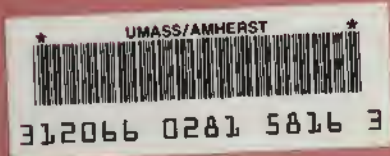


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IS GEOGRAPHY DESTINY? AN ANALYSIS OF HOME HEALTH PRODUCTIVITY ACROSS MASSACHUSETTS



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*One of a Series of Reports on
Elderly and In-Home Services by
the Bureau of Ambulatory Care*

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TABLE OF CONTENTS

EXECUTIVE SUMMARYi

INTRODUCTION1

METHODOLOGY3

 A) HYPOTHESES3

 B) DATA SOURCES3

 C) ANALYSES5

RESULTS8

DISCUSSION12

IS GEOGRAPHY DESTINY?

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EXECUTIVE SUMMARY

Introduction

Demographic shifts and changes in reimbursement policies have resulted in an increased reliance on community health services. Prominent among these changes are the rapid growth in the elderly population and policy initiatives which discourage use of hospitals and nursing homes. Throughout the Commonwealth, a growing number of home health agencies are providing more services to greater numbers of clients. In Massachusetts, \$30 million in state funds is spent annually on home health through agencies such as Medicaid and the Department of Public Health.

The Rate Setting Commission establishes the fees that the state agencies use in purchasing these services. Each certified home health agency receives a rate for its skilled nursing and therapy services based on an adjustment to its reported costs. These costs are entered into a formula which imposes an efficiency norm, currently defined as 5.2 patient visits per full time equivalent staff member per day. A productivity incentive is applied to agencies that perform over 6.03 visits per day, with decreasing benefit after 7.5 visits per day.

Currently, the same productivity standard is applied to all agencies. However, home health agencies serving clients living in rural areas have often reported difficulties in meeting the productivity standard. The present study is an attempt to evaluate the applicability of the existing standards across geographic settings. Factors associated with rural areas such as lack of conveniently located highways, seasonal traffic, and poor road conditions may all serve to present hardships in meeting the established standard. In this analysis, the impact of these factors on agency productivity has been measured.

Analysis

Information regarding the geographic and population characteristics of each agency's service area, the Health Service Area in which the agency is located, the number of clients served, and staff productivity rates were required in order to conduct the analyses. These data were obtained from several sources including a questionnaire completed by 81 of the 131 home health agencies, the U.S. Census Bureau, and Medicare Cost Reports for fiscal year 1985.

Several analyses were conducted to determine whether the average nurse care and physical therapy productivity rates for rural agencies differ from the average productivity rates of urban agencies. Variables such as the presence of major highways, local roads, hills, snow, lack of public transportation, seasonal fluctuations, the presence of other agencies serving the same service area, and volume were analyzed to determine their effect on agency productivity. Further, comparisons were made between the average number of nursing visits provided to those patients that live in urban areas and those that live in rural areas.

Findings

The results of these studies suggest that efficiency of home health services and the impact of geographic variables on productivity vary significantly depending on the nature of the provider's visit. A predominantly rural service area does not in itself affect the productivity of skilled nursing visits, while it does affect an agency's physical therapy productivity. Agencies with rural service areas tend to have lower physical therapy productivity rates than agencies with more urban service areas.

A further analysis of nursing care productivity indicated that the presence of other agencies serving the same service area had a negative impact on the productivity of nursing visits, while certain geographic characteristics, such as the presence of major highways, had a positive impact. It was also found that the volume of nursing visits done by the agency, up to a certain level, had a positive impact on the agency's productivity. When the service being examined was physical therapy rather than nursing, however, none of these effects were observed.

A final analysis compared the number of nurse care visits provided to each client living in urban areas to that of each client living in rural areas. No statistically significant differences were detected.

Discussion

These results indicate that nurse care and physical therapy visits represent two distinct types of services which respond quite differently to various geographic and organizational factors. One possible explanation for the discrepancy involves the compressibility of the visit. Physical therapists may be unable to adjust visit times in order to maintain a time schedule. Also, many urban agencies use physical therapy aides to conduct visits. The use of such aides for routine physical therapy is associated with shorter visits but the supply of these paraprofessionals is sparse in rural areas. Another factor working in favor of urban agencies' physical therapy productivity rates is that their volume of business is sufficiently large to allow them to organize the service by geographic district. Rural areas would not necessarily be in the same position.

Implications

The results of this study have many implications for the organization and management of home health agencies. Further, these findings suggest that third-party reimbursement policies must be sensitive to operational differences among agencies serving diverse geographic areas. Efficiency - promoting standards, particularly regarding the therapy services, should consider the agencies' geographic constraints in order to maintain access to quality services for residents in all parts of the state.

INTRODUCTION

The visiting nurse, once the mainstay of community health services, is re-emerging as a significant component of medical care. Growth among the elderly population, as well as changes in reimbursement policies which now discourage use of hospitals and nursing homes, have fueled a dramatic increase in the number of home health agencies and the volume of patient visits. The number of Medicare-certified home health agencies in the United States has doubled over the last five years, and the federal government spends more than \$2.6 billion annually on home health services for Medicare beneficiaries alone¹.

Despite the explosive growth of the home health industry, estimated at 20 to 25 percent per year², little research has been conducted on the operational efficiency of this service. One such study conducted by Joel Hay and George Mandes³ on a cost-function analysis found that the relationship between average cost per visit and annual number of nurse visits per agency resembles a U-shaped curve with the lowest cost occurring at 7,159 visits per year. The authors conclude that small agencies (less than 4,000 visits) may be subject to scheduling or travel inefficiencies, while significantly larger agencies may be over-burdened by administrative complexities. In another study, Sandra Spoelstra examined actual home health nurse productivity and management's expectations for productivity across a variety of home health agency settings⁴. She found that urban agencies, hospital-based agencies, and agencies conducting 10,000 to 20,000 visits annually had the highest productivity.

Massachusetts spends over \$30 million annually on home health care through its Medicaid program, the Department of Public Health and other state agencies. The Massachusetts Rate Setting Commission establishes fees that state agencies use in purchasing home health services. The rate formula used to determine these fees includes an implicit efficiency standard.

¹ "HHS Targets Home Health Costs", Washington Report on Medicine and Health; McGraw-Hill. August 5, 1985.

² Waldo, David; Levit, Katharine; Lazenby, Helen; "National Health Expenditures, 1985" Health Care Financing Review Fall 1986, Vol. 8, no.1, 1-21.

³ Hay, Joel W. and Mandes, George, "Home health care cost-function analysis", Health Care Financing Review Spring 1984, Vol.5, no.3, 111-116.

⁴ Spoelstra, Sandra L. "Productivity of Registered Nurses in the Home Health Care Setting" HEMOCARE 86 November/December 1986, 6.

Under Rate Setting Regulation 114.3 CMR 3.00, each certified home health agency receives a rate for its skilled nursing and therapy services based on an adjustment to its reported costs. These costs are entered into a formula which imposes a minimum productivity level of 5.2 visits per Full Time Equivalent (FTE) per day. Marginal costs associated with doing less than 5.2 visits per day are not reimbursed. An incentive factor rewards agencies that perform over 6.03 visits per day, with decreasing benefit after 7.5 visits per day. The minimum productivity standard is based on the median productivity experienced by Massachusetts home health agencies in 1982. A review of 1984 data corroborated the earlier statewide average findings.

The present study is an attempt to evaluate the applicability of the existing productivity standard for home health agencies across geographic settings. The present standard of 5.2 visits per Full Time Equivalent per day was initially developed as a means both to encourage agencies to operate in an efficient, cost-effective manner and to establish a standard length of visit with which all agencies might be compared. The concept of a single productivity standard for all Massachusetts agencies has recently come under question.

Home health agencies serving clients living in rural areas offered testimony at the Rate Setting Commission public hearing in April, 1986 regarding their difficulties in meeting the productivity standard. Factors associated with rural areas such as low population density, absence of multi-family dwellings, lack of conveniently located highways, seasonal traffic and poor road conditions may all serve to present hardships in meeting the established standard.

This study is an exploration of the effect of geographic conditions on agency productivity. Our overall hypothesis, which is to test whether "rurality" has an impact on average productivity rates is as follows:

[Ho: \bar{x} Visits per Day Rural = \bar{x} Visits per Day Urban].

In other words, we are examining whether the average productivity of agencies operating in rural areas is the same as the average productivity of agencies in urban areas. The findings may suggest that the existing productivity standard be reconsidered.

METHODOLOGY

A. HYPOTHESES

Several hypotheses have been examined in our research. They were intended to identify differences between the productivity of agencies operating in urban and rural areas and to examine factors contributing to any differences. The hypotheses are as follows:

- 1) Average nurse care productivity for rural agencies differs from the average nurse care productivity for urban agencies.
- 2) Average physical therapy productivity for rural agencies differs from the average physical therapy productivity for urban agencies.
- 3) A linear correlation exists between degree of agency "rural-ity" and nurse care productivity.
- 4) A linear correlation exists between degree of agency "rural-ity" and physical therapy productivity.
- 5) Major highways, local roads, hills, snowbelt, lack of public transportation, traffic problems, seasonal fluctuations, expanded service area since 1982, and the number of other agencies serving the same area affect agency nurse care productivity.
- 6) Major highways, local roads, hills, snowbelt, lack of public transportation, traffic problems, seasonal fluctuations, expanded service area since 1982, and the number of other agencies serving the same area affect agency physical therapy productivity.
- 7) There is a relationship between agency productivity and total volume of nurse care visits.
- 8) Clients living in rural areas receive more nurse care visits than clients living in urban areas.

B. DATA SOURCES

1) Dependent Variables:

The dependent variables in this study are agency productivity rates for skilled nursing and physical therapy visits. The Rate Setting Commission maintains productivity data for each home health agency. These data are based on time studies provided by the agencies. To determine actual daily productivity rates for skilled nursing and therapy visits, the following calculations were done for each agency using fiscal year 1985 reports.

[Productivity Rate/FTE/Day = (Actual Staff Visits in Year / Actual Days Worked in Year) / Adjusted Full Time Equivalents]

Depending on the number of days per year that the agency works, some agencies actually had two productivity rates. This is attributable to the fact that the Home Health Agency Regulation specifies that agencies should work a minimum of 218 days per year. In those cases involving agencies that work less than 218 days, the rate is automatically calculated using 218 as the days worked per year. In order to test whether this factor has been serving to obfuscate some agencies' true productivity per day by attributing to them artificially low daily productivity, an additional set of productivity rates using actual days worked was also calculated.

2) Independent Variables:

Rurality Measures

a. Zip Codes.

We measured "rurality" using an indicator called The Percentage of People Living in Rural Areas for each zip code in Massachusetts. This information is provided by the State Data Center at the University of Massachusetts at Amherst. This agency uses the Census Bureau's definition of rural and then calculates the rural percentage for each zip code based on information from their own data base. The Census Bureau's definition of rural and urban are described in Table 1.

b. Agency "Rurality".

Each agency's nursing and physical therapy service areas were assigned "rurality" scores to reflect their demographic characteristics. First, we identified the Zip codes served by each agency. The number of skilled nursing and physical therapy visits provided to each Zip code was also determined. We then multiplied each Zip code's Percentage of People Living in Rural Areas by the proportion of visits provided to that Zip code by that agency. Each Zip code thus received a rural weight. An agency's total "rurality" score reflects the sum of these rural weights.

We obtained information on agencies' service areas by asking each agency to conduct a client origin study (See Appendix A). Each of the 131 Medicaid certified home health agencies in Massachusetts received a survey instrument. Agencies were asked to select a random sample of 20 percent of their total number of clients discharged in fiscal year 1985, with a minimum of 100 and a maximum of 200 clients. The following data were extracted from each sampled clients' medical record: 1) Zip code of each clients' place of residence; 2) The type of visits provided to

TABLE 1

DEFINITIONS OF URBAN, URBANIZED AND RURAL AREAS *

1) URBAN AREAS - As defined in the 1980 census, the urban population is comprised of all persons living in urbanized areas and in places of 2,500 or more inhabitants outside urbanized areas.

A) URBANIZED AREAS - An urbanized area is comprised of an incorporated place and adjacent densely settled surrounding area that together have a minimum population of 50,000. Urbanized areas are sub-sets of urban areas. The densely settled surrounding area consists of:

a. Contiguous incorporated or census designated places having a population of 2,500 or more, or a population of fewer than 2,500 but having a population density of 1,000 persons per square mile, a closely settled area containing a minimum of 50% of the population, or a cluster of at least 100 housing units.

b. Contiguous unincorporated area which is connected by road and has a population density of at least 1,000 persons per sq. mile.

c. Other contiguous unincorporated area with a density of less than 1,000 persons per square mile, provided that it:

1. Eliminates an enclave of less than 5 square miles which is surrounded by built-up area.

2. Closes an indentation in the boundaries of the densely settled area that is no more than 1 mile across the open end and encompasses no more than 5 sq. miles.

3. Links an outlying area of qualifying density, provided that the outlying area is: 1) Connected by road to, and is not more than 1.5 miles from, the main body of the urbanized area. 2) Separated from the main body of the urbanized area by water or other undevelopable area, is connected by road to the main body of the urbanized area, and is not more than 5 miles from the main body of urbanized area.

d. Large concentrations of nonresidential urban area (such as industrial parks, office areas, and major airports), which have at least one-quarter of their boundaries contiguous to an urbanized area.

2) RURAL AREAS - All other places are designated as rural areas.

* Information obtained from 1980 Census of the Population, Volume 1, Characteristics of the Population, Chapter B, General Population Characteristics.

that client, e.g. physical therapy, skilled nursing; and, 3) The number of times that each type of visit was provided to each client during fiscal year 1985. Only reimbursable morbidity visits by salaried staff were included. Visits provided by home health aides and contracted staff were not included in the study as their rates are not based on a productivity standard.

Agencies provided additional descriptions of their service areas. These included recent changes in client population, expansions in service area, number of other agencies serving the same area, topography of service area, and presence of seasonal fluctuations in productivity.

Other Descriptors

a. Agency Size

The total number of nurse and physical therapy visits for each agency was taken from the Medicare Cost Report (HCFA 1728-80) for fiscal year ending 1985.

b. Region

Each agency was sorted into one of six Health Service Areas (HSA) based on the location of the agency.

C. ANALYSES

The impact of "rurality" on Home Health Agencies' productivity was examined in two ways. The first designates agencies as either urban or rural depending upon the composition of their primary service area. This is referred to as the "dichotomous analysis", as all agencies were classified as being in only one of two possible categories. The second approach considers "rurality" on a continuum, and is identified as the "continuum analysis". This approach compares each agency's productivity based upon its degree of "rurality". Many of the more descriptive variables provided on the questionnaire were included in a multi-variate regression analysis to determine their significance in explaining agency productivity. An additional analysis was also conducted to determine whether there was a difference in the average number of visits provided per patient per year between patients residing in urban and rural areas. All analyses were conducted using the SPSS-X Utility on an IBM3081.

1) Dichotomous Analysis: Agency Service Areas

We grouped the agencies into two distinct categories, urban and rural, based on their rurality scores. We conducted a sensitivity analysis, in which several hypotheses were tested, to identify the appropriate demarcation between the two categories.

In the first scenario, agencies were labeled rural if their service area was over 25% rural. In the second scenario, the demarcation point was 50% rural. A third scenario distinguished rural from urban agencies at the 75% rural level.

The above-described scenarios were examined for both nursing and physical therapy service areas. In each statistical analysis a two-sided T-test was performed to identify any significant differences between the mean productivity rates for urban versus rural agencies.

2) Continuum Analysis: Agency Service Areas

The second method of analysis considers the degree of rurality of the service area faced by each home health agency along a continuum. We attempted to identify any linear relationships which might exist between an agency's rurality score and its nursing and physical therapy productivity rates. For both nursing and physical therapy service areas, we performed a linear regression using productivity rates as the dependent variable and rurality scores as the independent variable.

3) Multi-variate Analysis

We performed a stepwise model multiple regression analysis to detect the influence of service area geographic characteristics on nursing and physical therapy productivity rates. The variables describing agency service area included: 1)major highways; 2)local roads; 3)hills; 4)snowbelt; 5)no public transportation; 6)traffic problems; 7)seasonal fluctuations in productivity; 8)expanded service area since 1982; and 9)the number of other agencies serving the same area. These factors were self-reported by the agencies and unverified.

A second stepwise regression was performed on nursing and physical therapy productivity rates using verifiable data as independent variables. These independent variables were: 1)rurality score of agency service areas; 2)number of nursing and physical therapy visits conducted during FY 1985; 3)the presence of other agencies serving the same area; and 4)the Health Service Area (HSA) in which the agency operates. This analysis was conducted a second time for nursing productivity by converting the visit volume variable into its logarithmic notation.

Each of the regressions described above was performed twice, once using the productivity rates as calculated in the regulation (using 218 days as the minimum number of days worked per year), and once with the actual number of days worked per year if it was less than 218.

4) Comparison of Urban and Rural Visit Frequency.

We tested the claim made by several home health providers that clients who reside in rural areas require more nurse visits per person than do those clients living in urban areas. Using linear regression as in the continuum analysis, we examined the relationship between the mean number of visits per client and nursing productivity rate. This analysis was conducted on a randomly selected sample of 18 agencies' (22%) service areas. The total number of nursing care visits in each zip code were compiled and then divided by the number of clients living in the area, yielding an average number of visits per client in each of the sampled Zip codes.

RESULTS

Response Rate

One productivity questionnaire including a client origin study was sent to each of the 131 freestanding Medicare-certified home health agencies in Massachusetts. Agencies had one month to complete the form and return it to the Rate Setting Commission. Follow-up telephone calls were made to agencies that had not returned their forms by the deadline.

Of the 131 questionnaires sent out, 101 responses were received, representing a 77.1% response rate. Of the 101 received, 81 questionnaires were included in the analysis. Twenty questionnaires were excluded for the following reasons: Eleven were from agencies that did not have a fiscal year 1985 productivity rate; Two were received from hospital-based home health agencies for whom the Rate Setting Commission does not set rates; Three questionnaires were completed incorrectly; Two were from agencies that had fewer than ten patients; Two were received too late to be included in the analysis.

Therefore, 61.8% of the total number of freestanding certified home health agencies in Massachusetts were included.

Analyses on therapy productivity excluded data reported on occupational or speech therapy visits, as only a small number of visits were conducted by staff therapists. Most agencies contract for these services, and would not have a productivity rate calculated for them by the Rate Setting Commission.

1) Dichotomous Analysis: Agency Service Areas

No statistically significant differences were found between the nursing productivity rates of "urban" and "rural" agencies regardless of where the cut-off point was drawn. In all three scenarios (25%, 50%, and 75% rural demarcation line), $p > .2$.

Physical therapy productivity was found to differ between urban and rural service areas. Of the 81 agencies included in the study, 36 were included in the physical therapy analysis. These agencies employed staff therapists and therefore were subject to the productivity standard in the calculation of their rates. We conducted several analyses using the two-sided T test to identify the boundaries of the significant difference between mean productivity in urban and rural agencies. These results appear in Table 2 below.

Table 2. Mean physical therapy productivity, urban and rural agencies.

<u>Cut-off Point</u> <u>(% Rural)</u>	<u>N</u> <u>Rural</u>	<u>N</u> <u>Urban</u>	<u>Rural</u> <u>Mean</u>	<u>Urban</u> <u>Mean</u>	<u>P</u> <u>Value</u>
5% rural	21	15	5.07	5.45	>.10
10%	14	22	4.79	5.52	<.05
25%	11	25	4.57	5.52	<.01
50%	7	29	4.52	5.41	<.01
72%	4	32	4.67	5.30	<.05
75%	3	33	4.61	5.29	>.10

Thus, a physical therapy service area with as few as 10% of its clients living in rural areas had a significantly lower productivity rate than more urban agency service areas.

2) Continuum Analysis: Agency Service Area

The regression analysis examining the relationship between nursing care service area and nursing productivity rates resulted in a slight negative correlation. However, correlation explained little of the variation in productivity factors with an r^2 of only .02.

A similar linear regression analyzing rurality of physical therapy service area against physical therapy productivity rate revealed a negative correlation. In this case, the r^2 value suggested that 16% of the variance was explained by the correlation.

3) Multi-variate Analysis

The multiple regression of nursing care productivity indicated that three of the self-reported variables affected productivity. Presence of other agencies serving the same area had a negative correlation, while the presence of major highways and hills had a positive correlation. The combination of these variables explained 24% of the variation in productivity. Rurality was not an explanatory variable in the stepwise analysis.

A stepwise regression of physical therapy found that the only factor affecting productivity was rurality. This variable explained over 13% of the variation in productivity.

A stepwise analysis of verifiable variables revealed that

the number of nurse care visits conducted annually by an agency had the greatest correlation with nursing productivity. This variable explained almost 8% of the variation. This analysis was repeated converting the volume variable into its logarithmic notation, which resulted in volume accounting for 33% of the variation in nursing productivity. When agency region (HSA) was included in the analysis, 36% of the nursing productivity variation was explained. Physical therapy volume was not correlated with physical therapy productivity ($r^2 < .02$).

Table 3 below describes the mean nurse care productivity rates by Health Service Area. The statewide mean was 4.97 visits per FTE per day.

Table 3. Nursing Productivity by HSA

HSA 1	Western Mass. (Berkshires)	5.91 NC visits/FTE/day
HSA 2	Central Mass.	4.77
HSA 3	Merrimac Valley	5.69
HSA 4	Boston	4.77
HSA 5	Southeastern Mass.	4.39
HSA 6	North Shore	5.42

4) Evaluation of 218-Day Work Year

In all of the above analyses, no differences appeared between calculations using productivity rates based on the actual number of days worked and those using 218 as a minimum number of days worked. Use of the 218 day minimum in the rate calculation formula still appears to be valid.

5) Comparison of Urban and Rural Visit Frequency

The linear regression examining the relationship between average number of nurse care visits per client and rurality of clients' Zip code revealed a very slight positive correlation. However the correlation explained little of the variation in the number of visits per client with an r^2 of .004.

6) Comparison of Respondants to Non-Respondants

We compared the distribution of nurse care and physical therapy productivity rates between agencies that completed the client origin study and those that did not. Respondants tended to have lower productivity in general than those that did not

complete the client origin study. These comparisons appear in Table 4 below.

Table 4. Comparison of Productivity:
Respondants versus Non-Respondants.

	Respondants	Non-Respondants
Nurse Care		
N	81	26
Mean	4.88	5.37
Median	4.96	5.08
Range	1.72 - 7.65	3.37 - 8.01
PT		
N	36	14
Mean	5.23	5.47
Median	5.13	5.34
Range	3.09 - 7.17	2.83 - 9.65

DISCUSSION

Our results indicate that efficiency of home health services should not be considered as a unitary concept. Rather, one must look at the efficiency of a particular type of home health service when setting standards or organizing agency operations. While the Massachusetts Rate Setting regulation currently treats skilled nursing and physical therapy identically, the two appear to be quite different.

A predominantly rural service area does not in itself affect the productivity of skilled nursing visits, while it does affect an agency's physical therapy productivity. One explanation for this difference is the nature of the disciplines. Physical therapy, being generally procedure-oriented, requires a fairly standard amount of visit time across patients with similar impairments. Thus, the length of a visit cannot be easily compressed in order to accommodate the rural physical therapist's travel needs. Further, many urban agencies use physical therapy aides to assist with the exercise regimens, while the supply of these paraprofessionals is very sparse in rural areas. Urban agencies may also have sufficient physical therapy visit volume to allow them to organize the service by geographic district. Rural agencies would not necessarily be in the same position.

Skilled nursing, on the other hand, varies in visit length to a much greater degree. A nurse who has miles to go before she sleeps can put off some treatment or patient education from one visit until another time without compromising the patient's nursing plan.

A heavily urban environment may also hinder the nurse's travel. Traffic or public transportation problems can cause delays. Inner-city clients may be difficult to reach at home or may require lengthier visits because of compound health problems associated with poverty.

A regional analysis of skilled nursing productivity across the six HSA regions of Massachusetts revealed that the Boston area, by far the most urban, ranked second to last while western Massachusetts, which encompasses a mixture of moderate-sized cities and rural mountain areas, had the highest productivity. Regions with small-to-medium-sized cities and large suburban areas generally produced the highest skilled nursing productivity. Extremely urban or rural, isolated areas showed the lowest productivity.

Unlike the fairly standardized discipline of physical therapy, skilled nursing appears to be subject to general principles of organizational efficiency. Management practices would therefore have a discernible influence on its productivity. Skilled nursing productivity was significantly correlated with

total agency nurse volume, although the trend tapered off after a certain level. The implications of this finding are underscored by the increasing number of mergers occurring among home health agencies which may not have provided sufficient volume to operate efficiently on their own.

In the present study we have examined geographic determinants of home health productivity. Our results suggest that organizational and management practices should be further examined as they relate to skilled nursing visits. In addition, rural agencies might want to examine how they could structure their physical therapy departments to maximize productivity within their environmental constraints. Third-party payors might also consider the implications of geographic variation in the determination of reimbursement policies.

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