



U.S. Department of Health and Human Services  
Assistant Secretary for Planning and Evaluation  
Office of Disability, Aging and Long-Term Care Policy



# **CHANGES IN MEDICARE HOME HEALTH AGENCY SUPPLY:**

## **1996-1999**

September 2003

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# **CHANGES IN MEDICARE HOME HEALTH AGENCY SUPPLY: 1996-1999**

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# TABLE OF CONTENTS

<b>I. INTRODUCTION</b> .....	1
<b>II. BACKGROUND</b> .....	2
<b>III. DATA AND METHODOLOGY</b> .....	4
Data Sources.....	4
Components of Medicare HHA Supply Changes.....	4
Requirements for Active Medicare Services.....	5
Classification of Medicare HHA Supply Changes.....	6
Variable Specification .....	7
<b>IV. EMPIRICAL RESULTS</b> .....	12
Components of Change in Medicare Beneficiaries Served 1996-1999 .....	12
Multivariate Analysis Results.....	12
<b>V. DISCUSSION</b> .....	16
<b>APPENDIX A. METHODOLOGY FOR CLASSIFYING HHA SERVICE AREA CHANGES</b> .....	18
Geographic Service Area Delineation.....	18
Zip Codes Added or Dropped from HHA Service Areas .....	18
Classification of HHA Service Area Changes .....	19
<b>REFERENCES</b> .....	21

# **LIST OF TABLES**

TABLE 1: Categories of Change in Medicare HHA Supply 1996-1999 with Selected Agency Attributes .....	23
TABLE 2: Variable Definitions and Descriptive Statistics.....	24
TABLE 3: Components of Change in Medicare Beneficiaries Served 1996-1999 .....	25
TABLE 4: Multinomial Logit Model Results for HHA Supply Decisions 1996-1999.....	26

# I. INTRODUCTION

Closure of many Medicare home health agencies (HHAs) following implementation of the interim payment system (IPS) mandated by the Balanced Budget Act (BBA) of 1997 was a concern of policy makers, stakeholders, and advocacy groups. The U.S. General Accounting Office (GAO) (1999) found that over the 18 months that followed implementation of the IPS in October 1997, 760 HHAs closed, either voluntarily or involuntarily, and only 45 HHAs entered the market nationwide. The Office of Inspector General (IOG) (2000) reported that the number of Medicare-certified HHAs decreased by 25 percent overall from 1997 to 1999.

Past studies of changes in the supply of Medicare HHAs after IPS implementation have employed data from the Medicare Online Survey, Certification, and Reporting (OSCAR) system to analyze (GAO 1999; OIG 2000). OSCAR system data are helpful in identifying agencies that either no longer participate at all in the Medicare program or which have merged with another Medicare-certified HHA. However, they do not contain information on a less obvious way that HHA supply can be reduced, namely, by “active” HHAs shrinking their geographic service areas. That is, rather than discontinuing all service to Medicare beneficiaries, an agency may opt to only discontinue service in a portion of its geographic service area, for example, by the closure of one or more of its branches or subunits. In addition, because the provider surveys entered into OSCAR are conducted in up to 18 month intervals, counts of certified agencies for any particular year may be inaccurate because of lags in reporting.

This paper expands upon previous research addressing the question of how supply of Medicare HHAs changed after implementation of the IPS in two important ways. First, Medicare HHA claims activity is used together with Medicare certification status from the OSCAR system to determine the Medicare service activity status of HHAs. Second, changes in the supply of Medicare home health care (HHC) is more broadly defined by considering not only agency closings, but also agencies that changed their geographic service areas following implementation of the IPS. Descriptive analyses provide some new insight about the magnitude of both of these sources of Medicare HHC supply change following implementation of the IPS. Multivariate analyses provide a deeper understanding of how HHAs’ responses to the IPS varied with respect to characteristics of agencies and the geographic markets they served.

## **II. BACKGROUND**

Beginning in the late 1980s, spending on Medicare's home health benefit grew rapidly. Between 1988 and 1997, spending increased an average of 28.2 percent annually, from \$1.9 billion to \$17.8 billion (GAO 1999; Health Care Financing Administration 1998). This growth has been attributed primarily to a loosening of eligibility and coverage criteria in 1989 in response to a class action suit involving inconsistent interpretations of these criteria by Medicare fiscal intermediaries (Bishop, Kerwin & Wollack 1999; McCall, Komisar, Petersons & Moore 2001; GAO 1998), as well as some states' Medicare maximization policies that took advantage of more liberal Medicare guidelines to cover some of the costs associated with long-term care (LTC) for beneficiaries eligible for both Medicare and Medicaid (GAO 1998).

The BBA of 1997 required the Health Care Financing Administration (HCFA, now the Centers for Medicare and Medicaid Services, hereafter referred to as CMS) to replace its cost-based reimbursement systems to prospective payment systems (PPS) in many settings, including hospital outpatient departments, skilled nursing facilities, HHAs, inpatient rehabilitation facilities and LTC hospitals (Medicare Payment Advisory Commission 2000). The reimbursement changes of the BBA were intended to slow spending growth and provide incentives to providers in these settings to deliver care more efficiently. For HHAs, the BBA sought to impose limits on spending per beneficiary and per visit (National Health Policy Forum 1999).

Recognizing that the development of a PPS for HHAs would take considerable time, CMS created an IPS to affect a more immediate slowing of expenditure growth. CMS began phasing in the IPS as early as October 1997 depending upon an HHA's cost reporting year, with original expectations that the PPS would be fully implemented by October 1999 (later delayed until October 1, 2000). Under the IPS, HHAs continued to be reimbursed according to their costs, but these costs were subject to two cost limits in the aggregate: an area-specific per-visit ceiling that was more stringent than pre-IPS reimbursement, and an annual maximum HHA payment limit that considered the total number of beneficiaries served using an annual maximum per-beneficiary amount.

A dramatic contraction in Medicare home health expenditures was observed following implementation of the IPS. Whereas Medicare expenditures per home health fee-for-service user increased by an average annual rate of about 22 percent from 1992-1997, they decreased by an average annual rate of about -27 percent between fiscal years 1997 and 1999 (MedPAC 2000). According to McCall, Kosimar, Petersons & Moore (2001), total spending decreased over 50 percent (from around \$16.4 billion to around \$7.8 billion), total per-beneficiary spending decreased 50 percent (from around \$500 to around \$248), and annual per-user spending decreased 37 percent (from around \$4,969 to around \$3,110). Likewise, the total number of visits per-user decreased around 41 percent. Payments per-visit increased over this period by 7 percent (from around \$63.00 to around \$67.40).

In their 1998 report, the GAO described the impact of the IPS in terms of agency closures. In sum, the GAO (1998) indicated that there were more HHAs in August 1998 than there were in October 1996, and that recent closures were dwarfed by longer-run industry growth. Since the implementation of the IPS in October 1997 through June 1998, 554 HHAs closed voluntarily nationwide, with an additional 206 closing involuntarily due primarily to a failure to meet minimum quality or financial standards. During the same period, only 45 HHAs entered the market nationwide. An OIG (2000) report indicated that the number of HHAs decreased by 25 percent overall from 1997 to 1999.

For the three years prior to the implementation of the IPS, an annual average of 285 HHAs closed voluntarily and 62 closed involuntarily (during the same three-year period, an average of 1,227 HHAs opened each year). Half of these closures were concentrated in four states; California, Louisiana, Oklahoma and Texas. Moreover, HHAs that closed voluntarily were more likely to be smaller (treating an average of 166 beneficiaries compared with 385 beneficiaries for HHAs that remained open) and provided more treatments per beneficiary (averaging over 90 visits per beneficiary compared to about 65 for HHAs that remained open). These factors may suggest that less efficient HHAs were less able to accommodate the changes to their reimbursement (GAO 1998), but much in the literature suggests that providers that focus on meeting the needs of more complex, higher cost beneficiaries are more likely to be negatively impacted by the reimbursement limits and blended rates of the IPS (GAO 1998; National Health Policy Forum 1999; Bishop, Kerwin & Wallack 1999).

An important distinction between *agency* closures and *agency branch* closures is made in the GAO (1998) report. Under Medicare rules, HHA branches are not considered independent providers. Rather, they are part and parcel of the parent agency. As such, branches do not receive unique provider certification, are not individually surveyed or certified for Medicare compliance, and are not required to file a unique Medicare cost report. In general, it was often financially advantageous for a branch to operate under a parent agency that had more attractive reimbursement as a result of their urban locale and higher wage index, while the branch provided services in an area with a lower wage index. This distinction was reiterated after reports from the home health industry about agency closures were substantially higher than those calculated by the GAO.

## **III. DATA AND METHODOLOGY**

### **Data Sources**

Multiple data sources were employed in the study. Medicare HHC claims data for the calendar years 1996 and 1999 were used to determine the activity status of HHAs and to delineate their geographic service areas. The year 1996 is the latest full calendar year preceding implementation of the IPS on October 1, 1997. The year 1999 was the most recent full calendar year of claims data available at the start of the study. It precedes the implementation of the Medicare HHC PPS that occurred in October 2000. Medicare Provider of Service (POS) files for 1996 and 1999, derived from the OSCAR system, contained information on Medicare certification status and several organizational attributes of agencies. Medicare Denominator file (MDF) data from 1996 were aggregated to produce measures of the total Medicare beneficiary population residing in geographic health service market areas (HSMAs). Finally, county-level data from the 2000 Area Resource File (ARF) on hospitals and nursing homes were used to specify various indicators reflecting the supply of LTC services for the multivariate analysis.

### **Components of Medicare HHA Supply Changes**

Although complete market exit and market entry by HHAs via changes in Medicare certification status clearly represent changes in Medicare HHA provider supply, these are not the only ways in which Medicare HHA supply changes can occur. While still retaining their Medicare certification, some HHAs may decrease Medicare HHA supply by contracting their geographic service area and visit volume, perhaps through the closure of branches or subunits. Other certified HHAs may increase Medicare HHA supply by adding staff to serve additional beneficiaries in an expanded geographic service area.

Medicare HHA supply changes, as reflected by increased or decreased visit capacity, can also occur in the absence of agency closures or any changes in HHAs' geographic service areas. However, there is an important fundamental geographic basis underlying policy concerns about the many HHA closures that followed implementation of the IPS. When Medicare HHA supply reductions occur via agency closure (or geographic service area contraction), the potential adverse impacts on beneficiary access are spatially concentrated in geographic areas where service is discontinued. Given the geographic basis of HHC service delivery, travel costs naturally limit the geographic extent of HHA service areas, which in turn, may limit the number of agencies able to expand service to affected areas. Potential access problems may be of particular concern in places where Medicare beneficiaries are served by a handful of HHAs. If the Medicare HHA supply reductions that followed the IPS resulted from proportional reductions in staffing and service capacity among all Medicare-certified

HHAs, it is doubtful that there would be a similar level of policy concern about potential access problems.

In this study Medicare HHA supply changes are broadly defined to encompass not only market exits and entries, but also significant changes in agencies' geographic service areas. When an HHA fully exits the Medicare home health market, the agency discontinues service to *all* Medicare beneficiaries in the service area it previously served. Similarly, when an HHA is a new market entrant, service is initiated to *all* Medicare beneficiaries in the new geographic service area where the agency willingly provides visits. Under this line of reasoning, HHAs which exhibit significant contractions or expansions of their geographic service areas can be viewed as *partial market exits* or *partial market entries* in the sense that service is discontinued to or added for some, but not all beneficiaries.

## **Requirements for Active Medicare Service**

Measuring HHA supply changes in ways other than Medicare certification status requires consideration of what level of service to Medicare beneficiaries is necessary for an HHA to be actively serving Medicare beneficiaries. Although a reliable measure of Medicare certification would certainly seem to be a necessary condition for active Medicare service, it may not be sufficient for practical measurement of HHA supply changes. National Medicare HHA claims data for 1996 and 1999 reveal that a small but significant number of Medicare-certified HHAs actually serve very few Medicare beneficiaries annually. For example, 559 HHAs, amounting to 5.7 percent of the 9,806 HHAs with at least one Medicare visit claim in 1996, served ten or fewer different beneficiaries in 1996. The market behavior of HHAs serving so few patients is unlikely to have much practical significance for measuring HHA supply change. As part of the changes in Medicare participation rules made in 1997 designed to screen out problem providers, agencies were required to serve at least ten patients before seeking Medicare certification (GAO 1999). While these rules could be used as a basis for defining active Medicare service, there are practical difficulties in measuring geographic service area changes for HHAs serving so few beneficiaries. As any assumed minimum beneficiary threshold will be arbitrary, active service to Medicare beneficiaries is conservatively defined in this study to be the provision of visits to more than 20 different beneficiaries annually. There were 958 HHAs, which accounted for 0.22 percent of total Medicare HHA visits in 1996, considered to be inactive in 1996 under this definition. Among these 958 HHAs, 208 of them were certified but also inactive in 1999, and 434 of them were no longer Medicare-certified in 1999. There were also 211 HHAs that obtained Medicare certification after 1996 but did not meet the minimum beneficiary service threshold in 1999. These latter 853 HHAs that did not actively serve Medicare beneficiaries in either 1996 and/or 1999 under the assumed threshold were excluded from the study, leaving 10,034 HHAs that met the active Medicare service requirement in 1996 and/or 1999.

## Classification of Medicare HHA Supply Changes

A methodology was developed to classify HHAs that actively served Medicare beneficiaries in at least one of the years 1996 or 1999 into one of six mutually exclusive categories:

1. HHA market exit: This category includes HHAs that actively served more than 20 beneficiaries in 1996 with *no Medicare claims* in 1999.
2. HHA service area contraction : This category includes: (1) HHAs that actively served more than 20 beneficiaries in both 1996 and 1999 and contracted their geographic service area between 1996 and 1999; and (2) HHAs with Medicare claims in both 1996 and 1999 that actively served more than 20 beneficiaries only in 1996.
3. HHA service area expansion: This category includes: (1) HHAs that actively served more than 20 beneficiaries in both 1996 and 1999 and expanded their geographic service area between 1996 and 1999; and (2) HHAs with Medicare claims in both 1996 and 1999 that actively served more than 20 beneficiaries only in 1999.
4. HHA service area change: This category includes HHAs that actively served more than 20 beneficiaries in both 1996 and 1999 whose geographic service area changed between 1996 and 1996 due to both discontinued service in some areas and expansion of service to others.
5. HHA service area stable: This category includes HHAs that actively served more than 20 beneficiaries in both 1996 and 1999 whose geographic service area was relatively stable between 1996 and 1999.
6. HHA new market entrant: This category includes HHAs that actively served 20 or more beneficiaries in 1999 with *no Medicare claims* in 1996.

A summary of the methodology employed to classify HHA geographic service area changes as expanding, contracting, stable, or changed, is contained in the Appendix.

Table 1 contains information about the distribution of 10,034 HHAs that actively served Medicare beneficiaries in either 1996 or 1999 or both years among the six Medicare HHA supply change categories defined above. The relatively conservative criteria used to classify HHAs as expanding or contracting their service areas have produced a set of HHA classifications exhibiting a high degree of face validity. Among HHAs classified as contracting their service areas, about 36.3 percent of total beneficiaries served in 1996 lived in zip codes that were subsequently dropped from these HHAs' geographic service areas. Only 3.2 percent of beneficiaries served in 1999 by HHAs in this group lived in zip codes that were newly served in 1999. A reciprocal pattern to this one is found for HHAs classified as expanding their geographic service

areas. Whereas only 2.5 percent of beneficiaries served by these HHAs in 1996 lived in zip codes that were later dropped from an HHA's service area, 39.2 percent of beneficiaries served in 1999 lived in zip codes that were not previously served by these HHAs in 1996. Among HHAs classified as having stable geographic service areas, only 3.2 percent of beneficiaries served in 1996 and 4.1 percent of beneficiaries served in 1999 lived in zip codes that were dropped and added to these HHAs' service areas between 1996 and 1999, respectively. A relatively small number of HHAs, accounting for only 3.7 percent of active HHAs in 1996, could not be classified as either expanding or contracting their service areas under the classification criteria employed. As expected, a relatively high percentage of beneficiaries served by these HHAs in 1996 and 1999, respectively, lived in zip codes that were dropped (18.5 percent) or added between 1996 and 1999.

Table 1 also contains information about distance traveled to beneficiaries served by HHAs in 1996 and 1999. Mean distance traveled to beneficiaries in their service areas among HHAs that contracted their service areas declined by about three miles between 1996 and 1999, presumably as a consequence of a tendency to discontinue service in more distant than closer zip codes.<sup>1</sup> On the other hand, the mean distance traveled to beneficiaries in their service areas among HHAs that expanded their service areas increased by about 4.3 miles, presumably as a consequence of a tendency to add service in more distant than closer zip codes. In stark contrast to these two groups of HHAs, there was very little if any change in mean travel distance to beneficiaries in the service areas of HHAs with stable geographic service areas.

Table 1 shows similar differences among categories in the data on changes in staffing levels for registered nurses (RNs) and certified nurse aides (CNAs). The decrease in mean RN and CNA staffing among HHAs with stable service areas reflects broader overall trends of supply contraction in the HHA industry following the IPS. Nevertheless, the data suggest that on average HHAs that were classified as contracting their service areas exhibited larger percentage decreases in staffing, particularly for RNs. The mean staffing level changes among HHAs classified as expanding their geographic service areas are sharply different from all other categories of HHAs. On average HHAs that expanded their service areas exhibited RN and CNA staffing levels in 1999 that were 83 percent and 23 percent *higher* than those in 1996, respectively. Overall these supporting data also suggest of a high degree of construct validity in the HHA response classifications.

## Variable Specification

Multivariate analyses were performed to identify agency and market area attributes associated with the categorization of HHA supply changes described above. Table 2 contains a summary of definitions for all specified independent variables. Here we

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<sup>1</sup> Mean distance traveled to beneficiaries in their service areas for each year was computed as a beneficiary-weighted average of the straight-line distance between the centroids of the zip code of the HHA contained in Medicare POS file data and the centroids of zip codes contained in an HHA's service area.

discuss the rationale for specification of these variables and their expected relationships with the outcome variable, or the likelihood that HHAs responded to the IPS through market exit, service area expansion, service area contraction, or a changed service area, relative to maintaining a stable geographic service area. Given our premise that the motivations for service area contraction and expansion are similar to the more extreme respective responses of market exit and entry, generally it is expected that most independent variables should have the same directional influence on these two outcomes. Weaker relationships are expected for service area contraction outcome relative to market exit, however. Expectations about the signs of variables with respect to the outcome of changed service areas are uncertain given the mixed nature of this form of supply response.

### Agency Attributes

Dummy variables were specified for variables measuring the ownership status, organizational setting, and organizational structure of HHAs. GAO (1999) found that for-profit HHAs were disproportionately over-represented among market exits relative to government and voluntary not-for-profit agencies. In addition to a dummy variable distinguishing proprietary HHAs a separate dummy variable was specified for HHAs with government control. Voluntary not-for-profit control served as the reference class. Given the broader service missions that are likely to influence the behavior of not-for-profit agencies, for-profit HHAs are expected to be more likely than their voluntary not-for-profit counterparts to exit and to contract their service areas, and less likely to expand their service areas. As government HHAs may be less dependent on Medicare revenue than are voluntary not-for-profit agencies, government HHAs are expected to be less likely to exit and contract their service areas than not-for-profit HHAs.

Expectations about differences service area expansion among HHAs with different control status are uncertain. To the extent that many service area expansions reflect an agency responding to service demands of beneficiaries in places affected by closures and/or service area contractions, government HHAs may be less likely than voluntary not-for-profit agencies to fill those needs given their service missions. A dummy variable was specified to distinguish HHAs based in hospitals or nursing facilities from freestanding agencies. Such facility-based agencies should be less dependent on Medicare HHC revenues than freestanding agencies since they also receive patient revenue for institutional care. More modest market responses are expected for facility-based agencies (i.e., less likely to contract or expand their service areas, and to exit) than freestanding agencies.

A count variable was specified as the number of subunits and/or branches operated by an agency in 1996 to distinguish HHAs whose market response to the IPS may have been influenced by changes in Medicare participation rules in 1997. GAO (1999) noted that prior to 1997 it was common for a parent HHA to set up branches or semi-autonomous subunits for delivery of services. While a parent HHA may maintain some administrative control over a subunit, subunits are required to independently meet Medicare certification requirements and are supposed to serve patients in a different

geographic area than the parent organization. On the other hand branches are not autonomous organizations and are not required to independently meet certification requirements from the parent organization. Changes in Medicare participation rules implemented in 1997 clarified the rules that branches had to be located sufficiently close to the parent organization (about ½-1 hour driving time) so that the parent organization could effectively manage the operation and service delivery without independent Medicare certification (GAO 1999). As a consequence of these changes in Medicare participation rules, HHAs operating subunits and/or branches in 1996 are expected to be more likely than their counterparts without such an organizational structure to exit and contract their geographic service areas. The expected effect of subunits and branches on service area expansion is uncertain. While Medicare participation rule changes might be expected to have a negative effect on service area expansion, the infrastructure of closed branches may facilitate an agency's ability to expand its service area under its parent agency.

GAO (1999) found that HHAs with less than five years of Medicare program tenure were disproportionately over-represented among closed agencies. As HHAs of longer Medicare program tenure should be more likely to have been able to achieve administrative and operational efficiencies compared to HHAs of shorter tenure, agencies with longer tenure should be less likely to contract their service area or exit the market. In addition, a separate dummy variable to distinguish agencies with Medicare certification dates after the start of the 1994 fiscal year. In contrast to established agencies whose per-beneficiary payment limits under the IPS were largely based on their own historical program experience, per-beneficiary payment limits for HHAs without a full year of program experience in fiscal year 1994 were fully based on the national median for established agencies. If recent market entrants tend to have per-beneficiary costs lower than established HHAs nationally, they should be less likely to exit or contract their service area, and more likely to expand their service area than established HHAs. On the other hand, national limits based on established HHAs should adversely affect recent market entrants with higher per-beneficiary costs.

The remaining two agency variables represent attributes associated with Medicare service delivery. Total beneficiaries served in 1996 was specified as an indicator of the scale of Medicare service provision by the HHA. GAO (1999) found that smaller HHAs serving fewer Medicare beneficiaries were disproportionately over-represented among closed agencies. HHAs serving larger volumes of beneficiaries annually should be less constrained by per-beneficiary limits imposed by the IPS because per-beneficiary costs will be affected as much by a relatively small number of high cost patients. The expected effect of total beneficiaries served on the likelihood of service area expansion is uncertain. The IPS did not provide any positive incentives for expansion by larger HHAs. The last agency attribute, average visits per beneficiary served in 1996, was specified as an indicator of the intensity of visits provided by HHAs to patients. While it is not equivalent to an agency's per-beneficiary costs, it should be fairly highly correlated with it. Since an agency's per-beneficiary limit was partially based on its own historical cost experience and partially based on the median values of HHAs in its region, per-beneficiary limits imposed with the IPS were more stringent for HHAs with

higher costs per beneficiary served. Accordingly, HHAs that provided more visits per beneficiary served in 1996 should be more likely to exit and contract their service areas, and less likely to expand their service areas.

### Market Area Attributes

Two variables were specified as indicators of the level of Medicare HHC demand from residents of the market area of each HHA using the county-based HSMA developed by Makuc, Haglund, Ingram, Kleinman & Feldman (1991) as the geographic units.<sup>2</sup> Since Medicare beneficiaries aged 75 years and older exhibit much higher Medicare HHC utilization rates than younger beneficiaries, market area Medicare HHC demand attributes were measured with data on this subset of the aged Medicare population. The size of an HHA's Medicare HHC market was specified as the number of Medicare beneficiaries aged 75 years and older in the HSMA within an HHA's service area in 1996. Since travel costs should impede the delivery of HHC visits to distant patients, a demand density variable was specified to distinguish rural and urban HSMA. The density of Medicare HHC market demand was specified as Medicare beneficiaries aged 75 year or older in 1996 per square mile for HSMA within an HHA's service area.<sup>3</sup> In general, HHAs providing visits in market areas with greater Medicare HHC demand should be less likely to exit and contract their service areas, and more likely to expand their service areas.

The presence of other competitor HHAs serving beneficiaries in the same market area is likely to affect supply responses by individual agencies. A count of active HHAs with service areas within the HSMA served by an HHA in 1996 was specified as an indicator of competitive market structure and potential over-supply of Medicare HHC capacity. HHAs serving patients in market areas with more competitors should be more likely to exit or contract their service areas in response to the IPS than HHAs serving in market areas with lesser Medicare HHC supply. The effect of competitor agencies on the likelihood of expansion is uncertain. To the extent that more competitors reflects over-supply more than competition, having more competitor agencies should have a negative effect on the likelihood of service area expansion. An HHA's market share of total Medicare beneficiaries receiving visits in 1996 within the HSMA it serves was specified as an additional separate indicator of the HHA's competitive position *relative* to other agencies serving patients in the same market area. An HHA with a relatively small market share may behave differently than an otherwise similar one with a relatively large share in the same market area. HHAs with relatively larger market

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<sup>2</sup> Makuc, et al. (1991) created HSMA with Medicare hospital patient origin data by aggregating together one or more counties in such a way that the resultant geographic areas were relatively "self-contained" in the sense that relatively few local beneficiaries were hospitalized outside the HSMA and local hospitals served relative few beneficiaries who were not residents of the HSMA. Our computed 1996 HHA service area data suggest that HSMA are relatively self-contained with respect to Medicare HHC as well. In 1996, more than 75 percent of HHAs had service areas where more than 90 percent of patients lived in the same HSMA as the agency site as reported in Medicare OSCAR data.

<sup>3</sup> Although, on average more than 90 percent of the patients in an HHA's service area were residents of the same HSMA in which the agency was sited, these variables were constructed as weighted averages of HSMA data for HHAs that served beneficiaries from more than one HSMA.

shares should be more able to maintain stable geographic service areas given their dominant market presence. On the other hand, the effect of a smaller market share on market response is less clear. While contraction by HHAs with smaller market shares may make them vulnerable to a greater risk of exit, such HHAs may also respond strategically by expanding service in areas where service was discontinued by other agencies.

To the extent that their service are substitutable for Medicare HHC visits, other sources of post-acute care (PAC) and LTC supply in an HHA's market area, such as nursing homes, chronic disease hospitals, and LTC hospitals may also influence individual HHA supply decisions. Two variables were specified as indicators of other sources of PAC and LTC supply: nursing home beds per resident beneficiary 75 years and older and the count of LTC and chronic disease hospitals in the HSMA served by an HHA. HHAs serving patients in market areas with greater supplies of other PAC and LTC resources should be more likely to exit and contract their service area, and less likely to expand their service areas.

Finally, GAO (1999) found that closed HHAs were disproportionately over-represented in southwestern states of Texas, Oklahoma, and Louisiana. Although a fairly large set of agency and market area variables were specified as factors likely to influence individual HHA supply decisions, some important factors may remain unspecified. Eight regional dummy variables corresponding to Census Divisions as defined by the U.S. Bureau of the Census were specified to capture unspecified residual influences associated with regional location.

## **IV. EMPIRICAL RESULTS**

### **Components of Change in Medicare Beneficiaries Served 1996-1999**

Table 3 contains information about changes in the volume of beneficiaries served for each category of HHAs, and gives some indication of the relative net contributions of market exits, service area contractions and expansions, and market entry to the 25 percent net national decline in Medicare beneficiaries served by active HHAs, a decline from 3,994,963 beneficiaries served in 1996 to 2,995,812 served in 1999. HHAs that closed after 1996 served more than 558,000 beneficiaries in 1996 that they no longer served in 1999, a substantial amount relative to the net decrease of nearly one million Medicare beneficiaries served by HHAs in 1999 relative to 1996. However, HHA exits are only one of several sources that contributed to this overall net decline. HHAs which significantly contracted their geographic service areas served more than 244,000 fewer beneficiaries overall in 1999 relative to 1996. A little more than half of this net decrease was associated with discontinued service in the dropped portions of their 1996 geographic service areas. Note also that HHAs with stable geographic service areas served more than one-half million fewer beneficiaries in 1999 than 1996, an amount nearly as large as the volume of beneficiaries served by exiting HHAs. Finally, the data also show that a sizable minority of HHAs expanded Medicare HHA via expansion of their geographic service areas. HHAs expanding their geographic service areas served nearly 195,000 more beneficiaries in 1999 than 1996. While roughly three-fourths of this net increase was attributable to service in expanded portions of their geographic service areas, there was also a net increase of nearly 56,000 beneficiaries served in portions of their service areas that were already served in 1996. It is also notable that the net increase in beneficiaries served by HHAs expanding their geographic service areas was actually larger than the nearly 132,000 beneficiaries served by new market entrant HHAs in 1999.

Previous studies have focused nearly exclusively on the high number of agency closures that occurred after implementation of the IPS (GAO 1999; OIG 2000). However, decomposing the overall change in the volume of Medicare beneficiaries served between 1996 and 1999 into multiple sources suggests a more complex picture of HHA supply response to the IPS than has been commonly portrayed in other studies. While more modest than that associated with closures and new market entry, the supply changes associated service area contractions and expansions by active HHAs were not trivial by any means. Our multivariate analysis results impart some additional insight about the factors influencing individual HHA supply decisions after implementation of the IPS.

### **Multivariate Analysis Results**

Table 4 contains empirical results from a multinomial logit model that was fitted on the supply decisions of 9,061 active HHAs in 1996. Odds ratio transformations of the

estimated parameters are reported to facilitate interpretation of the results. Since five alternative supply decision outcomes were specified, there are four sets of estimated coefficients for each independent variable specified in the model. Each of the four odds ratio estimates is interpreted with respect to the common reference outcome of “stable service area.” Conventional tests of multicollinearity and other sensitivity analyses of the model specification suggested that the estimated model parameters were robust.

### Agency Attributes

Most of the ownership status and organizational variables were significantly associated with HHAs’ supply decisions with signs consistent with expectations. For-profit HHAs were more likely to have contracted their service area (OR=1.85), changed their service area (OR=2.31, or exited the market (OR=1.60) than to have maintained a stable geographic service area relative to otherwise similar voluntary not-for-profit agencies. The odds of market exit over a stable service area were about 60 percent higher among for-profit agencies relative to their not-for-profit counterparts. While government-owned HHAs were also less likely to close than voluntary not-for-profit agencies (OR=0.46), in contrast to for-profit HHAs, the odds of service area expansion over a stable market area were about 59 percent lower among government-owned HHAs relative to voluntary not-for-profits. Facility-based agencies were very unlikely to exhibit changes of any type in their service areas. For example, the estimated parameters suggest that odds of contracting and expanding their service areas rather than maintaining a stable service area were about 56 percent and 63 percent lower, respectively, among facility-based HHAs relative to their freestanding agency counterparts.

HHAs with geographically dispersed organizational structures with branches and/or subunits in 1996 were more likely to either have contracted (OR=1.18) or changed (1.09) their service area, or to close altogether (OR=1.12), than their counterparts without branches or subunits. The odds of service area contraction were particularly high among HHAs with multiple branches and/or subunits. For example, the expected odds of service area contraction over a stable service area are suggested to increase by about 18 percent for each additional branch and/or subunit of the parent organization in 1996.

The effects of Medicare program tenure on HHA supply response were varied. Very recent market entrant HHAs were both more likely to close (OR=1.56) and to expand (OR=2.49) their service areas than agencies that were Medicare-certified before October 1993. For, example, the odds of expanding rather than maintaining a stable service area between 1996 and 1999 were about 2.5 times higher among very recent market entrants relative to otherwise similar HHAs with longer Medicare program tenures. This was contrary to expectations, and may reflect pressure on upstart HHAs’ to offset the arguably higher costs associated with initiating their business and avoid a likely large financial loss via exiting the market right away. Aside from these recent market entrant effects, additional years of Medicare program tenure were generally associated with decreased odds of both service area contraction and expansion, but not

market exit. For each additional year of certification, the odds of both service area contraction and expansion over a stable service area are decreased by about 2 percent.

HHAs serving greater volumes of Medicare beneficiaries in 1996 were more likely to maintain stable service areas than smaller agencies. The odds of an HHA contracting or changing its service area, or closing altogether over maintaining a stable service area are suggested to decrease by roughly 3-5 percent for each 100 additional beneficiaries served in 1996. Agencies serving larger volumes of Medicare beneficiaries were also much less likely to expand their service areas. The odds of service area expansion over maintaining a stable service area are suggested to decrease by almost 12 percent for each 100 additional beneficiaries served in 1996.

Finally, the per-beneficiary limits imposed on HHAs under the IPS appear to have influenced HHA supply decisions in the manner expected. HHAs with more visit intensive practice styles were at greater risk of closure and service area contraction, and were less likely to expand their service area, than agencies providing fewer average visits per beneficiary in 1996. The odds of service area contraction and closure over maintaining a stable service area are both suggested to increase by roughly 2 percent, and the odds of service area expansion to decrease by almost 5 percent for every ten visits higher was an agency's average annual visits per beneficiary served in 1996.

### Market Area Attributes

HHA supply decisions following the IPS appear to have been modestly influenced by the size and density of Medicare market HHC demand. An HHA's odds of service area contraction and closure over maintaining a stable service area decreased by almost 2 percent for each additional 10,000 Medicare beneficiaries residing in their HSMA. The risks of contraction and closure were unrelated to the spatial density of Medicare service demand. However, the expected odds of an HHA expanding over maintaining a stable service area are suggested to have increased by nearly 8 percent for each additional 100 Medicare beneficiaries aged 75 years or more per square mile in their HSMA.

An HHA's risks of closure and service area changes of all types were all influenced not only by the market presence of competitor HHAs in their HSMA, but also by their relative competitive standing as reflected by their market share of beneficiaries served. The estimated parameters for the variable active Medicare HHAs suggest that the odds of an HHA contracting its service area, expanding it, or closing altogether, over maintaining a stable service area roughly increased between 3-5 percent for each ten HHAs serving beneficiaries in the same HSMA in 1996. A uniform pattern of odds ratios less than one for the beneficiary market share variable suggests that HHAs serving greater market shares of Medicare beneficiaries in 1996 were most likely to maintain a stable geographic service area over the next three years. For example, the odds of service area contraction, expansion, or closure over maintaining a stable service area, are estimated to be about 5-8 percent lower for each additional percentage point higher

was an agency's 1996 share of Medicare beneficiaries served in their market area. Interestingly, the results suggest that the odds of service area expansion, service area contraction, and closure outcomes are all similarly influenced by changes in factors reflecting aspects of market competition. While one can only speculate without further analysis, this finding could be the result of some agencies expanding their service areas to meet the needs of beneficiaries previously served by agencies that contracted their service areas or closed.

Mixed empirical results were found regarding the influence of the supply of other PAC and LTC resources on HHA supply decisions. Consistent with expectations, HHAs in market areas with more LTC and chronic disease hospitals are suggested to be at greater risk of closure (OR=1.26) and a changed service area (OR=1.39) than otherwise similar agencies in market areas with fewer facilities. In contrast, HHAs in market areas with greater nursing home bed supply are suggested to have lower odds of contracting their service areas (OR=0.97).

Lastly, several census division regional dummy variables were significant suggesting there were some regional factors beyond those specified in the model that influenced HHA supply decisions. The expected odds of closure over a stable service area are suggested to be more than two times higher among HHAs located in either the Mountain or Pacific census divisions relative to otherwise similar agencies in the New England census division. Given the large magnitude of these regional differences, it is interesting that the closure outcome dummy variable corresponding to the West South Central division (containing Arkansas, Louisiana, Oklahoma, and Texas) was insignificant. In light of earlier GAO (1999) findings that the bulk of HHA closures occurred in Louisiana, Oklahoma, and Texas. On the other hand HHAs located in the South Atlantic (OR=1.73), East South Central (2.83), and West South Central (OR=1.85) census divisions were much more likely to expand their service area relative to otherwise similar agencies in the New England census division. This would suggest that the most important factors associated with closures in those states have been specified in the multinomial logit model.

## **V. DISCUSSION**

In this study we have employed Medicare HHC claims data and a broader definition of HHA supply changes than simply closure to investigate factors associated with HHA supply response to implementation of the IPS in 1997. Similar to past research, our empirical investigation of HHA supply changes following the IPS portrays an HHA industry with serious declines in supply. In contrast to earlier studies, however, our analyses indicate that the surge of HHA closures between 1997 and 1999 that have received so much attention do not fully reflect the magnitude of HHA supply response to the IPS. An examination of changes in geographic patterns of service to Medicare beneficiaries among HHAs actively serving Medicare beneficiaries in the years following the IPS reveals substantial dynamics in local HHA supply that rival the magnitude of supply changes associated with agency closures. Given the relative magnitudes of HHA supply changes associated with geographic service area contraction and expansion found in this study, further analysis is warranted regarding the spatial distribution of these service area changes to better understand their potential impacts on access.

It is important to assess the degree to which HHA supply reductions associated with service area contraction occurred in the same or different market areas as closures. If HHA service area contractions largely occurred in the same geographic market areas as closures, agency closures may understate the potential for access problems. On the other hand, if HHA service area contraction largely occurred in different geographic markets from markets with high agency closures, potential beneficiary access problems may be more difficult to identify by simple comparisons of rates of change in Medicare HHC utilization changes in markets with and without high prevalence of agency closures. Similarly, it is important to assess the degree to which the geographic distribution of HHA service area expansions and new HHA market entrants coincided so as to have offsetting effects on potential access problems.

General findings from our multivariate empirical analysis of individual HHA supply decisions suggest that the geographic distributions of HHA service area contractions and closures may coincide. This analysis suggests that HHA service area contractions were largely associated with the same factors as agency closures. HHAs that closed or contracted their service areas both tended to be freestanding, for-profit agencies, with subunits or branches, with relatively fewer years of Medicare program tenure. The per-beneficiary limits imposed by the IPS were more likely to adversely affect agencies that served smaller volumes of beneficiaries with relatively higher costs per beneficiary. Agencies that closed or contracted their geographic service areas both generally served fewer Medicare beneficiaries but provided more visits per beneficiary served than other HHAs that maintained or expanded their geographic service areas after the IPS. Finally, HHAs that closed or contracted their service areas both tended to serve relatively small shares of the total volume of Medicare beneficiaries served in more competitive geographic markets served by many other agencies.

Our multivariate empirical findings hint that the geographic distribution of HHA service area expansions may also coincide with those of closures and service area contractions. HHAs that expanded their service areas tended to be smaller, freestanding agencies under voluntary not-for-profit ownership, that acquired Medicare-certified within a couple of years of IPS implementation. Similar to HHAs which contracted their service areas or closed, HHAs that expanded their service areas tended to serve relatively small market shares of beneficiaries in more competitive geographic market areas served by many other HHAs. They differed from contracting and closed agencies, however, in that they were likely to have been constrained by per-beneficiary cost limits since on average, they provided relatively fewer visits per beneficiary served in 1996. The overall pattern of empirical results suggests that many of these HHAs may have expanded their service area in places previously served by HHAs that contracted supply.

This study has produced a more comprehensive picture of the magnitude and complexity of changes in HHA supply that occurred following implementation of the IPS. The insights it has added about various sources of supply response, and the factors contributing to the HHA supply decisions suggest that observed reductions in HHA supply reflected rational market decisions by agencies responding to very significant changes in the payment system. While our study findings are richer than earlier studies, they similarly suggest that the HHA supply reductions following the IPS more likely reflect the loss of marginal agencies in geographic markets with an abundance of supply in 1996.

# **APPENDIX A. METHODOLOGY FOR CLASSIFYING HHA SERVICE AREA CHANGES**

## **Geographic Service Area Delineation**

Geographic service areas were first delineated for each active HHA in 1996 and 1999 using an iterative approach commonly employed for the delineation of hospital service areas where zip codes accounting for the most patients are sequentially added one at a time to the service area, each time adding fewer patients, until some threshold percentage of patients served is reached (Garnick., Luft, Robinson, & Tetreault 1987; Goody 1993; Slifkin, Ricketts, & Howard 1996). Only five-digit zip codes involving service to two or more beneficiaries by the HHA were used to delineate service areas. Preliminary analyses suggested that many zip codes where only one beneficiary was served reflected idiosyncratic situations, including for example, long-distance moves by beneficiaries during the year that are not reflected in the beneficiary residence zip code on Medicare claims data.<sup>4</sup> Employing a threshold percentage of 90 percent, each HHA's geographic service area included either: (1) the zip codes with the greatest numbers of beneficiaries served that collectively accounted for 90 percent of all beneficiaries served over the year by the HHA; or (2) all zip codes involving visits to two or more beneficiaries if the 90 percent threshold was not met. The selected zip codes comprising the service areas of HHAs active in 1996 collectively accounted for 89.3 percent of all Medicare beneficiaries served by these same HHAs in 1996, with duplicated counts of beneficiaries who were served by more than one HHA during the year.

## **Zip Codes Added or Dropped from HHA Service Areas**

For each HHA, zip codes comprising its service area in 1996 and 1999 were then classified into one of three categories: (1) zip codes served in 1996 but not 1999; (2) zip codes served in 1999 but not 1996; and (3) zip codes served in both 1996 and 1999. Zip codes involving visits to two or three beneficiaries in one of the years that were not served in the other year were counted as being served in both 1996 and 1999 to reduce the chances of their misclassification due to sampling variation.<sup>5</sup> Beneficiaries served in zip codes assigned to these three categories were aggregated to the HHA level to

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<sup>4</sup> There were much higher prevalence rates of: (1) HHA and beneficiary residence locations in different states; (2) a distance of 120 miles or more between HHA and beneficiary residence zip code locations; and (3) beneficiaries who were served by multiple HHAs during the year that were not located in the general vicinity of each other.

<sup>5</sup> If it is assumed beneficiaries served in a zip code are events distributed under a Poisson distribution with an expected value equal to beneficiaries served by the HHA in either 1996 or 1996, one can compute the chances that the zip code will not be in the HHA's service area in the other year. The probabilities that zip codes involving service to only two and three beneficiaries in 1996 will not be contained in the HHA's service area in 1999 due to chance are about 0.41 and 0.20, respectively.

produce four summary totals of beneficiaries served: (1) beneficiaries served in 1996 of zip codes served by the HHA in both 1996 and 1999; (2) beneficiaries served in 1996 of zip codes no longer served by the HHA in 1999; (3) beneficiaries served in 1999 of zip codes served by the HHA in both 1996 and 1999; and (4) beneficiaries served in 1999 of zip codes newly served by the HHA in 1999.

## **Classification of HHA Service Area Changes**

Each of the 7,021 HHAs that actively served beneficiaries in both 1996 and 1999 were then classified into categories of expanded, contracted, changed, or stable geographic service area between 1996 and 1999 based on the relative magnitudes of the four summary variables containing counts of beneficiaries served in dropped, added, and continuously served zip codes. Since most HHAs discontinued service to some zip codes in 1999 that were served in 1996 and/or added service to zip codes in 1999 that were not served in 1996, the general aim was to distinguish those HHAs with service area changes large enough to be of practical significance from other HHAs whose geographic service areas were relatively stable over time.

We first considered what level of beneficiary service contraction or expansion is necessary to have *practical* significance. Suppose that in 1999 an HHA no longer served a subset of zip codes that accounted for 1 percent of total beneficiaries in 1996, and the HHA does not serve beneficiaries in any newly added zip codes in 1999. While this may technically be viewed as a service area contraction, it is unlikely to have much practical significance. Recognizing that any minimum threshold will be arbitrary, a minimum threshold percentage of 20 percent of total beneficiary service volume was chosen as a classification parameter. Under this assumed threshold three important subsets of HHAs were assigned to categories:

- First, an HHA that discontinued service in 1999 to beneficiaries of some zip codes served in 1996, and that did not initiate service in 1999 to beneficiaries of any zip codes that were not also served in 1996, can be classified as having *contracted its service area* if service in the dropped zip codes satisfy the 20 percent threshold.
- Second, an HHA that continued to serve in 1999 beneficiaries of all zip codes previously served in 1996, and that initiated service in 1999 to beneficiaries of other zip codes, can be classified as having *expanded its service area* if the added zip codes satisfy the assumed 20 percent thresholds for 1996 and 1999.
- Third, an HHA that discontinues service to some zip codes and/or newly expands service to other zip codes can be classified as having a *stable service area* if neither of the assumed 20 percent beneficiary service thresholds for 1996 and 1999 is met.

The assumed 20 percent beneficiary service threshold alone is not sufficient, however, to classify those HHAs that contracted or expanded their service areas vis-à-vis *both* discontinuing service to beneficiaries of some zip codes and initiating service to beneficiaries of other zip codes between 1996 and 1999. Here the *relative magnitudes of beneficiary service volume* in zip codes dropped and added must be considered. It seems reasonable to generally expect that HHAs contracting their service areas should have served *many more* beneficiaries in 1996 in the zip codes dropped from its service area than they later served in newly added zip codes in 1999. Likewise, HHAs expanding their service areas should serve *many more* beneficiaries in newly served zip codes in 1999 than they served in 1996 in zip codes dropped from its service area.

While any definition of *many more* will be arbitrary, *many more* was defined in this study to be *at least five times larger*. That is, to be classified as contracting its service area, an HHA must have served five times as many beneficiaries in 1996 in the zip codes dropped from its service area than it later served in 1999 in newly added zip codes. Similarly, classification of expanded service area required that beneficiaries in newly added zip codes outnumber those in dropped zip codes by a factor of five. All remaining HHAs that both dropped and added zip codes from their service areas that did not meet these relative service volume requirements were assigned to a residual category of HHAs with changed service areas.

Given that arbitrary assumptions were employed in the classification process, sensitivity analyses were performed to assess the sensitivity of the initial assignments to marginal changes in the assumed classification parameters. The service area data of HHAs with parameter-sensitive classifications that served at least 500 beneficiaries annually were manually compared with the norms of HHAs comprising the shifted categories. As a consequence of these comparisons, 24 HHAs in the residual category of *changed service area* were reclassified. Ten of these HHAs were reassigned to the contracted service area category, with the remainder were reassigned to the *expanded service area* category.

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**TABLE 1: Categories of Change in Medicare HHA Supply 1996-1999 with Selected Agency Attributes**

Variable	HHA Supply Change Category 1996-1999							
	Market Exit	Service Area Contraction	Service Area Expansion	Service Area Changed	Service Area Stable	New Market Entrant	Total 1996	Total 1999
<b>Beneficiary Service Attributes</b>								
Number of HHAs	2,143	1,027	942	342	4,710	870	9,164	7,891
% of Total 1996	23.4%	11.2%	10.3%	3.7%	51.4%		100.0%	
% of Total 1999		13.0%	11.9%	4.3%	59.7%	11.0%		100.0%
Medicare beneficiaries served 1996	558,493	343,651	167,120	85,626	2,840,073		3,994,963	
Beneficiaries served in dropped zip codes 1996	558,493	124,851	4,122	15,836	90,967		794,269	
Service in dropped zip codes as % of 1996 total	100.0%	36.3%	2.5%	18.5%	3.2%		19.9%	
Medicare beneficiaries served 1999		99,163	362,048	71,599	2,331,417	131,585		2,995,812
Beneficiaries served in added zip codes 1999		3,200	142,054	19,926	96,665	131,585		393,430
Service in added zip codes as % of 1999 total		3.2%	39.2%	27.8%	4.1%	100.0%		13.1%
<b>Travel Distance Attributes<sup>1</sup></b>								
Mean distance from HHA to beneficiary in miles 1996		16.89	12.28	21.4	10.13			
Mean distance from HHA to beneficiary in miles 1999		13.84	16.57	19.3	10.25			
Mean change in distance 1996-1999 in miles		-3.05	4.29	-2.10	0.12			
<b>HHA Staffing Levels<sup>2</sup></b>								
Mean RN FTEs 1996		12.82	7.1	8.19	17.96			
Mean RN FTEs 1999		8.28	13.01	7.81	15.84			
Mean change in RN FTEs 1996-99		-35.4%	83.2%	-4.6%	-11.8%			
Mean CNA FTEs 1996		14.63	7.56	10.95	17.34			
Mean CNA FTEs 1999		9.58	9.31	9.6	12.94			
Mean change in CNA FTEs 1996-99		-34.5%	23.1%	-12.3%	-25.4%			
1. Only HHAs that were active in both 1996 and 1999 were used in computations of mean distance traveled (N=7,021). 2. Only HHAs with staffing data for both 1996 and 1999 were used in computations of mean staffing levels (N=6,904).								

<b>TABLE 2: Variable Definitions and Descriptive</b>				
<b>Variable</b>	<b>Definition</b>	<b>Source</b>	<b>Mean</b>	<b>SD</b>
<b>Ownership Status</b>				
For-profit	Yes=1, No=0	POS	0.545	0.498
Government	Yes=1, No=0	POS	0.146	0.353
Voluntary not-for-profit (reference)	Yes=1, No=0	POS	0.309	0.462
<b>Organizational Setting</b>				
Hospital-based	Yes=1, No=0	POS	0.299	0.458
Freestanding (reference)	Yes=1, No=0	POS	0.701	0.458
<b>Organizational Structure</b>				
Branches and subunits	A count of branches and/or subunits operated by the HHA in 1996.	POS	0.602	1.839
<b>Medicare Program Tenure</b>				
Medicare program tenure	Years of Medicare program certification as of 1/1/1996.	POS	9.028	9.064
Recent market entrant	Medicare program certification before 10/1/1993, otherwise=0	POS	0.326	0.469
<b>Medicare Service Delivery Attributes</b>				
Beneficiaries served 1996	Total Medicare beneficiaries (in 100s) served by the HHA with 1+ visits in 1996.	claims	4.400	7.948
Visits per beneficiary served 1996	Average visits (in 10s) per beneficiary served in 1996.	claims	8.231	5.828
<b>Medicare HHC Demand Attributes</b>				
Medicare market demand size	Medicare beneficiaries 75 yrs and older (in 10,000) in market area 1996.	MDF	6.893	10.402
Medicare market demand density	Medicare beneficiaries 75 yrs and older (in 100s) per square miles in market area 1996.	MDF ARF	0.276	1.020
<b>Medicare HHC Market Area Attributes</b>				
Active Medicare HHAs	The number of HHAs (in 10s) with catchment areas within the market areas served by the HHA.	POS claims	5.757	8.290
Market share of beneficiaries served	The percentage of total beneficiary users in the geographic market area that area served by the HHA.	claims	6.674	11.085
<b>Other LTC Supply Indicators</b>				
Nursing home bed supply	Medicare-certified nursing home beds per 100 beneficiaries 75 years and older in the market area.	MDF ARF	4.094	4.766
Chronic disease and LTC hospitals	Number of LTC and chronic disease hospitals in market area 1996	ARF	0.090	0.461
<b>Census Division</b>				
New England (reference)	HHA headquarters in ME,NH,VT,MA,RI,CT=1, otherwise=0	POS	0.047	0.211
Middle Atlantic	HHA headquarters in NY,NJ,PA=1, otherwise=0	POS	0.065	0.247
East North Central	HHA headquarters in OH,MI,IN,IL,WI=1, otherwise=0	POS	0.149	0.356
West North Central	HHA headquarters in MN,MO,IA,KS,NE,SD,ND=1, otherwise=0	POS	0.108	0.311
South Atlantic	HHA headquarters in DE,MD,DC,VA,WV,NC,SC,GA,FL=1, otherwise=0	POS	0.116	0.320
East South Central	HHA headquarters in KY,TN,AL,MS=1, otherwise=0	POS	0.064	0.244
West South Central	HHA headquarters in LA,TX,AR,OK=1, otherwise=0	POS	0.279	0.448
Mountain	HHA headquarters in MT,WY,CO,NM,AZ,UT,ID,NV=1, otherwise=0	POS	0.099	0.299
Pacific	HHA headquarters in CA,OR,WA=1, otherwise=0	POS	0.072	0.259
<b>NOTES:</b> POS=Medicare Provider of Service file; ARF=Area Resource File; Claims=100% Medicare HHA claims data; MDF=Medicare Denominator File.				

<b>TABLE 3: Components of Change in Medicare Beneficiaries Served 1996-1999</b>								
<b>Variable</b>	<b>HHA Supply Change Category 1996-1999</b>							
	<b>Market Exit</b>	<b>Service Area Contraction</b>	<b>Service Area Expansion</b>	<b>Service Area Changed</b>	<b>Service Area Stable</b>	<b>New Market Entrant</b>	<b>1996 or 1999 Totals</b>	<b>Net Change 1996-99</b>
<b><i>Beneficiaries Served</i></b>								
Number of HHAs	2,143	1,027	942	342	4,710	870		-1,273
Medicare beneficiaries served 1996	558,493	343,651	167,120	85,626	2,840,073	0	3,994,963	
Beneficiaries served in dropped zip codes 1996	558,493	124,851	4,122	15,836	90,967	0		
Medicare beneficiaries served 1999	0	99,163	362,048	71,599	2,331,417	131,585	2,995,812	
Beneficiaries served in added zip codes 1999	0	3,200	142,054	19,926	96,665	131,585		
<b><i>Sources of Change in Beneficiaries Served</i></b>								
Continuously served zip codes	0	-122,837	56,996	-18,117	-514,354	0		-598,312
Zip codes dropped from HHA service areas	-558,493	-124,851	-4,122	-15,836	-90,967	0		-794,269
Zip codes added to HHA service areas	0	3,200	142,054	19,926	96,665	131,585		393,430
<b>Total Net Change</b>	<b>-558,493</b>	<b>-244,488</b>	<b>194,928</b>	<b>-14,027</b>	<b>-508,656</b>	<b>131,585</b>		<b>-999,151</b>

**TABLE 4: Multinomial Logit Model Results for HHA Supply Decisions 1996-1999**

Variables	Contract Service Area/ Stable Service Area			Expand Service Area/ Stable Service Area			Changed Service Area/ Stable Service Area			Market Exit/ Stable Service Area		
	OR <sup>1</sup>	t	p-value	OR	t	p-value	OR	t	p-value	OR	t	p-value
<b>Ownership Status (not-for-profit)</b>												
For-profit	1.849	5.35	0.000	1.109	0.90	0.370	2.313	4.34	0.000	1.599	5.42	0.000
Government	1.198	1.25	0.210	0.410	-4.87	0.000	0.885	-0.45	0.654	0.457	-6.20	0.000
<b>Organizational Setting</b>												
Hospital-based	0.436	-6.95	0.000	0.370	-7.62	0.000	0.268	-5.93	0.000	0.493	-7.87	0.000
<b>Organizational Structure</b>												
Branches and subunits	1.184	7.14	0.000	0.991	-0.19	0.852	1.090	2.15	0.032	1.119	5.03	0.000
<b>Medicare Program Tenure</b>												
Medicare program tenure	0.983	-2.38	0.017	0.977	-2.56	0.011	0.993	-0.63	0.526	0.990	-1.70	0.090
Recent market entrant	1.003	0.03	0.974	2.490	7.79	0.000	1.326	1.84	0.066	1.560	5.48	0.000
<b>Medicare Service Delivery Attributes</b>												
Beneficiaries served 1996 (100s)	0.963	-3.63	0.000	0.881	-6.45	0.000	0.971	-2.01	0.044	0.952	-5.52	0.000
Visits per beneficiary served 1996 (10s)	1.023	2.88	0.004	0.954	-5.10	0.000	1.013	1.17	0.243	1.021	3.16	0.002
<b>Medicare HHC Demand Attributes</b>												
Medicare market demand size (10,000s)	0.983	-2.00	0.045	0.998	-0.19	0.848	1.017	1.25	0.210	0.977	-3.12	0.002
Medicare market demand density (100s/m <sup>2</sup> )	1.050	1.22	0.224	1.079	2.27	0.023	0.893	-0.76	0.449	0.897	-1.41	0.158
<b>Medicare HHC Market Structure Attributes</b>												
Active Medicare HHAs (10s)	1.046	4.47	0.000	1.028	2.72	0.006	1.040	2.79	0.005	1.043	5.15	0.000
Market share of beneficiaries served (%)	0.921	-8.59	0.000	0.954	-4.64	0.000	0.979	-2.01	0.045	0.947	-8.94	0.000
<b>Other LTC Supply Indicators</b>												
Nursing home bed supply (/100 capita)	0.966	-2.95	0.003	1.004	0.35	0.726	1.004	0.24	0.813	0.999	-0.09	0.931
Chronic disease and LTC hospitals	0.893	-1.02	0.309	1.164	1.39	0.165	1.392	2.86	0.004	1.258	3.07	0.002
<b>Census Division (New England)</b>												
Middle Atlantic	0.935	-0.25	0.802	1.423	1.15	0.250	1.044	0.11	0.913	1.058	0.26	0.798
East North Central	1.277	1.07	0.284	1.078	0.27	0.787	0.625	-1.29	0.198	1.184	0.90	0.366
West North Central	1.545	1.81	0.071	0.793	-0.76	0.447	0.898	-0.28	0.782	1.248	1.11	0.265
South Atlantic	1.339	1.28	0.202	1.732	2.00	0.045	0.747	-0.79	0.427	1.208	1.00	0.317
East South Central	1.188	0.69	0.488	2.832	3.46	0.001	1.013	0.03	0.974	0.710	-1.54	0.122
West South Central	0.911	-0.37	0.708	1.851	2.13	0.033	1.144	0.36	0.720	1.217	0.99	0.322
Mountain	0.872	-0.52	0.602	0.986	-0.05	0.963	0.687	-0.92	0.360	2.214	3.99	0.000
Pacific	1.370	1.25	0.212	1.753	1.91	0.056	1.184	0.43	0.666	2.002	3.46	0.001
Log likelihood=-9,907.61 Pseudo-R squared=0.1465 N=9,061												
1. OR=odds ratio for (supply decision/stable market area).												