NORC | WALSH CENTER FOR RURAL HEALTH

# PERFORMANCE OF RURAL AND URBAN HOME HEALTH AGENCIES IN IMPROVING PATIENT OUTCOMES

**FINAL REPORT**

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# EXECUTIVE SUMMARY

**Objective:** This study was conducted to determine whether rural and urban home care agencies differ in terms of patient care outcomes, and to ascertain whether there are agency characteristics that are associated with better or worse outcomes.

**Methods:** Using the Home Health Compare (HHC) database, which is produced by the Centers for Medicare and Medicaid Services as part of the Home Health Quality Initiative (HHQI), we conducted analyses to determine whether rural and urban home care agencies differ in terms of selected patient care performance measures. Performance measures include the following:

- ***Functional Improvement*** **-** The percentage of the agencies patients that experienced improvement in:
    - Upper body dressing
    - Bathing
    - Ambulation
    - Transferring in and out of bed
    - Management of oral medications
    - Pain interfering with activities.
- ***Occurrence of Adverse Events*** **-** The percentage of patients that, during the course of the home care episode:
    - are admitted to the hospital
    - require urgent, unplanned medical care.

Multivariate regression analyses were used to determine whether outcomes on each of the eight performance measures are significantly different for rural and urban agencies after controlling for agency characteristics and characteristics of the environment in which the agency operates. Independent variables incorporated in these analyses included:

- Agency Characteristics: ownership, facility-based status, service lines (e.g., physical, occupational and speech therapy), years certified;
- Location: rural/urban region, region of country; and
- Characteristics of health care environment: need (poverty rate), Health Professional Shortage Area, competitiveness of post-acute market.

Data for 5,775 home care agencies, approximately 75 percent of the Medicare certified home health agencies in operation in 2005, were available for this study.

**Results**

Findings from the multivariate analyses indicated that net of other factors, rural and urban agencies each performed better than their counterpart on selected functional outcome measures: rural agencies performed better on measures of improvement in walking, transferring, and dressing whereas urban agencies performed better on measures of improvement in pain frequency and medication management. However, rural or urban location had only a modest effect on functional performance scores. Rural and urban agency differences in rates of unplanned urgent care and hospital admissions were not statistically significant after controlling for other agency characteristics, region of country and characteristics of the health care market.

Indeed, a factor that appeared to have a more substantive effect on performance was region of the country. We noted that for most measures, agencies located in the Western part of the country performed better than agencies in other regions. For instance, when functioning was measured in terms of the percentage of the agencies' patients who showed improvement in bathing ability, the average score for agencies located in the West was 7 percentage points higher than that of agencies located in the Northeast and 6 percentage points higher than that of agencies in either Mid-Atlantic and Midwestern states. Although a systematic analysis of the factors contributing to regional differences in performance were outside the scope of this study, additional research is warranted to better understand these findings.

**Discussion:** This study found rather small differences in the quality of care provided by home health agencies in urban and rural areas. Measured in terms of improvement in functional performance, these modest differences were generally less than two percentage points, and rural agencies' performance was neither consistently better nor consistently worse than that of their urban counterparts. When measured as adverse events, rural and urban differences were not significant.

The finding that small differences in the performance of rural and urban agencies were statistically significant does not necessarily imply that these differences were important or clinically meaningful. Results suggest that rural and urban agencies' performance on the set of outcomes represented in

our scales is relatively comparable. This is encouraging, but does not offer definitive evidence that the care delivered by rural and urban agencies is either of high-quality or equal. One factor that could limit our ability to detect quality differences across agencies is the relatively small across-provider variation in certain functional improvement measures. Because individual patients' outcomes are reported using a dichotomous score (improvement =1, no improvement or got worse=0) gradients of improvement in functioning are not captured. It is therefore possible that although no statistically significant difference in the proportion of rural and urban home health users who improved in one functional measure occurred, marked and clinically meaningful differences in the magnitude of improvement may exist. Furthermore, the measures used to assess performance failed to provide information on many outcomes of care that are important to a population receiving home health services, such as improvement in physical health, mental health and psychosocial well-being, community integration and independent living. In September 2005, CMS updated the measures in the HHC to include three measures (improvement in dyspnea, improvement in urinary incontinence, and discharge to community), thereby addressing some of these gaps.

Home health data used to conduct this study overlapped with the period in which the home health rural payment add-on was in effect. With the elimination of the rural payment add-on, agencies that serve large numbers of rural patients may come under increased financial pressure. While it will be necessary to monitor how agencies adapt to financial circumstances posed by the loss of the add-on, continued monitoring is also necessary to ensure that financial pressure does not affect performance. Toward this objective, an investment in robust tools that offer a comprehensive approach for measuring performance and which capture meaningful differences in patient outcomes is needed.

# PERFORMANCE OF RURAL AND URBAN HOME HEALTH AGENCIES IN IMPROVING PATIENT OUTCOMES

## BACKGROUND

Studies have shown that the nature of home care provided to rural Medicare beneficiaries differs from that provided to urban residents. In particular, rural residents are substantially less likely to receive rehabilitative services that include physical, occupational and speech therapy (Franco, 2004; Sutton, 2005a; Sutton, 2005b). One possible reason for the differences in rates of utilization is that, perhaps because of difficulties in provider recruitment and retention, rural agencies are less likely than their urban counterparts to offer rehabilitation services. In fact, the odds that agencies in the most rural locations offer physical and occupational therapy have been found to be about one-half and one-fifth, respectively, that of urban agencies (Sutton 2005c).

Given differences in utilization and service line, it is possible that outcomes, such as improvement in functional status, are not comparable for patients treated by rural and urban agencies. To date, there is little information to indicate whether the quality of home care services varies by rural and urban location. Two studies that have explicitly compared outcomes among rural and urban home care users have produced inconsistent results. The first of these studies examined patient outcomes in six home care agencies in the state of Washington (Adams and Short, 1999) and found that rural residents achieved better outcomes than urban residents in the management of oral medications, reduction in the frequency of pain and reduction in the occurrence of dypsnea. Rural and urban home care users did not differ in two other outcome measures: improvement or stabilization in ambulation and bathing. Our ability to draw inferences concerning the quality of care of rural agencies from this study is limited because the sample was not nationally representative and because the analyses did not adjust for differences in patient severity or case-mix.

The second study (Schlenker et al, 2002) used a nationally representative sample of Medicare claims to examine whether rural and urban beneficiaries differed in terms of their discharge status. Rural Medicare beneficiaries were significantly more likely to have been hospitalized and less likely to have been discharged from home health with their improvement or stabilization goals having been met. Schlenker did note that, in addition to rural or urban location, one agency characteristic, profit

status, had a significant effect on discharge status. Medicare beneficiaries treated by for-profit agencies were more likely to have been hospitalized at some point during the home care episode and to not have met their home care goals. The relationship between outcomes and other agency characteristics were not examined in this study.

## OBJECTIVES AND METHODS

This study used Home Health Compare (HHC) data, which are produced by the Centers for Medicare and Medicaid Services as part of the Home Health Quality Initiative (HHQI), to determine whether rural and urban home care agencies differ in terms of patient care outcomes, and to ascertain whether there are any agency characteristics that are associated with better or worse outcomes.

**Home Health Compare Initiative**

*The goal of the HHQI was to (1) provide Medicare beneficiaries with information on the quality of home care agencies as a means to assist them in selecting a provider, and (2) assist agencies in improving the quality of home care. In an effort to achieve the former objective, CMS developed the Home Health Compare (HHC) database, a web-based tool for public reporting of quality data. HHC uses data from the Outcome and Assessment Information Set (OASIS) to score agencies' on 11 measures that reflect agencies' performance in patient care. Quality data in the HHC database are updated every three months and consists of a rolling 12 months of OASIS data.*

*Source:* Centers for Medicare and Medicaid Services. Home Health Quality Initiative. March 21, 2003. www.cms.hhs.gov/quality/hhqi/HHQIOverview.pdf. Accessed July 11, 2005

The HHC data on which this study was based were obtained in May 2005 and included records on the performance of approximately 7,400 agencies. Agency-level performance measures compiled in this system consist of items related to improvement (between the time of admission and time of discharge from home care) in functioning and ability to perform activities of daily living experienced by clients of each agency. Performance measures include the following:

- ***Stabilization*** **-** The percentage of the agencies' patients that were stabilized, or did not get worse in bathing;
- ***Functional Improvement*** **-** The percentage of the agencies patients that experienced improvement in:
    - Upper body dressing
    - Bathing
    - Toileting
    - Ambulation

- Transferring in and out of bed
- Management of oral medications
- Level of confusion
- Pain interfering with activities;

- ***Occurrence of Adverse Events*** **-** The percentage of patients that, during the course of the home care episode:

  - are admitted to the hospital
  - require urgent, unplanned medical care.

Higher values on items related to stabilization and improvement in functioning indicate better performance in each of these areas. In contrast, lower values on the two measures that were designed to capture information about medical emergencies that could, in some instances, be avoided with appropriate care – hospital admissions and urgent, unplanned medical care – are associated with better performance.

To enable comparison across agencies, outcome measures reported in the HHC are risk adjusted using logistic regression models developed by Shaughnessy and Hittle (2002). Factors associated with risk of each outcome (and that were used in the risk adjustment models) as well as the variance explained by each model differed according to outcome. Examples of the variables included in these models were diagnosis, presence of selected conditions (e.g., orthopedic condition, pressure ulcer), severity, presence of risk factors (e.g., smoking, obesity), prior hospital admission, and living arrangement.

Data for all home care admissions and for all agencies are not reported in HHC. Excluded from these data are home health admissions for persons under the age of 18, those receiving maternity services or only personal care. Also excluded from these data are agencies that are only Medicaid certified, those for which 6 months of OASIS[1] data are not available, and those for which the number of cases are insufficient to produce reliable estimates. As such, new and smaller agencies may not be represented in these data.

[1] OASIS is a 54-item patient assessment instrument that is used to classify patients into one of 80 Home Health Resource Groups (HHRGs) for purposes of reimbursement and to monitor quality of care. Data are collected on admission, 60-day episodes of care, and on discharge.

Means and t-tests, were used to determine whether the performance of rural and urban agencies on each of the outcome measures reported in the HCC database were statistically significant. Two outcome measures - the percentage of patients that showed improvement in toileting and the percentage of patients that were less confused – were not included these analyses because data for more than 30 percent of home health agencies was missing. Additionally, because we found little variation in agencies' performance on this measure, stabilization in bathing was not included in this analysis. These analyses were therefore limited to examining improvements in the six other functional outcomes and two adverse event measures.

Multivariate regression analyses was used to determine whether outcomes on each of the eight performance measures are significantly different for rural and urban agencies. Agency characteristics and characteristics of the environment in which the agency operates that could affect performance were used as independent variables in these analyses. These independent variables are listed in Table 1.

**Table 1: Agency Characteristics Used in Analysis of Performance**

| Variables | Definition and Data Source |
|---|---|
| **Agency Characteristics** | |
| Ownership | Government owned, proprietary, voluntary. Source: HHC |
| Facility-based | Agency is part of a hospital, rehabilitation or skilled nursing facility. Source: Providers of Services File |
| Service Lines | Physical therapy, occupational therapy, speech therapy, medical social work. Source: HHC |
| Certification | Number of years that agency has been certified: < 5, 5-10, 11-20, and 20+. Source: HHC |
| **Location** | |
| Rural/Urban | Zip codes corresponding to Rural-Urban Commuting Area Codes (RUCAs) 1.0 - 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1 are classified as "urban". All others are classified as "rural." Source: Zip codes in HHC, RUCAs from WWAMI 2005. |
| Region | Northeast, Mid-Atlantic, South, Midwest, Southwest, West. Source: Compiled from zip codes in HHC |
| **Health Care Environment** | |
| Need | Poverty Rate (%). Source: Area Resource File. |
| Primary Care Infrastructure | Location in a Primary Care Health Professions Shortage Area (HPSA). 0=No, 1=Yes (in whole or part). Source: Area Resource File |
| Competitiveness of Post-acute Market | Home Health Competition: Number of home health agencies per 10,000 population. SNF Competition: Number of SNFs per 10,000 population. Source: Area Resource File. |

## RESULTS

Data for 5,775 home care agencies were available for this study. This represents approximately 75 percent of the Medicare certified home health agencies in operation in 2005. The majority of agencies excluded from this analysis were eliminated due to missing outcome measure data.

**Table 2: Characteristics of Home Health Agencies in Study**

| | Urban | Rural |
|---|---|---|
| Total sample size | 3,714 | 2,061 |
| *Ownership (%)* | | |
| Government | 3.8 | 29.6 |
| Proprietary | 67.3 | 30.8 |
| Voluntary | 28.9 | 39.6 |
| *Facility based (%)* | | |
| | 19.9 | 49.0 |
| *Years Certified (%)* | | |
| < 5 | 25.9 | 5.9 |
| 5-10 | 20.0 | 14.5 |
| 11-20 | 25.7 | 32.9 |
| 20+ | 28.4 | 46.7 |
| *Region (%)* | | |
| Northeast | 13.9 | 8.1 |
| Mid-Atlantic | 7.1 | 9.8 |
| South | 37.1 | 34.5 |
| Midwest | 22.6 | 36.7 |
| Southwest | 5.4 | 6.3 |
| West | 13.9 | 4.6 |
| *Service Lines Available* | | |
| Physical | 99.3 | 98.8 |
| Occupational | 95.6 | 87.6 |
| Speech therapy | 93.2 | 84.9 |
| Social work | 93.1 | 72.6 |
| *Total Number of Rehabilitation Disciplines Offered (%)* | | |
| None | < 1.0 | <1.0 |
| One | 2.7 | 7.5 |
| Two | 4.4 | 11.6 |
| All | 92.3 | 80.2 |

*Agency Characteristics:* About 36 percent of the home health agencies represented in this study were located in a rural area. As noted in Table 2, rural and urban agencies differed markedly on several key characteristics. Urban agencies, for instance, were more likely than agencies in a rural location to be proprietary; 67 percent of urban agencies were proprietary compared to only 31 percent of agencies in rural towns. However, rural agencies were more likely than urban agencies to be government owned or voluntary. In fact, while over one-fourth of rural agencies were government owned, less than 4 percent of urban agencies were owned by the government. Urban agencies also tend to be younger than rural agencies. Over one-fourth of urban agencies have been Medicare certified for less than 5 years compared to less than 6 percent of agencies located in rural areas. Almost one-half of rural agencies in this study were Medicare certified for 20 years or more compared to only 28 percent of urban agencies.

Small differences in service lines were noted. Nearly all agencies reported that physical therapy was one of the disciplines in their service line. Rural agencies were, however, less likely to include speech therapy and medical social work services in their service line. About three-quarters of rural agencies offered medical social work and 85 percent offered speech therapy services; in comparison, 93 percent of urban agencies offered medical social work and speech therapy. On a related note, urban agencies were more likely than agencies in rural towns to include all three rehabilitation disciplines in

their service line. Slightly more than 92 percent of urban agencies offered physical, occupational and speech therapy services compared to only 80 percent of agencies in rural areas.

*Rural-Urban Differences in Functional Improvement:* Overall, small but statistically significant differences in urban and rural agencies' performance on functional improvement measures were noted. As shown in Table 3, the pattern of performance on these measures was not consistent. On three measures, reduction in the occurrence of pain, improvement in bathing and improvement in medication management, urban agencies performed better than their rural counterparts. On two measures, improvement in bed transfers and upper body dressing, rural agencies performed better than urban agencies. On one measure, improvement in walking, no statistically significant difference was noted between rural and urban agencies. (Appendix A contains additional descriptive statistics for each measure, including standard deviations, medians and inter-quartile – $25^{th}$ to $75^{th}$ percentile – ranges.

The finding that differences in the performance of rural and urban agencies were statistically significant does not necessarily imply that these differences were important or clinically meaningful. Examining the magnitude of agencies' scores, we noted that for most measures the difference in urban and rural agency performance was between one and two percentage points. That small differences in agency performance were found to be statistically significant is not surprising given the large agency sample sizes used in these analyses.

Adjusting for agency characteristics, significant rural/urban differences in performance were noted on several outcome measures. The pattern that emerged from this descriptive analysis was similar to that described above. Even when agencies were examined separately by ownership type, facility-based status, years certified, region of the country located, and number of rehabilitation disciplines included in the service line, urban agencies tended to perform better on measures related to the occurrence of pain, improvement in bathing, and improvement in medication management. Rural agencies tended to perform better on measures related to improvement in bed transferring and upper body dressing. For the most part, the magnitude of rural and urban differences in performance was small, less than 4 percentage points. Larger differences were noted in a few cases, however. As one example, among the subset of agencies that include only one rehabilitation discipline in their service line, those located in a rural area were found to have scores on the

**Table 3: Performance on Functional Improvement Measures, Rural and Urban Agencies**
(Bold indicates rural and urban differences are statistically significant $p < .05$)

| | | AREA OF IMPROVEMENT | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Pain** | **Walking** | **Bed Transfer** | **Bathing** | **Taking Meds** | **Dressing** |
| ***All Agencies*** | | | | | | | |
| | Urban | **59.8** | 35.8 | **49.3** | **59.7** | **37.4** | **63.3** |
| | Rural | **57.4** | 36.0 | **50.7** | **58.1** | **35.0** | **64.4** |
| ***Ownership*** | | | | | | | |
| Government | Urban | 58.7 | 35.9 | **53.3** | 57.5 | **36.8** | 64.6 |
| | Rural | 56.7 | 34.7 | **50.3** | 56.8 | **33.2** | 64.0 |
| Proprietary | Urban | **60.0** | **35.5** | 48.1 | **59.9** | **37.5** | 62.3 |
| | Rural | **56.1** | **36.7** | 48.6 | **58.5** | **36.3** | 62.9 |
| Voluntary | Urban | 59.7 | 36.5 | **51.5** | 59.6 | **37.2** | 65.4 |
| | Rural | 58.9 | 36.4 | **52.5** | 58.7 | **35.4** | 65.8 |
| ***Facility-based*** | | | | | | | |
| Yes | Urban | **60.0** | 36.9 | 52.5 | **60.0** | **37.5** | 65.8 |
| | Rural | **58.5** | 36.0 | 52.0 | **58.7** | **34.4** | 65.8 |
| No | Urban | **59.9** | 35.8 | 48.9 | **59.7** | **37.4** | 63.1 |
| | Rural | **56.5** | 35.9 | 49.3 | **57.5** | **35.7** | 63.2 |
| *Years Certified* | | | | | | | |
| < 5 | Urban | **61.3** | **35.2** | 47.1 | 60.9 | 38.2 | 61.6 |
| | Rural | **54.2** | **37.7** | 47.7 | 59.3 | 37.1 | 61.0 |
| 5-10 | Urban | **60.3** | 35.2 | **48.2** | 60.1 | **36.6** | **62.8** |
| | Rural | **58.3** | 36.0 | **52.0** | 59.6 | **34.6** | **64.4** |
| 11-20 | Urban | 58.4 | 36.1 | 49.7 | 58.8 | **36.9** | **63.5** |
| | Rural | 57.6 | 36.0 | 50.6 | 58.7 | **35.2** | **64.7** |
| 20+ | Urban | **59.6** | **36.6** | **51.7** | **59.2** | **37.7** | 65.0 |
| | Rural | **57.3** | **35.7** | **50.7** | **56.9** | **34.8** | 64.6 |
| ***Region*** | | | | | | | |
| New England | Urban | 60.6 | 35.1 | **49.8** | **57.3** | **37.0** | 62.8 |
| | Rural | 59.4 | 35.6 | **52.1** | **55.5** | **34.4** | 63.0 |
| Mid-Atlantic | Urban | 59.7 | **36.9** | **53.2** | **58.0** | **35.7** | 65.0 |
| | Rural | 60.9 | **38.8** | **55.2** | **55.9** | **33.7** | 64.4 |
| South | Urban | **58.5** | 35.5 | **47.1** | 60.1 | 38.1 | **61.3** |
| | Rural | **56.3** | 36.3 | **48.3** | 59.3 | 37.4 | **63.4** |
| Mid-West | Urban | **60.1** | **35.8** | 50.5 | **58.3** | **36.5** | 64.8 |
| | Rural | **57.2** | **34.7** | 50.5 | **56.4** | **32.7** | 64.8 |
| Southwest | Urban | 55.5 | **35.2** | 52.0 | 61.8 | 36.8 | 64.9 |
| | Rural | 56.9 | **37.4** | 52.9 | 63.5 | 37.1 | 66.3 |
| West | Urban | **64.2** | 37.3 | **49.6** | 63.8 | 38.5 | **65.2** |
| | Rural | **57.5** | 36.3 | **55.2** | 63.9 | 37.9 | **68.8** |
| *Number of Rehabilitation Disciplines in Service Line* | | | | | | | |
| One | Urban | 56.0 | **32.4** | **42.7** | 55.2 | 34.4 | **56.3** |
| | Rural | 56.2 | **35.9** | **51.2** | 58.1 | 35.7 | **63.8** |
| Two | Urban | **58.9** | 34.4 | 47.1 | 57.4 | **37.9** | **60.6** |
| | Rural | **55.6** | 35.1 | 49.5 | 56.8 | **34.5** | **64.1** |
| All | Urban | **60.0** | 36.0 | **49.6** | **60.0** | **37.5** | **63.7** |
| | Rural | **57.8** | 36.1 | **50.9** | **58.3** | **35.0** | **64.5** |

measures of improvement in bed transferring and upper body dressing that were about 8 percentage points higher than that of their urban counterparts. As another example, urban agencies certified for less than 5 years had average scores on the measure of improvement in pain frequency that were 7 percentage points higher than that of rural agencies.

Results of multiple regression analyses, which were used to adjust for differences in the characteristics of rural and urban agencies or the environmental characteristics in which they operate that could affect performance on these functional measures, are shown in Table 4. As seen in this table, net of other factors, rural or urban location has only a modest effect on performance scores. Rural and urban agencies each performed better than their counterpart on selected outcome measures: rural agencies performed better on measures of improvement in walking, transferring, and dressing whereas urban agencies performed better on measures of improvement in pain frequency and medication management. Importantly, performance of rural and urban agencies on each of these measures differed by less than two percentage points.

A factor that appeared to have a more substantive effect on performance was region of the country. We noted that for most measures, agencies located in the Western part of the country performed better than agencies in other regions. For instance, when functioning was measured in terms of the percentage of the agencies' patients who showed improvement in bathing ability, the average score for agencies located in the West was 7 percentage points higher than that of agencies located in the Northeast and 6 percentage points higher than that of agencies in either Mid-Atlantic and Midwestern states.

Although not the focus of this study, another interesting observation from these regression analyses was that greater competition in the post-acute care market, where competition was measured in terms of home health agencies or skilled nursing facilities per 10,000 population, was frequently associated with worse performance on functional outcome measures. It is not entirely apparent why this would be the case. One possibility for consideration in future research is that agencies in competitive markets are under greater financial pressure and in adapting their services to remain price competitive may compromise patient outcomes.

**Table 4: Coefficients for Regression Models of Agency Improvement in Functional Areas**

(----- Indicates reference group; bold indicates coefficients are statistically significant at the $p < .05$ level )

| | | Pain | Walking | Bed Transfer | Bathing | Taking Meds | Dressing |
|---|---|---|---|---|---|---|---|
| **Location** | Urban | **0.8** | **-0.8** | **-1.8** | 0.2 | **0.9** | **-1.3** |
| | Rural | ----- | ----- | ------ | ----- | ----- | ----- |
| **FacilityBased** | No | -0.8 | -0.5 | **-2.2** | -0.6 | 0.4 | **-1.5** |
| | Yes | ----- | ----- | ----- | ----- | ----- | ----- |
| **Ownership** | Government | -0.3 | **-1.6** | -0.4 | **-1.5** | **-1.9** | **-1.2** |
| | Proprietary | -0.4 | -0.3 | **-1.1** | **-0.9** | -0.4 | **-1.3** |
| | Voluntary | ----- | ----- | ----- | ----- | ----- | ----- |
| **Certified** | Years | **-0.9** | 0.0 | 0.0 | **-0.1** | 0.0 | 0.0 |
| **PT available** | No | -1.4 | -0.1 | -0.7 | 1.7 | 1.6 | 2.9 |
| | Yes | ----- | ----- | ----- | ----- | ----- | ----- |
| **OT available** | No | **-1.8** | -0.6 | -0.4 | **-2.0** | -0.6 | -0.8 |
| | Yes | ----- | ----- | ----- | ----- | ----- | ----- |
| **ST available** | No | 0.4 | -0.8 | -0.3 | -0.1 | 0.2 | -0.4 |
| | Yes | ----- | ----- | ----- | ----- | ----- | ----- |
| **HPSA** | No | 0.5 | 0.2 | 0.2 | -0.0 | 0.0 | 0.4 |
| | Yes | ----- | ----- | ----- | ----- | ----- | ----- |
| **Region** | Mid-Atlantic | **-1.9** | 0.6 | **3.0** | **-6.4** | **-3.3** | **-1.7** |
| | Midwest | **-2.5** | **-1.7** | **-1.2** | **-6.4** | **-2.9** | **-2.6** |
| | Northeast | **-1.5** | **-2.3** | **-2.2** | **-7.1** | **-2.3** | **-5.2** |
| | South | **-3.9** | -0.8 | **-1.3** | **-3.2** | -0.0 | **-2.4** |
| | Southwest | **-5.9** | -0.9 | **1.8** | -1.1 | -1.2 | -0.6 |
| | West | ----- | ----- | ------ | ----- | ----- | ----- |
| **Poverty** | % | **0.1** | -0.0 | **-0.3** | **-0.1** | -0.0 | **-0.3** |
| **Competition** | HHA/10,000 | **-0.4** | **-0.2** | **-0.5** | -0.0 | -0.1 | **-0.2** |
| | SNF/10,000 | **-0.2** | -0.1 | **-0.1** | -0.1 | **-0.2** | -0.0 |

*Rural-Urban Differences in Adverse Events:* Overall, rates of adverse events differed significantly by agency location, with agencies located in urban areas having lower average scores, and hence better performance, than those in rural areas (Table 5). Statistically significant differences in the performance of urban and rural agencies were noted even after adjusting for selected agency characteristics. With few exceptions, however, rural and urban differences in adverse event rates were not only small (less than 3 percentage points), but they were higher for rural agencies. A couple notable exceptions were observed. For instance, among agencies that had been certified for five years or less, differences in the proportion of patients who were admitted to a hospital or who received unplanned urgent care during the course of their home care episode were both about 5 percentage points higher for rural than for urban agencies. As another example, proprietary rural

agencies had hospital admission rates that were about 4 percentage points higher than that of their urban counterparts.

**Table 5: Home Health Agency Performance on Adverse Event Measures**
(bold indicates rural and urban differences are statistically significant at the $p < .05$ level)

| | | ADVERSE EVENT | |
|---|---|---|---|
| | | **Urgent Care** | **Hospital Admission** |
| ***All Agencies*** | | | |
| | Urban | **21.9** | **30.3** |
| | Rural | **23.6** | **31.4** |
| ***Ownership*** | | | |
| Government | Urban | 23.5 | 29.9 |
| | Rural | 24.3 | 31.4 |
| Proprietary | Urban | **21.5** | **31.2** |
| | Rural | **24.1** | **35.3** |
| Voluntary | Urban | 22.6 | 28.1 |
| | Rural | 22.7 | 28.3 |
| ***Facility-based*** | | | |
| Yes | Urban | 22.6 | 28.2 |
| | Rural | 23.0 | 28.8 |
| No | Urban | **21.7** | **30.9** |
| | Rural | **24.1** | **33.7** |
| ***Years Certified*** | | | |
| < 5 | Urban | **20.7** | **30.3** |
| | Rural | **25.5** | **35.5** |
| 5-10 | Urban | **21.7** | 31.8 |
| | Rural | **23.7** | 32.1 |
| 11-20 | Urban | 22.9 | 30.7 |
| | Rural | 23.4 | 31.0 |
| 20+ | Urban | **22.4** | **28.6** |
| | Rural | **23.5** | **30.9** |
| ***Region*** | | | |
| Northeast | Urban | 25.6 | **32.9** |
| | Rural | 25.1 | **30.7** |
| Mid-Atlantic | Urban | **22.7** | **27.9** |
| | Rural | **24.5** | **30.4** |
| South | Urban | **20.9** | **31.9** |
| | Rural | **23.0** | **36.0** |
| Mid-West | Urban | 23.3 | **31.0** |
| | Rural | 24.3 | **29.6** |
| Southwest | Urban | 22.9 | 25.7 |
| | Rural | 22.8 | 26.3 |
| West | Urban | **17.4** | **24.7** |
| | Rural | **20.3** | **22.1** |
| ***Rehab Disciplines*** | | | |
| One | Urban | 22.4 | **30.7** |
| | Rural | 24.1 | **34.0** |
| Two | Urban | **22.2** | 31.5 |
| | Rural | **24.9** | 31.9 |
| All | Urban | **21.8** | **30.1** |
| | Rural | **23.2** | **30.8** |

After controlling for differences in agency characteristics and environmental characteristics, rural and urban agency differences in rates of unplanned urgent care and hospital admissions were not statistically significant ($p < .05$). Interestingly, the availability of physical therapy services and region of the country where the agency is located appeared to have more influence on adverse event rates. Agencies that did not include physical therapy in their service lines were found to have rates of urgent unplanned care and hospital admissions that were 3 and 8 percentage points higher, respectively, than that of agencies that made this discipline available. Agencies located in the western U.S. had the lowest adverse event rates. Compared to home health agencies in the Northeast, for example, rates of urgent unplanned care were almost 8 percentage points lower and rates of hospital admissions were almost 11 percentage points lower for agencies located in a western state.

**Table 6: Coefficients for Regression Model of Home Health Agency Rates of Adverse Events**

(----- Indicates reference group; bold indicates coefficients are statistically significant at the $p < .05$ level )

| | | Urgent Care | Hospital Admission |
|---|---|---|---|
| **Location** | Urban | -0.6 | 0.1 |
| | Rural | ----- | ----- |
| **Facility Based** | No | -0.1 | **1.6** |
| | Yes | ----- | ----- |
| **Ownership** | Government | **1.0** | **1.2** |
| | Proprietary | 0.6 | **2.9** |
| | Voluntary | ----- | ----- |
| **Certified** | Years | -0.0 | -0.0 |
| **Physical Therapy available** | No | **3.2** | **8.3** |
| | Yes | ----- | ----- |
| **Occup. Therapy available** | No | **1.5** | 0.5 |
| | Yes | ----- | ----- |
| **Speech Therapy available** | No | 0.6 | -0.1 |
| | Yes | ----- | ----- |
| **HPSA** | No | 0.0 | -0.3 |
| | Yes | ----- | ----- |
| **Region** | Mid-Atlantic | **5.4** | **5.2** |
| | Midwest | **5.4** | **6.8** |
| | Northeast | **7.9** | **10.7** |
| | South | **3.2** | **7.1** |
| | Southwest | **4.8** | 1.1 |
| | West | | |
| **Poverty** | % | 0.0 | **0.3** |
| **Competition** | HHAs/10,000 pop | 0.0 | **0.4** |
| | SNFs/10,000 pop | **0.2** | **0.2** |

## DISCUSSION

This study found rather small differences in the quality of care provided by home health agencies in urban and rural areas. Measured in terms of improvement in functional performance, these modest differences were generally less than two percentage points, and rural agencies' performance was neither consistently better nor consistently worse than that of their urban counterparts. When measured as adverse events, rural and urban differences were not significant.

The finding that small differences in the performance of rural and urban agencies were statistically significant does not necessarily imply that these differences were important or clinically meaningful. Results suggest that rural and urban agencies' performance on the set of outcomes represented in this study is relatively comparable. This is encouraging, but does not offer definitive evidence that the care delivered by rural and urban agencies is either of high-quality or equal. One factor that could limit our ability to detect quality differences across agencies is the relatively small across-provider variation in certain functional improvement measures.[2] Because individual patients' outcomes are reported using a dichotomous score (improvement =1, no improvement or got worse=0) gradients of improvement in functioning are not captured. It is therefore possible that although no statistically significant difference in the proportion of rural and urban home health users who improved in one functional measure occurred, marked and clinically meaningful differences in the magnitude of improvement may exist. Furthermore, the measures used to assess performance failed to provide information on many outcomes of care that are important to a population receiving home health services, such as improvement in physical health, mental health and psychosocial well-being, community integration and independent living. In September 2005, CMS updated the measures in the HHC to include three measures (improvement in dyspnea, improvement in urinary incontinence, and discharge to community), thereby addressing some of these gaps.[3]

Perhaps the most significant result from this study was the finding that home health outcomes differed substantially by region of the country. Although systematic analyses of the factors contributing to regional differences in performance were outside the scope of this study, additional

[2] For most outcome measures inter-quartile ranges ($25^{th}$ to $75^{th}$ percentile) were modest, with a spread of between 10 and 14 percentage points.

[3] Four measures (1) improvement in upper body dressing, (2) stabilization in bathing, (3) improvement in toileting, and (4) improvement in confusion frequency, was also retired as per the recommendations of the National Quality Forum National Consensus Standard.

research is warranted to ascertain the factors that contribute to regional differences in home health agency performance.

Home health data used to conduct this study overlapped with the period in which the home health rural payment add-on was in effect. With the elimination of the add-on agencies serving rural communities could come under increased financial pressure. While it will be necessary to monitor how agencies adapt to financial circumstances posed by the loss of the add-on, continued monitoring is also necessary to ensure that financial pressure does not affect performance. Toward this objective, an investment in robust tools that offer a comprehensive approach for measuring performance and which capture meaningful differences in patient outcomes is needed.

## REFERENCES


Adams CE, Short R. Rural Versus Urban Home Health : Does Locale Influence OASIS Outcome. Outcomes Management for Nursing Practice, 1998;3(1):26-31.

Franco, SJ. Medicare Home Health Care in Rural America. Policy Analysis Brief. Bethesda, MD: NORC Walsh Center for Rural Health Analysis, W Series, No. 1, 2004.

Schlenker RE, Powell MC, Goodrich GK. Rural-Urban Home Health Care Differences Before the Balanced Budget Act of 1997. Journal of Rural Health, 2002;18(2):359-372.

Shaughnessy PW, Hittle DF. Overview of Risk Adjustment and Outcome Measures for Home Health Agency OBQI Reports: Highlights of Current Approaches and Outline of Planned Enhancements. September 2002. www.cms.hhs.gov/providers/hha/RiskAdj1.pdf. Accessed July 22, 2005.

Sutton JP. Utilization of Home Health Services Among Rural Beneficiaries Before and After the PPS. Bethesda, MD: NORC Walsh Center for Rural Health Analysis. August 2005a.

Sutton, JP. Patterns of Post-Acute Utilization in Rural and Urban Communities: Home Health, Skilled Nursing, and Inpatient Medical Rehabilitation. Bethesda, MD: NORC Walsh Center for Rural Health Analysis. March 2005b.

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

WWAMI Rural Health Research Center. The Use of RUCAs in Health Care. Updated January 2002. http://www.fammed.washington.edu/wwamirhrc/rucas/use_healthcare.html. Accessed July 27, 2005.

# APPENDIX A

## Descriptive Statistics

**Descriptive Statistics for Functional Improvement Variables: Percentage of Agencies' Patients Improved in Pain Frequency, Walking, Bed Transfers, Bathing, Medication Management, and Upper Body Dressing**

| | Pain | Walking | Bed Transfer | Bathing | Taking Meds | Dressing |
|---|---|---|---|---|---|---|
| **Urban** | | | | | | |
| Mean | 59.8 | 35.8 | 49.3 | 59.7 | 37.4 | 63.3 |
| Standard Deviation | 12.9 | 9.2 | 12.2 | 11.1 | 10.7 | 11.4 |
| Median | 60.0 | 36.0 | 50.0 | 60.0 | 37.0 | 65.0 |
| Inter-quartile Range | 14.0 | 10.0 | 14.0 | 11.0 | 12.0 | 12.0 |
| **Rural** | | | | | | |
| Mean | 57.4 | 36.0 | 50.7 | 58.1 | 35.0 | 64.4 |
| Standard Deviation | 11.8 | 8.8 | 12.3 | 9.8 | 10.1 | 9.2 |
| Median | 58.0 | 35.0 | 51.0 | 58.0 | 35.0 | 65.0 |
| Inter-quartile Range | 15.0 | 11.0 | 16.0 | 12.0 | 12.0 | 11.0 |

**Descriptive Statistics for Adverse Event Variables: Percentage of Agencies' Patients Admitted to Hospital or Required Urgent, Unplanned Medical Care During Home Health Episode**

| | Admissions | Urgent Care |
|---|---|---|
| **Urban** | | |
| Mean | 30.3 | 21.9 |
| Standard Deviation | 11.2 | 11.2 |
| Median | 28.0 | 22.0 |
| Inter-quartile Range | 12.0 | 11.0 |
| **Rural** | | |
| Mean | 31.4 | 23.6 |
| Standard Deviation | 10.4 | 10.0 |
| Median | 30.0 | 24.0 |
| Inter-quartile Range | 14.0 | 12.0 |