that rural residents are less likely than their urban counterparts to use post-acute services, some evidence suggests that rural/urban differences reflect differences in post-acute supply, and that these differences are mitigated after controlling for the availability of post-acute providers (Manton et al., 1994; Liu et al., 1998; Liu et al., 1999; Gage, 1999).

Research has further shown that a number of characteristics influence where patients receive post-acute care. Liu et al. (1998) found that among Medicare beneficiaries, home health care users tended to be younger than SNF users. Home health users were also more likely than SNF users to be married and nonwhite. In terms of health and functional status, studies have shown that Medicare beneficiaries who use SNF services are more likely than home health users to have a longstanding disability. In contrast, home health users were more likely to have a serious health problem and, when a disability was present, it tended to be associated with the health problem (Manton et al, 1994).

⁴ It is necessary to note that a number of other considerations, such as patient and provider preferences, and the requirements imposed by Medicare for admission to each setting, are factors that affect post-acute placement.

Few studies have directly examined either how patterns of post-acute placement vary by region (Kane et al., 2002) or rural/urban location. Those that have, have found that Medicare beneficiaries residing in rural areas were less likely than their urban counterparts to use home health care services and more likely to be admitted to a SNF (Liu et al 1998, Dubay 1993, Nyman et al., 1991). Although the results are now dated, Dubay estimated that rural Medicare enrollees use the SNF benefit at a rate that is 15 percent higher than the rate for urban enrollees. This figure includes both post-acute users and community referrals. It is not clear whether observed rural/urban differences in the use of SNF services reflect differences in the characteristics of rural and urban beneficiaries, differences in rural/urban practice patterns or differences in supply.

Despite the differences noted in these studies, HHAs, IRFs, and SNFs offer many of the same services (e.g., physical, occupational and speech therapy) and patients needing post-acute care are treated in each of these settings. Not surprising given the overlap in services, findings from a small number of studies suggest that post acute settings may substitute for each other, particularly when the availability of post-acute providers is limited (Vladek, 1997). As an example, Cohen and Tumlinson (1997) demonstrated the presence of a post-acute substitution effect by showing that the number of Medicare home health users was inversely, but significantly, related to the number of SNFs in a state. As the number of SNFs increased (decreased) the number of beneficiaries who used home care decreased (increased).

Understanding the degree to which substitution occurs is important because a small but growing body of evidence suggests that the extent to which post-acute settings are effective substitutes may differ by diagnosis. Research conducted by Kramer et al. (1997) indicated that when adjusted for differences in functional and cognitive impairment, hip fracture patients in rehabilitation facilities fared as well as those in SNFs. The same study found that for stroke patients inpatient rehabilitation facilities had better outcomes than SNFs, even after controlling for selection bias. These findings suggest that IRFs and SNFs may be appropriate substitutes for hip fracture, but not for stroke. Furthermore, using a sample from the 1988-1989 University of Minnesota post-acute care study of 51 hospitals in the Twin Cities, Pittsburgh and Houston, Chen et al. (2000) found that when corrected for selection bias, home health care resulted in the best functional outcomes (measured by ADL scores) among the three post-acute care settings. This was true for stroke and hip fracture. Among patients with chronic obstructive pulmonary

disease, congestive heart failure and hip procedures (conditions where patients are rarely sent to a SNF or an IRF) patients who received home health care had better functional outcomes than those patients who returned home without formal care.

Significance: Although several studies have examined post-acute utilization patterns, few have explicitly focused on the experiences of rural beneficiaries. Those that have looked at rural beneficiaries' use of post-acute care have typically defined "rural" as any county or place that is not located in a metropolitan area. Characteristics of Medicare beneficiaries, provider supply, and practice patterns vary widely across rural communities. Because these studies fail to draw distinctions across the many different types of rural communities, they add little to our understanding of how access to care differs by degree of rurality, patient characteristics and supply. Moreover, recent changes in reimbursement have dramatically transformed the post-acute care environment, making study of post-acute placement and utilization patterns essential.

METHODS

This study uses data from the 2000 Medicare denominator file, the MEDPAR inpatient and SNF files and the Home Health Standard Analytical file to describe patterns of post acute use across the range of rural communities. Among the questions that we sought to address were the following:

- How do rural and urban Medicare beneficiaries differ in their use of alternative post-acute settings, including home health agencies, skilled nursing facilities, and inpatient rehabilitation facilities?
- How do patterns of post-acute utilization – length of stay, number of visits, per diem charges – differ for rural and urban beneficiaries who receive care in each post acute setting?
- To what extent does the supply of post-acute providers influence post-acute use?

Using MEDPAR data, we identified Medicare beneficiaries with an acute care discharge during the first quarter of 2000 and tracked these patients' claims from the point of discharge through 2001. We constructed post acute episodes to classify patients in terms of whether they received no post acute care, only home health care, only SNF care, only IRF care, or a

combination of different types of post-acute care. We initiated an episode if the beneficiary received any post-acute care between the dates of discharge up to 32 days⁵ following the acute inpatient discharge; all post-acute services following inpatient discharge counted as part of the same episode. We terminated an episode if the patient experienced a 32-day period without any post acute service, an acute inpatient readmission occurred, or the patient died. Only one episode per beneficiary was considered in these analyses. This approach is a modified version of that used by MedPAC and others to designate post acute episodes (McCall et al., 2003; MedPAC, 2003; Neu et al., 1989).

In this study, we only examined the use of three settings – SNF, IRF and home health. Medicare beneficiaries may receive care in other post-acute venues, including long-term-care hospitals and comprehensive outpatient rehabilitation facilities. Because the use of these settings is still relatively limited, we do not examine the use of these facilities in this analysis.

As previously indicated, beneficiaries with an acute discharge in the first quarter of 2000 were selected for inclusion in these analyses. Since managed care plans are not required to submit claims and a record of having received post-acute services would not be available, we excluded beneficiaries who enrolled in a managed care plan (at any time during the study period) from this analysis. We also excluded beneficiaries who did not have Medicare Part A and B coverage since beneficiaries may obtain home health services under both parts. Another group that we excluded from this analysis is persons whose reason for Medicare entitlement is end-stage renal disease or a disability. Our rationale for excluding these beneficiaries is that we would expect their clinical profile and, hence, their pattern of utilization to differ from that of other beneficiaries with an acute care discharge.

We further narrowed this population to include only those beneficiaries with a principal acute care diagnosis corresponding to one of the following Diagnosis Related Groups (DRGs):

- DRG 107 - Coronary bypass with cardiac catheterization
- DRG 109 - Coronary bypass without cardiac catheterization
- DRG 127 - Heart failure and shock (e.g. congestive heart failure)
- DRG 209 - Surgical procedures of the joint (e.g., hip implant)
- DRG 210 - Hip & femur procedures (e.g., operations to fix a hip fracture)
- DRG 294 - Diabetes

⁵ This 32-day rule takes into consideration Medicare's requirement that patients have an acute hospital discharge within the 30-day period prior to admission to a SNF.

We selected these diagnostic groups for inclusion in this study for several reasons. First, these DRGs are frequently associated with the receipt of post-acute care and the volume of cases in the MEDPAR file was sufficient to enable us to conduct analyses across the range of urban and rural settings. Second, although we recognize that patients in these DRGs differ widely in terms of health and functional characteristics, we hypothesized that patients represented in these groups were more homogenous than that in other high volume DRGs (e.g., stroke). This was particularly important given that limited data were available to risk adjust results. Finally, we chose both medical and rehabilitation DRGs so that we would be able to examine how use of rehabilitation specialists, physical and occupational therapists, differ by location.

Using cross tabulations we estimated the proportion of Medicare beneficiaries residing in metropolitan and non-metropolitan counties who: (1) received post-acute care, and (2) received care from a HHA, a SNF, an IRF, or a combination of these settings. We estimated the odds that metro and non-metro residents would use any post-acute care as well as any home health, SNF or IRF services. We report the non-metro/metro odds ratios, adjusted for differences in age, race, sex and dual eligibility status

Among the subset of Medicare beneficiaries who were discharged to either home health or SNF care we also examined differences in resource consumption or intensity. For patients who received home health services, we estimated the average total number of visits for all disciplines (skilled nursing, home health aide, physical therapy, occupational therapy, speech-language pathology, and medical social work) and the proportion of home care users whose treatment included care from each of these disciplines. For Medicare beneficiaries admitted to a SNF, we estimated the average length of SNF stay and average per diem charges. Research has shown that post-acute services may, in some cases, substitute for acute care and that, particularly after the enactment of the acute hospital PPS, reductions in acute length of stay were accompanied by increases in the utilization of post-acute care (Vladek, 1997). To assess the likelihood that differences in post-acute utilization reflect differences in utilization or intensity of acute care services, we also estimated the average length of stay and average per diem charges for metro and non-metro patients in each DRG group. Inpatient charges were adjusted using the CMS Inpatient PPS Wage Index for fiscal year 2000 to account for differences in hospitals' input

costs (e.g., labor).⁶ As does CMS under the SNF PPS, we adjusted SNF charges for geographic differences in wage levels using the hospital wage index.

To better understand how access is affected by the degree of rurality, we used a modified version of the Department of Agriculture Rural and Urban Continuum Codes to identify Metropolitan counties and establish non-metropolitan county subgroups. Metropolitan (metro) counties were designated as counties of any size that were located in a metropolitan area. We theorized that because the overall supply of post-acute providers is greater in metropolitan areas, that even non-metropolitan residents who live in areas with a limited availability of post-acute providers would be more likely to access services if the individual resided in a county that was adjacent to a metro area.⁷ For this reason, we designated non-metropolitan county subgroups, based on both size and adjacency to a metropolitan, as follows:

- We grouped non-metropolitan counties with an urban population of more than 2,500 that are located in an area adjacent to a metropolitan area were grouped. We refer to these counties as ‘metro adjacent.’
- We grouped residents of non-metropolitan counties with an urban population of more than 2,500 that are located in an area that is not adjacent to a metropolitan area. We refer to these counties as ‘non-metro adjacent.’
- Counties in which no place has a population larger than 2,500, whether located adjacent to a metropolitan area, were considered to be “rural” counties.

Analyses were conducted separately for each DRG. In 1996, less than one percent of Medicare post-acute beneficiaries received post-acute care in an IRF (HCFR, 1998). In fact, Medicare beneficiaries with a medical diagnosis (DRGs 107, 109, 127 and 294) often do not require or cannot tolerate intensive medical rehabilitation. For this reason, we only examine IRF use among beneficiaries in the rehabilitation DRGs, 209 and 210.

We hypothesized that patients who received post-acute services in multiple post-acute settings were medically complex and we analyzed patterns of resource consumption for this group separately.

We conducted a correlation analysis to test the assumption that the supply of post acute providers drives placement decisions. This county-level analysis measured SNF supply as the

⁶ The wage index measures differences in hourly wage rates for hospital labor markets across the country.

⁷ We hypothesized that travel to and from metro and non-metro counties is easier if the counties are adjacent.

number of certified SNF beds per 1,000 Medicare aged beneficiaries. We measured home health supply in terms of the number of agencies operating in each county scaled by Medicare aged population. In theory, if the supply of home health agencies or SNFs drives post-acute placement, we would expect that the proportion of beneficiaries admitted to each setting would increase as the supply increases and to decrease as the supply decreases. To the extent that SNF and home health function as substitutes, we would expect an increase or decline in the supply of one type of provider to result in a decline or increase in placement in the other provider. We obtained supply data to construct these measures from the CMS Providers of Services files.

RESULTS

Characteristics of Medicare Beneficiaries: Table 1 lists the distribution of beneficiaries in this study by discharge DRG. During the first quarter of 2000, a total of 124,307 Medicare beneficiaries were discharged from an acute care hospital with one of the five study conditions. Approximately 71 percent of these discharges were associated with two DRGs: DRG 127 (heart failure) and DRG 209 (surgical procedures of the joint).

Table 1: Count of Medicare Acute Care Discharges, for Selected DRGs, First Quarter of 2000		
DRG Codes	N	%
107: Coronary bypass with cardiac catheterization	12,462	10.0
109: Coronary bypass without cardiac catheterization	8,789	7.1
127: Heart failure and shock	38,764	31.2
209: Surgical procedures of the joint	48,990	39.4
210: Hip & femur procedures with complications	9,912	8.0
294: Diabetes	5,390	4.3
Total	124,307	100

We examined the characteristics of beneficiaries in this study to determine whether metro and non-metro residents differed by gender, race, age or eligibility for both Medicare and Medicaid. Metro and non-metro differences in age and distribution by gender were small. We noted larger differences in the proportion of beneficiaries who were members of minority groups

and the proportion that were dual eligible. In general, smaller proportions of non-metro residents were minorities. Only 20.7 percent of non-metro patients with an acute inpatient discharge diagnosis of diabetes (DRG 294), for example, were members of racial/ethnic minority groups compared to almost 30 percent of metro residents. As another example, over one-quarter of non-metro residents who were discharged following a hip/femur procedure (DRG 210), were dual eligible compared to less than one-fifth of metro residents. The distribution of beneficiaries by selected characteristics is reported in Table 2.

Table 2: Selected Characteristics of Metro and Non-Metro Medicare Beneficiaries, by DRG						
	DRG 107		DRG 109		DRG 127	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
# Cases	8,554	3,908	6,191	2,598	27,351	11,413
% Dual eligible	5.8	8.0	5.4	7.3	17.2	22.7
% Female	30.6	30.1	26.9	26.9	54.6	53.1
% Nonwhite	6.1	3.2	6.0	4.0	15.0	10.1
Average age	74.6	73.9	74.2	73.6	80.0	79.5
	DRG 209		DRG 210		DRG 294	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
# Cases	34,218	14,772	7,106	2,806	3,722	1,668
% Dual eligible	6.5	8.4	18.5	25.7	25.8	29.1
% Female	63.1	59.9	75.5	71.5	54.6	55.0
% Nonwhite	5.6	3.6	5.5	4.4	29.7	20.7
Average age	76.5	76.0	82.9	82.4	77.4	77.1

Use of Any Post Acute Care in Metro and Non-Metro Counties: Of all the patients included in this study over one-half (52.8 percent) received post-acute care following discharge. As indicated in Table 3, the proportion of patients discharged to post-acute care varied by diagnosis. Patients discharged following a hip and femur procedure (DRG 210) were the most likely to use post-acute care, over 80 percent of both metro and non-metro beneficiaries received either HHA, IRF, or SNF care within 32 days of discharge. Patients with a discharge diagnosis of diabetes (DRG 294) or heart failure (DRG 127) were the least likely to receive post-acute care.

Approximately 61 percent of metro and 68.4 percent of non-metro patients with a discharge diagnosis of diabetes and almost 66 percent of metro and 71 percent of non-metro beneficiaries with a discharge diagnosis of heart failure did not receive post-acute care.

We examined use of post-acute care for subgroups defined by age, gender, race/ethnicity and dual eligibility. With the exception of DRG 210, the proportion of non-metro beneficiaries who received post-acute care was significantly less than that for metro beneficiaries. For example, among whites with a discharge diagnosis of diabetes (DRG 294), 41.7 percent of metro beneficiaries received post-acute care, compared to only 32 percent of non-metro beneficiaries, a difference of nearly 9 percentage points. Among males who received a coronary bypass with cardiac catheterization (DRG 107), the proportion who received post-acute care was 12 percentage points lower for non-metro beneficiaries (44.0 percent v. 32.0 percent.) We noted an even larger difference among dual eligible beneficiaries in DRG 109; the proportion who received post-acute care was 18 percentage points lower for non-metro than for metro beneficiaries (58.2 percent v. 40.2 percent.)

Table 4 presents the condition-specific odds ratios of post-acute use after controlling for differences in age, race, sex and dual eligibility status. Values less than 1.0 indicate that the odds that non-metro beneficiaries receive post-acute care are less than the odds for metro beneficiaries. For one DRG, hip/femur procedures (DRG 210), metro and non-metro residents did not differ in the likelihood of using post-acute care. Across other DRGs, non-metro beneficiaries were between two-thirds and four-fifths as likely as metro beneficiaries to receive post-acute care. We also noted that for most DRGs non-metro beneficiaries in all subgroups had lower odds of receiving post-acute care than did metro beneficiaries.

Table 3: Proportion of Metro and Non-Metro Medicare Beneficiaries who Received Post-Acute Care, by DRG and Patient Characteristics

	Bypass w/ Cardiac Cath		Bypass w/o Cardiac Cath		Heart Failure	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
All Cases	46.7	36.1	45.3	34.9	34.2	28.7
Dual eligible						
Yes	53.0	46.0	58.2	40.2	40.6	35.3
No	46.3	35.2	44.5	34.5	32.9	26.8
Sex						
Male	44.0	32.0	42.4	32.1	28.4	23.1
Female	52.9	45.5	53.1	42.5	39.0	33.7
Race						
White	47.0	36.3	45.4	35.3	35.2	29.8
Nonwhite	42.1	30.6	43.1	23.8	28.5	23.0
Age						
< 76 yrs	38.2	29.1	38.2	28.6	22.0	18.5
> 76 yrs	58.1	47.7	56.4	46.6	39.2	33.6
	Joint Procedures		Hip & Femur Procedures		Diabetes	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
All Cases	70.7	65.1	82.1	80.6	39.0	31.6
Dual eligible						
Yes	78.1	73.9	87.0	83.1	43.2	36.9
No	70.1	64.2	81.0	79.7	37.5	29.4
Sex						
Male	66.3	59.4	80.0	77.0	34.8	28.8
Female	73.2	68.9	82.8	82.0	42.4	33.9
Race						
White	70.8	65.2	82.5	81.1	41.7	32.8
Nonwhite	67.7	61.8	75.4	69.3	33.7	27.0
Age						
< 76 yrs	64.6	57.2	70.9	70.4	30.0	23.4
> 76 yrs	76.2	73.2	84.3	82.8	45.4	37.9

Bolded numbers indicate that differences between metro and non-metro are statistically significant, $p < .05$

Table 4: Odds Ratio of Post-Acute Use, by DRG and Non-metro Location Adjusted for Age, Race, Sex and Dual Eligibility Status

(Odds Ratio = Odds for non-metro beneficiaries / Odds for metro beneficiaries)

	Bypass w/ Cardiac Cath		Bypass w/o Cardiac Cath		Heart Failure	
	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit
All Non-metro	0.65	0.60 – 0.70	0.64	0.59 – 0.71	0.76	0.72 – 0.71
Metro Adj.	0.68	0.62 – 0.76	0.68	0.60 – 0.79	0.81	0.76 – 0.81
Non-metro Adj.	0.58	0.52 – 0.66	0.61	0.53 – 0.71	0.72	0.66 – 0.77
Rural	0.70	0.58 – 0.85	0.59	0.47 – 0.76	0.70	0.61 – 0.79
	Joint Procedures		Hip & Femur Procedure		Diabetes	
	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit
All Non-metro	0.78	0.75 – 0.82	0.89	0.79 – 1.00	0.69	0.61 – 0.78
Metro Adj.	0.79	0.76 – 0.86	0.94	0.81 – 1.09	0.72	0.60 – 0.84
Non-metro Adj.	0.76	0.72 – 0.81	0.89	0.74 – 1.03	0.68	0.57 – 0.81
Rural	0.73	0.66 – 0.80	0.73	0.55 – 0.96	0.62	0.45 – 0.84

Use of Different Post-Acute Settings: Patterns of post-acute placement vary substantially by DRG. Table 5 presents the percentage of metro and non-metro beneficiaries in this study who received any HHA, SNF or IRF services during their post-acute episode. Because beneficiaries could receive care in multiple settings rows do not total to 100 percent.⁸ As shown in this table, the proportion of metro and non-metro beneficiaries who use any home health and SNF services are significantly different for three conditions, heart failure, and the two rehabilitation DRGs, surgical procedures of the joint and hip/femur procedures. Interestingly, for each of these conditions the proportion of Medicare beneficiaries who used home health services was lower for those in non-metro, especially rural counties, whereas the proportion who received any SNF care was significantly greater for beneficiaries residing in rural counties. Among those discharged for heart failure, the proportion who received home health was 22 percent lower for rural than for metro residents (52.8 percent v. 67.8 percent) and the proportion who received SNF services was 24 percent higher for rural than for metro beneficiaries (60.3 percent v. 48.7

⁸ A distribution of beneficiaries by type of post-acute user – no post acute care, home health exclusively, SNF exclusively, IRF exclusively, or a combination of settings – is presented in Appendix A-1.

percent). Similarly, the proportion of rural beneficiaries who used home care following discharge for a joint/limb procedure was 12 percent lower and the proportion that received SNF care was 14 percent higher than the proportion of metro beneficiaries who used these services. Differences in the proportion of rural and metro beneficiaries who received home care following a discharge for a hip/femur procedure (DRG 210) were large; slightly more than 24 percent of rural beneficiaries used home care compared to 38.3 percent of metro beneficiaries. The proportion using SNF was also higher for non-metro residents in DRG 210, but differences were substantially smaller (90.7 percent of rural residents v. 83.9 percent of metro beneficiaries).

We also noted significant differences in the proportion of metro and rural beneficiaries hospitalized in an IRF during the post-acute period. Approximately 14.1 percent of metro beneficiaries who underwent a surgical procedure of the joint received IRF care compared to only 7.5 percent of rural beneficiaries, a difference of 47 percent. Among patients with a hip/femur procedure discharge diagnosis, the proportion who used IRF services was 52 percent lower for beneficiaries residing in rural counties compared to those in metro counties (4.8 percent v. 10.1 percent).

Table 6 shows the odds ratios of home health, SNF and IRF use among metro and non-metro Medicare beneficiaries who used any post-acute services; odds ratios control for age, race, sex and dual eligibility status. As this table indicates, non-metro residents in almost all diagnostic groups were less likely to use home health, SNF, or IRF care. Across all DRGs, the odds of non-metro residents using home health care was between two-thirds (for coronary bypass) to four-fifths (for hip/femur procedures) that of metro residents. Non-metro residents in all subgroups were significantly less likely than were metro residents to use HHA.

For most DRGs and non-metro subgroups, the odds of using SNF care was significantly less for non-metro than for metro residents after controlling for differences in patient characteristics. We nonetheless noted several exceptions. The likelihood of SNF use for non-metro subgroups was not significantly different from that of metro residents for those with a heart failure or diabetes discharge diagnosis. For DRG 210 (hip/femur procedures), the odds that non-metro residents (in all subgroups) used SNF care were not significantly different from the odds for metro residents. For the other rehabilitation diagnostic group, DRG 209, non-metro residents were 1.09 times as likely as their metro counterparts to enter a SNF.

Finally, we observed that the likelihood of admission to an IRF was significantly lower among non-metro residents in DRG 209 and 210. Across all subgroups, the likelihood that non-

Table 5: Percentage (%) of Medicare Beneficiaries Using Post-Acute Services, by Setting and Metro/Non-metro Location			
	Any HHA Use	Any SNF Use	Any IRF Use
DRG 107: Coronary Bypass with Cardiac Catheterization			
Metropolitan	81.8	28.8	N/A
All Non-Metropolitan	79.9	27.6	N/A
Metro Adjacent	79.9	27.5	N/A
Non-metro Adjacent	78.5	28.5	N/A
Rural	83.3	26.0	N/A
DRG 109: Coronary Bypass with out Cardiac Catheterization			
Metropolitan	84.9	24.6	N/A
All Non-Metropolitan	82.6	23.8	N/A
Metro Adjacent	83.2	23.7	N/A
Non-metro Adjacent	80.5	25.2	N/A
Rural	86.1	20.4	N/A
DRG 127: Heart Failure and Shock			
Metropolitan	67.8*	48.7*	N/A
All Non-Metropolitan	58.1*	55.6*	N/A
Metro Adjacent	58.9*	55.2*	N/A
Non-metro Adjacent	58.6*	54.8*	N/A
Rural	52.8*	60.3*	N/A
DRG 209: Surgical procedures of the Joint			
Metropolitan	62.5*	53.0*	14.1*
All Non-Metropolitan	56.4*	59.9*	8.5*
Metro Adjacent	57.4*	59.8*	9.1*
Non-metro Adjacent	55.5*	60.0*	7.9*
Rural	54.9*	60.3*	7.5*
DRG 210: Hip and Femur Procedures with Complications			
Metropolitan	38.3*	83.9*	10.1*
All Non-Metropolitan	33.6*	87.4*	6.2*
Metro Adjacent	35.9*	86.9*	6.5*
Non-metro Adjacent	33.2*	87.3*	6.2*
Rural	24.2*	90.7*	4.8*
DRG 294: Diabetes			
Metropolitan	66.4	48.6	N/A
All Non-Metropolitan	60.7	53.5	N/A
Metro Adjacent	61.6	53.2	N/A
Non-metro Adjacent	61.5	52.5	N/A
Rural	54.7	57.8	N/A

* indicates that χ^2 statistics for the group were significant at a level of $p < .05$ or better
 metro beneficiaries in either of these DRGs received IRF care was between one half and two thirds of that for metro residents.

Table 6: Odds Ratio of Home Health, SNF and IRF Use, among Post-acute Users, by DRG, Adjusted for Age, Race, Sex and Dual Eligibility
(Odds Ratio = Odds for non-metro beneficiaries / Odds for metro beneficiaries)

	Any HHA Use		Any SNF Use		Any IRF Use	
	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit	Odds Ratio	95% Confidence Limit
DRG 107: Coronary Bypass with Cardiac Catheterization						
All Non-metro	0.66	0.61 – 0.72	0.72	0.64 – 0.82	N/A	N/A
Metro Adj.	0.70	0.63 – 0.78	0.73	0.63 – 0.87	N/A	N/A
Non-metro Adj.	0.59	0.53 – 0.66	0.70	0.58 – 0.85	N/A	N/A
Rural	0.76	0.63 – 0.91	0.71	0.53 – 0.97	N/A	N/A
DRG 109: Coronary Bypass without Cardiac Catheterization						
All Non-metro	0.65	0.59 – 0.74	0.71	0.64 – 0.82	N/A	N/A
Metro Adj.	0.69	0.61 – 0.79	0.74	0.59 – 0.92	N/A	N/A
Non-metro Adj.	0.60	0.52 – 0.70	0.73	0.57 – 0.93	N/A	N/A
Rural	0.64	0.50 – 0.82	0.57	0.36 – 0.90	N/A	N/A
DRG 127: Heart Failure and Shock						
All Non-metro	0.66	0.63 – 0.70	0.91	0.86 – 0.97	N/A	N/A
Metro Adj.	0.71	0.66 – 0.76	0.96	0.87 – 1.04	N/A	N/A
Non-metro Adj.	0.64	0.59 – 0.70	0.85	0.78 – 0.94	N/A	N/A
Rural	0.56	0.48 – 0.65	0.92	0.79 – 1.07	N/A	N/A
DRG 209: Surgical Procedures of the Joint						
All Non-metro	0.74	0.71 – 0.77	1.09	1.05 – 1.14	0.54	0.50 – 0.58
Metro Adj.	0.77	0.73 – 0.82	1.11	1.06 – 1.18	0.59	0.53 – 0.66
Non-metro Adj.	0.71	0.67 – 0.76	1.07	1.01 – 1.13	0.50	0.44 – 0.56
Rural	0.68	0.62 – 0.75	1.06	0.96 – 1.16	0.46	0.37 – 0.58
DRG 210: Hip and Femur Procedures with Complications						
All Non-metro	0.84	0.76 – 0.93	1.05	0.95 – 1.16	0.60	0.50 – 0.73
Metro Adj.	0.93	0.82 – 1.06	1.07	0.94 – 1.21	0.63	0.49 – 0.81
Non-metro Adj.	0.82	0.71 – 0.95	1.04	0.89 – 1.20	0.60	0.45 – 0.80
Rural	0.94	0.40 – 0.71	1.06	1.02 – 1.32	0.45	0.25 – 0.81
DRG 294: Diabetes						
All Non-metro	0.68	0.58 – 0.78	0.81	0.71 – 0.95	N/A	N/A
Metro Adj.	0.67	0.59 – 0.85	0.84	0.68 – 1.03	N/A	N/A
Non-metro Adj.	0.68	0.55 – 0.84	0.79	0.63 – 0.99	N/A	N/A
Rural	0.55	0.37 – 0.80	0.80	0.55 – 1.16	N/A	N/A

Home Care Resources Used by Beneficiaries Exclusively Using HHAs: We noted few differences in patterns of resource consumption across location for beneficiaries whose post-acute episode consisted exclusively of home care services. Table 7 indicates the average total number of home visits received by metro beneficiaries and beneficiaries in non-metro subgroups. The average numbers of home care visits varied by diagnosis, but across all diagnostic groups, metro/non-metro differences in visits were not statistically significant.

Table 7: Average Total Number of Home Care Visits, Medicare Beneficiaries who Only used Home Health Care						
	DRG 107	DRG 109	DRG 127	DRG 209	DRG 210	DRG 294
Metropolitan	6.6	6.4	8.4	8.0	9.7	8.2
Non-Metropolitan						
Metro Adjacent	6.6	6.2	8.0	7.9	8.2	9.8
Non-metro Adjacent	7.1	6.4	8.7	7.6	7.3	8.4
Rural	6.5	6.2	8.9	7.4	8.9	10.5

As shown in Table 8, we computed the proportion of home care users who received selected skilled services – skilled nursing, physical therapy, and occupational therapy. For the subset of beneficiaries who received each of these services, we also calculated the average number of visits provided. Non-metro adjacent and rural beneficiaries who underwent a joint procedure (DRG 209) were significantly more likely to receive skilled nursing services. About 66.7 percent of rural and 68.7 percent of non-metro adjacent home care users in this DRG received home-based skilled nursing services compared to only 57.7 percent of metro home care users. We did not observe any differences in the average number of skilled nursing visits received.

By contrast, non-metro beneficiaries in DRG 209 were less likely to receive physical and occupational therapy services. Nearly 92 percent of those who resided in metro areas received physical therapy and 7.3 percent received occupational therapy compared to only about 84 percent and 3.7 percent, respectively, for rural residents. Although the number of occupational therapy visits did not differ by location, the average number of physical therapy visits was slightly, but significantly, less for non-metro residents.

Other DRGs in which we noted differences in utilization of physical therapy services included DRG 107 (coronary bypass with catheterization) and DRG 127 (heart failure). The proportion of non-metro home care users in both DRGs who used physical therapy was less than the proportion of metro home care users. In the case of DRG 127, non-metro beneficiaries actually received significantly more physical therapy visits. Metro residents averaged only 4.7 physical therapy visits compared to 5.9 visits for rural residents. Although not shown in Table 8,

rural residents did have a significantly shorter acute inpatient length of stay compared to metro residents (4.6 days v. 5.3 days) and it is possible that the higher number of physical therapy visits is a result of shifting of acute services to the post-acute setting.

Table 8: Use of Skilled Nursing, Physical and Occupational Therapy among Metro and Non-Metro Home Health Users who Received Care from Each Discipline

DRG 107: Coronary Bypass with Cardiac Catheterization						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	97.9	5.0	19.3*	3.9	3.0	3.6
Non-Metropolitan						
Metro Adjacent	98.4	5.0	15.4*	3.8	3.4	N/A
Non-metro Adjacent	98.8	5.5	13.9*	3.7	1.8	N/A
Rural	99.3	5.0	12.8*	3.8	2.1	N/A
DRG 109: Coronary Bypass with out Cardiac Catheterization						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	97.8	4.9	17.9	4.1	2.8	3.0
Non-Metropolitan						
Metro Adjacent	98.2	4.9	18.4	3.6	3.0	N/A
Non-metro Adjacent	97.9	4.9	14.0	3.6	3.8	N/A
Rural	96.4	4.8	14.5	N/A	0.0	N/A
DRG 127: Heart Failure and Shock						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	94.9	5.5	27.6*	4.7†‡	4.7	3.2
Non-Metropolitan						
Metro Adjacent	94.3	5.4	22.1*	3.9‡	4.2	N/A
Non-metro Adjacent	95.3	5.4	19.5*	5.4†	4.1	N/A
Rural	98.0	5.5	21.6*	5.9†	4.1	N/A
DRG 209: Surgical Procedures of the Joint						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	57.7*	3.6	91.8*	5.4†	7.3*	2.6
Non-Metropolitan						
Metro Adjacent	60.2*	3.7	89.6*	5.4†	5.2*	2.2
Non-metro Adjacent	68.7*	3.7	84.0*	5.0‡	4.9*	2.4
Rural	66.9*	3.5	83.8*	5.0‡	3.7*	2.1

Table 8 (continued): Use of Skilled Nursing, Physical and Occupational Therapy among Metro and Non-Metro Home Health Users, by DRG

DRG 210: Hip and Femur Procedures with Complications						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	58.6	4.4	84.6	5.6†	16.6*	3.2
Non-Metropolitan						
Metro Adjacent	59.4	3.8	86.1	4.9‡	9.9*	N/A
Non-metro Adjacent	64.3	3.6	74.3	4.6‡	4.3*	N/A
Rural	N/A	N/A	N/A	N/A	N/A	N/A
DRG 294: Diabetes						
	Skilled Nursing		Physical Therapy		Occupational Therapy	
	% Used	Ave Visits	% Used	Ave Visits	% Used	Ave Visits
Metropolitan	95.5	6.0	19.2	4.5	4.2	4.6
Non-Metropolitan						
Metro Adjacent	96.7	7.3	17.5	N/A	3.3	N/A
Non-metro Adjacent	93.6	6.1	16.1	N/A	4.3	N/A
Rural	N/A	N/A	N/A	N/A	N/A	N/A

‘*’ Indicates that χ^2 statistics for the group were significant at a level of $p < .05$ or better. All averages designated as ‘†’ are significantly different from those designated with a ‘‡’. Values without these designations are not significantly different at the level of $p < .05$. N/A = sample size is too small to generate a reliable estimate.

Skilled Nursing Facility Resource Consumption among Exclusive SNF Users: We examined patterns of utilization for Medicare beneficiaries whose post-acute episode was limited to SNF care. Acute inpatient and SNF lengths of stay and per diem charges are shown in Table 9. For most of the study conditions, the magnitude of the difference in metro and non-metro residents’ SNF length of stay and per diem charges were not statistically significant. One of the conditions for which SNF utilization varied significantly by location is heart failure/shock. Average length of SNF stay was 22.7 percent lower for rural patients (22.1 days) than for metropolitan beneficiaries (28.6 days). Acute inpatient length of stay was also found to be an average of 14.5 percent lower for rural than for metropolitan beneficiaries in this diagnostic group.

Among patients discharged with a joint/limb procedure, we also found that SNF length of stay was significantly lower for residents of non-metro counties. Depending on non-metro subgroup, the average SNF length of stay was between 17 percent and 23 percent lower than that of metro beneficiaries. As reflected by the average per diem cost, the acute inpatient period was slightly more resource intensive for beneficiaries in metro counties than for those in non-metro counties.

Table 9: SNF and Acute Inpatient Length of Stay and Per Diem Charges for Beneficiaries who Only Used SNF Care, by DRG and Metro/Non-metro Location

DRG 107: Coronary Bypass with Cardiac Catheterization				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	12.8	6,786	18.6	695
Non-Metropolitan				
Metro Adjacent	12.4	6,520	20.8	636
Non-metro Adjacent	13.1	6,480	17.4	651
Rural	12.8	6,181	16.6	578
DRG 109: Coronary Bypass with out Cardiac Catheterization				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	9.1	6,615	17.7	657
Non-Metropolitan				
Metro Adjacent	10.4	6,546	22.9	551
Non-metro Adjacent	10.5	6,609	16.3	610
Rural	N/A	6,090	N/A	N/A
DRG 127: Heart Failure and Shock				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	6.2†	2,337†	28.6†	547
Non-Metropolitan				
Metro Adjacent	5.9†‡	2,068†‡	28.3†	530
Non-metro Adjacent	5.4‡	1,996‡	27.2†	573
Rural	5.3‡	1,824‡	22.1‡	582
DRG 209: Surgical Procedures of the Joint				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	5.2	5,509†	23.4†	603†
Non-Metropolitan				
Metro Adjacent	5.0	5,227‡	18.9‡	596†
Non-metro Adjacent	5.2	5,080‡	18.0‡	606†
Rural	5.0	5,049‡	19.5‡	567‡

Table 9 (continued): SNF and Acute Inpatient Length of Stay and Per Diem Charges for Beneficiaries who Exclusively Used SNF Care, by DRG and Metro/Non-metro Location

DRG 210: Hip and Femur Procedures				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	6.4	3,312	43.6	464
Non-Metropolitan				
Metro Adjacent	6.0	3,365	44.0	455
Non-metro Adjacent	6.2	3,469	42.0	467
Rural	5.9	2,720	40.2	437
DRG 294: Diabetes				
	Acute Inpatient		SNF	
	ALOS	Per Diem	ALOS	Per Diem
Metropolitan	5.7	2,012†	33.2	472
Non-Metropolitan				
Metro Adjacent	5.4	1,867†	30.1	516
Non-metro Adjacent	6.0	1,714†	35.6	505
Rural	N/A	1,207‡	N/A	N/A

All averages designated as ‘†’ are significantly different from those designated with a ‘‡’. Values without these designations are not significantly different at the level of $p < .05$. N/A = sample size is too small to generate a reliable estimate.

SNF and HHA Resource Consumption by Medically Complex Patients: With few exceptions, patterns of post-acute utilization for medically complex patients – those that use multiple post-acute settings – did not differ significantly by location. Across DRGs and metro and non-metro locations, we found no statistically significant differences in the average SNF length of stay and average total number of home care visits. Where we did note differences was in the use of selected skilled home-based services – skilled nursing and physical therapy. Greater proportions of metro than non-metro patients with an acute inpatient discharge diagnosis of coronary bypass without cardiac catheterization (DRG 109), heart failure (DRG 127), and joint/limb procedures (DRG 209) received physical therapy. Non-metro patients in DRG 209 were more likely than their metro counterparts were to use skilled nursing services. In fact, while the proportion of rural beneficiaries in this diagnostic group who used physical therapy was 16.5 percent less than that of metro beneficiaries (75.4 percent v. 90.3 percent), the proportion who used skilled nursing

services was almost 18 percent greater for rural than for metro beneficiaries (61.7 percent v. 52.3 percent).

Another condition in which use of skilled nursing and physical therapy differed by location is DRG 210, hip/femur procedures. Non-metro beneficiaries in this DRG were significantly more likely to use skilled nursing services (62.2 percent of rural and 53.7 percent of non-metro beneficiaries). Albeit we noted no difference in the proportion of metro and non-metro beneficiaries who used physical therapy, among those who did receive this service, the average number of physical therapy visits was significantly lower for non-metro than for metro beneficiaries (4.1 visits for rural and 5.6 visits for metro beneficiaries). services was almost 18 percent greater for rural than for metro beneficiaries (61.7 percent v. 52.3 percent).

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Table 10: Utilization of acute inpatient and skilled nursing facility services, Medicare beneficiaries Treated in Multiple Post-acute Settings

DRG 107: Coronary Bypass with Cardiac Catheterization							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total visits	% Use Skilled Nursing	# Skilled nursing visits	% Use PT	# PT visits
Metropolitan	12.1	15.3	9.2	91.9	5.6	47.6	4.6
Non-Metro							
Metro Adj	11.4	19.6	10.4	96.1	6.0	50.0	4.1
Non-metro Adj	11.6	15.9	10.4	95.7	7.0	48.9	4.0
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DRG 109: Coronary Bypass without Cardiac Catheterization							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total visits	% Use Skilled Nursing	# Skilled nursing visits	% Use PT	# PT visits
Metropolitan	9.1	16.8	9.3	90.5	6.0	46.0*	4.6
Non-metro							
Metro Adj	9.3	16.0	7.6	89.4	5.0	51.1*	4.1
Non-metro Adj	8.3	13.9	8.5	96.8	6.1	22.6*	N/A
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DRG 127: Heart Failure and Shock							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total Visits	% Use skilled nursing	# Skilled nursing visits	% Use PT	# PT visits
Metropolitan	6.2	27.0	11.6	90.1	6.1	53.0*	5.1
Non-metro							
Metro Adj	5.7	29.6	10.7	90.1	5.9	42.9*	4.4
Non-metro Adj	5.2	23.9	11.9	93.4	6.8	39.2*	5.4
Rural	5.3	26.1	11.1	93.0	6.4	31.6*	6.7

Table 10 Continued: Utilization of acute inpatient and skilled nursing facility services, Medicare beneficiaries Treated in Multiple Post-Acute Settings

DRG 209: Surgical Procedures of the Joint							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total visits	% Use skilled Nursing	# Skilled nursing visits	% Use PT	# PT visits
Metropolitan Non-Metro	4.7	16.3	8.5	52.3*	3.8	90.3*	5.2
Metro Adj	4.8	14.6	8.3	61.2*	3.8	85.8*	5.0
Non-metro Adj	4.8	14.2	8.0	60.9*	3.7	81.8*	5.0
Rural	4.9	15.8	8.3	61.7*	4.0	75.4*	4.8
DRG 210: Hip and Femur Procedures with Complications							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total visits	% Use skilled Nursing	# Skilled nursing visits	% Use PT	# PT visits
Metro Non-Metro	6.1	34.7	9.7	53.7*	4.3	83.7	5.6†
Metro Adj	5.8	31.3	9.5	62.7*	4.3	79.0	5.1†
Non-metro Adj	5.9	31.6	9.8	68.1*	4.0	79.2	5.2†
Rural	5.9	30.8	8.8	62.2*	5.3	75.6	4.1‡
DRG 294: Diabetes							
	Average LOS		Home Care Utilization				
	Inpatient	SNF	Total Home Visits	% Use skilled Nursing	# Skilled nursing visits	% Use PT	# PT visits
Metro Non-Metro	5.6	28.7	12.1	90.4	8.4	41.7	5.0
Metro Adj	6.5	25.6	10.5	90.0	6.4	35.0	4.1
Non-metro Adj	4.3	32.3	9.3	93.3	6.6	36.7	4.3
Rural	N/A	N/A	N/A	N/A	N/A	N/A	N/A

‘*’ Indicates that χ^2 statistics for the group were significant at a level of $p < .05$ or better. All values designated as ‘†’ are significantly different from values designated ‘‡’. Values without these designations are not significantly different at the level of $p < .05$. N/A = sample size is too small to generate a reliable estimate

Relationship between Supply and Post-Acute Utilization: We conducted a correlation analysis to determine the extent to which counties’ supply of skilled nursing facilities and home health agencies was associated with use of post-acute services and, specifically, the proportion of beneficiaries with one of the five study conditions who received care in each post-acute setting. This analysis showed that IRF supply was uncorrelated with IRF use. We found, however, that

the supply of home health agencies did have a statistically significant effect on the proportion of patients who received post-acute home care ($r=.06$, $p=.00$) and that increasing SNF supply increased the proportion of patients who received SNF services upon discharge from an acute care facility ($r=.05$, $p=.00$). The magnitude of these coefficients were so small, however, that these effects are relatively inconsequential.

If one post-acute setting were acting as a substitute for another setting we would expect that utilization of one setting would increase (or decrease) as the supply of the other type of post-acute provider decreased (or increased). We did observe that the supply of SNF beds was negatively associated with home health utilization, suggesting that SNF care may substitute for home health. The magnitude of the coefficient was also small ($r=-.06$, $p=.00$) and suggests that this relationship is extremely weak. Home health agency supply was uncorrelated with post-acute SNF use ($r=.01$, $p=.69$). Results were similar when we conducted DRG-specific analyses.

We conducted a separate analysis only using data from the subset of non-metro counties. Even though the correlation coefficients were relatively comparable to the coefficients that we obtained with data from all counties, results were not statistically significant.

DISCUSSION

Limitations: In evaluating the above results, it is necessary to consider several limitations of this analysis. First, patterns of post-acute care placement and utilization could reflect differences in patient characteristics that we did not account for in this study. Most importantly, data were not available to control for differences in clinical factors - severity, co-morbidities or functional status. DRGs are not homogeneous, and patients in each DRG have a range of diagnoses and clinical needs. Without controlling for this information, it is not possible to determine whether the observed differences in post-acute use indicate true differences in patterns of care or differences in patient need.

An implicit assumption of this study was that rural and urban elderly would utilize post-acute services at a comparable rate. However, research indicates that the health status of rural elderly is often worse than that of urban elderly. (Probst et al., 2002). If the rural elderly represented in each DRG are, in fact, sicker, we would expect them to utilize post-acute services at a higher rate. The finding that rural elderly are less likely to use post-acute services therefore suggests that the rural-urban gap may be even larger than the data indicates.

Other characteristics, including social and environmental factors, such as whether the patient has an able and willing caregiver available, as well as patient and provider preferences may also influence post-acute use. Although data will be difficult to obtain, future analyses should control for these elements in order to determine the factors that drive post-acute use in metro and non-metro areas.

Second, because it was impractical to link the index admission to post-acute services using diagnosis codes alone, we created post-acute episodes by matching inpatient discharges and post-acute care using dates of service. We cannot dismiss the possibility that, at least for a small number of cases, the discharge diagnosis is not the diagnosis for which the beneficiary received home health, SNF or IRF care. In other words, it is possible that we erroneously ascribed a post-acute episode to an inpatient discharge. Since we do not expect that the rate at which this “mismatching” occurs is large or that it varies by location, we are not overly concerned about such linking bias.

A third limitation of this study is that we did not examine use of other post-acute venues, including long-term care hospitals and outpatient rehabilitation. We do not believe that inclusion of episodes of long-term care hospital use would significantly alter our results since so few Medicare beneficiaries use these facilities.⁹ The exclusion of outpatient rehabilitation services, including physical therapy, is likely to be a more significant source of bias. Hospitals in rural communities are less likely to offer outpatient physical therapy or outpatient services¹⁰ and we would therefore expect that more metro patients would use these services in the post-acute period. Urban estimates of the proportion of beneficiaries who received post-acute care are more likely than non-metro estimates to understate actual levels of use. This could indicate that discrepancies in metro and non-metro beneficiaries’ use of post-acute care are larger than suggested by this study. To the extent that beneficiaries who use outpatient post-acute services are clinically different from other post-acute users, estimates of the units of services provided (i.e., length of stay and number of visits) could also be biased. The direction of this bias is not entirely clear.

⁹ According to MedPAC (2003), less than 1 percent of Medicare beneficiaries are admitted to a long-term care hospital following an acute inpatient discharge.

¹⁰ This figure is derived from an unpublished Walsh Center analysis of the 2002 Area Resource File.

Discussion of Findings: Medicare beneficiaries residing in most of the non-metro subgroups that we examined were less likely than were beneficiaries in metro areas to use post-acute services. Across most DRGs, the odds of receiving SNF, HHA, or IRF care was also less for non-metro subgroups. One exception was DRG 210 (hip/femur procedures). Perhaps because most patients in this DRG received post-acute care (and use of post-acute care is therefore less discretionary) as well as the fact that over one-half of all beneficiaries with this discharge diagnosis received care in a SNF, metro/non-metro differences in the use of post-acute care or in the proportion who received SNF care were not significant.

As mentioned in the introduction to this report, other studies have found that rural beneficiaries were more likely than urban beneficiaries to use SNF services. With the exception of patients who underwent a surgical procedure of the joint, we found that the odds of using SNF care was lower (and in the case of DRG 210, comparable) for non-metro subgroups. We are not entirely sure why our results differed from that of previous studies. Differences in findings could be due to a number of factors, including the fact that previous studies used data from the late 1980's or early 1990's, samples included community dwellers or institutionalized beneficiaries, and approaches to risk adjustment differed across studies.

We hypothesized that supply would drive post-acute use and that the extent to which beneficiaries received care in each setting would be directly related to provider availability. For instance, few IRFs are located in rural communities and it may be difficult for many rural beneficiaries to access these facilities. The observations that the use of particular post-acute settings was only weakly correlated with provider supply, however, fails to support this hypothesis.

The magnitude of the supply effect suggests to us that other factors are possibly driving post-acute use. In addition to patient health and functional status, these factors may include local practice patterns and provider perceptions concerning the appropriateness and efficacy of post-acute placement in treating selected conditions. We cannot discount the possibility that we did not observe a stronger relationship between supply and post-acute use because of limitations in how we measured both markets and supply. Markets designated based on county boundaries may not reflect actual provider referral patterns. County estimates of the total or per capita number of agencies are crude proxies for home health capacity. All of the supply measures that we used failed to account for differences in staffing ratios or the mix of skilled and non-skilled

labor. It is possible that for selected DRGs the availability of skilled personnel (as opposed to agencies or facilities) could drive patterns of post-acute use.

We found that for the two rehabilitation diagnostic groups (DRGs 209, and 210), the total number of visits were comparable for metro and non-metro residents but that non-metro residents were less likely than their metro counterparts to use physical therapy, and/or the number of visits was less. Non-metro residents in both diagnostic groups were also less likely to receive occupational therapy. The finding that non-metro beneficiaries represented in DRG 209 were more likely to use skilled nursing services is of particular interest since it offers some support for the assertion that home care agencies in rural areas with shortages of physical or occupational therapists use nurses to provide rehabilitative services (NAHCH, 2004).

The observation that non-metro beneficiaries are less likely to receive therapy and the possibility that agencies substitute nursing for therapy services is important for two reasons. One reason is that, for many conditions, physical and occupational therapy is essential for patients to achieve optimal functioning and to maintain independence. The lower rate of therapy use raises questions about whether the quality or outcomes of post-acute care are comparable for rural and urban residents. A second reason is that under the home care PPS, therapy services qualify for higher reimbursement rates. Agencies only qualify for this higher rate if services are rendered by a licensed physical therapist; to the extent that rural agencies substitute nurses for therapists they do not benefit from the more favorable rates.

Data are not directly available to determine how the supply of skilled health therapists is driving patterns of rural home health use or how practice patterns or standards of care influence urban/rural trends in post-acute use. Future studies should seek to collect and incorporate information of this type into studies of post-acute use in order to address concerns about not only access, but also the appropriateness and quality of post-acute utilization.

Conclusion: Findings from this study suggest that rural Medicare beneficiaries continue to experience barriers in accessing post-acute services. The recent enactment of the Medicare Modernization Act (MMA) may serve to alleviate some of the discrepancy in access to post-acute care that we observed in this study. For instance, Section 405(g) of the MMA permits Critical Access Hospital (CAH) to set up to 10 beds for inpatient rehabilitation or psychiatry services. The MMA further increases the number of acute or SNF-level swing beds that CAHs

may operate. Despite these developments, Medicare policies may continue to challenge rural providers in ways that may compound access problems. One such challenge is the loss of the 5 percent home health rural reimbursement add-on. Since the implementation of the home health PPS, Medicare reimbursed agencies an additional amount for serving rural residents to account for the higher costs of providing home care in rural areas. The reimbursement add-on, which was initially set at 10 percent, ceased in 2003. The Medicare Modernization Act (MMA) of 2003 reinstated the rural add-on at 5 percent. It is set to expire in March 2005. Whether or not the elimination of the rural add-on will affect the financial health of agencies and, subsequently, access to home care in rural communities is unclear. We recommend that researchers, policy analysts and policymakers seek a further understanding of the factors that affect use of post-acute services and that they continue to monitor the effect of these and other Medicare policies on post-acute access.

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APPENDIX

Table A-1: Percentage of Medicare Beneficiaries, by Type of Post-Acute Episode and DRG					
	No Post Acute Care	HHA Only	SNF Only	IRF Only	More than One Setting
DRG 107					
Metro	53.3	31.6	7.1	1.2	6.8
Non-metro	63.9	24.9	6.3	0.9	4.1
DRG 109					
Metro	54.7	32.4	5.5	1.3	6.2
Non-metro	65.1	25.1	4.9	1.1	3.8
DRG 127					
Metro	65.8	16.9	10.4	0.44	6.5
Non-metro	71.3	12.2	11.4	0.44	4.7
DRG 209					
Metro	29.3	23.9	19.9	6.2	20.7
Non-metro	34.9	21.1	24.4	3.7	15.9
DRG 210					
Metro	17.9	7.2	45.5	3.7	25.7
Non-metro	19.4	6.6	49.8	2.6	21.7
DRG 294					
Metro	61.0	19.5	12.7	0.3	6.5
Non-metro	68.4	14.3	12.0	0.2	5.1